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A Narrative Analysis of Federal Appropriations for Research and Development

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Andrew J. Fieldhouse† and Karel Mertens‡

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Abstract

This paper provides a narrative analysis of postwar federal appropriations for the research and development (R&D) activities of the Department of Defense, Department of Energy, National Aeronautics and Space Administration, National Institutes of Health, and National Science Foundation—five agencies that consistently account for the vast majority of federal outlays for all types of R&D. We build a novel dataset quantifying the enacted full-year appropriations for all budgetary accounts funding R&D activities at these five agencies over fiscal years 1947-2019. We use this dataset to isolate a subset of 218 "significant" changes in real appropriations for each agency, and we analyze numerous primary and secondary sources to understand the context and motivation. Based on these sources, we classify each significant change in federal R&D appropriations as either "endogenous" or "exogenous" to short-run macroeconomic developments. The exogenous changes in R&D appropriations are intended as instrumental variables for studying the causal effects of government R&D in appropriately specified empirical models.

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1 Introduction

This paper conducts a narrative analysis of postwar federal appropriations for the research and development (R&D) activities of five federal agencies: The Department of Defense (DOD), Department of Energy (DOE), National Aeronautics and Space Administration (NASA), National Institutes of Health (NIH), and National Science Foundation (NSF). These five agencies account for the vast majority of federal outlays for R&D over the postwar period. By "R&D," we mean all activities involving basic research, applied research, or experimental development work. Following the NSF (2022), basic research is defined by the objective of "gaining more complete knowledge or understanding of the fundamental aspects of phenomena and of observable facts, without specific applications toward processes or products in mind," applied research is defined by the objective of gaining "knowledge or understanding necessary for determining the means by which a recognized need may be met," and development is defined as "the systematic use of the knowledge or understanding gained from research, directed toward the production of useful materials, devices, systems, or methods, including design and development of prototypes, and processes...".

We build a novel dataset quantifying the enacted full-year appropriations for all budgetary accounts funding R&D activities at each of the five agencies over fiscal years 1947 to 2019. DOE funding for R&D covers both defense activities (nuclear weapons and naval propulsion) as well as non-defense activities (civilian energy and physics research). For this reason, we also separately track appropriations for the defense and nondefense R&D functions within the DOE. This enables the aggregation of R&D appropriations to distinct federal defense and nondefense categories that correspond to their separate treatment in the national accounts or in budget scores by the Congressional Budget Office (CBO).[1] The focus on appropriations rather than outlays facilitates the analysis of the legislative intent behind changes in R&D policy. It also leads to better measurement of the timing of policy changes, which can be important in empirical analyses of the effects of fiscal policy, see, e.g., Ramey (2011).

Using the R&D appropriations dataset, we isolate a subset of 218 "significant" changes in appropriations at the agency/year level, defined as year-over-year increases of at least 5 percent, or decreases by more than 2.5 percent, in real terms. For each significant policy change, we analyze a variety of primary and secondary historical sources to understand the context and motivation. Based on our reading of these historical sources, we classify each significant change in federal R&D appropriations as either "endogenous" or "exogenous" to short-run macroeconomic fundamentals. The purpose of this classification is to isolate changes in R&D appropriations that are not systematically related to contemporaneous business cycle shocks. It could, for example, be the case that policymakers commonly include increases in R&D appropriations in larger fiscal stimulus packages during economic downturns. It could also be the case that R&D funding systematically expands during economic booms when there is more room in government budgets for longer-term policy objectives. To the extent that business cycle shocks influence the pace of private-sector research activity—and therefore likely also productivity in the longer-term—either form of cyclicality in R&D appropriations would introduce potentially important simultaneity problems in the empirical relationship between productivity/innovation and government R&D funding. The subset of narratively identified exogenous changes in R&D appropriations are

[1] CBO treats defense and nondefense R&D spending as distinct in their analyses of the macroeconomic effects of federal R&D investments and assumes, for example, that defense weapons development does not yield private-sector productivity spillovers (Campbell and Shirley 2018).

intended as valid instrumental variables to address these simultaneity problems in appropriately specified empirical models. In a companion paper, Fieldhouse and Mertens (2023), we use the narrative series of federal R&D appropriations to estimate (1) the dynamic causal effects of shocks to government R&D on total factor productivity (TFP) and other measures of innovation, (2) the aggregate production function elasticity of government R&D capital, and (3) the macroeconomic returns to government R&D.

Our approach closely follows similar narrative analyses in the literature. Examples include applications to monetary policy (Romer and Romer 1989; Romer and Romer 2023), government spending (Ramey 2011; Ramey 2016; Ramey and Zubairy 2018), tax policies (Romer and Romer 2009; Romer and Romer 2010; Cloyne 2013), and housing credit policies (Fieldhouse and Mertens 2017; Fieldhouse et al. 2018). In our application to federal R&D funding, we find multiple examples of changes in R&D policies that appear primarily motivated by short-term changes in macroeconomic fundamentals. For example, the oil shocks of the 1970s spurred the creation of DOE and significant R&D investments in domestic energy sources. The American Recovery and Reinvestment Act of 2009 (ARRA) appropriated large sums for research as part of the effort to stimulate economic activity during the Great Recession. More recently, and after or sample of study, the NIH received substantial emergency appropriations to fund vaccine research in response to the COVID-19 pandemic. Despite these examples, our narrative analysis finds that the majority of the significant changes in federal R&D appropriations are not driven by shorter-run changes in macroeconomic conditions. These changes are instead more frequently motivated by national security concerns and other geopolitical imperatives, by general concerns about the adequacy of the science, technology, and engineering base, or by idiosyncratic preferences of influential policymakers. As shown in Fieldhouse and Mertens (2023), the narratively identified exogenous changes in appropriations for defense and nondefense R&D have good predictive power for measures of government R&D investment and capital available in the national accounts. The narrative series are therefore useful for the identification of the causal effects of changes in federal R&D spending.

The remainder of the paper is structured as follows. Section 2 provides an overview of the methodology and data sources used for the narrative analysis of federal R&D appropriations for each agency. Section 3 provides a brief overview of postwar federal R&D policy as background context for the ensuing narrative analysis. Section 4 provides the full details of our narrative analysis of primary and secondary sources for each significant policy change in real appropriations for each agency, organized as follows: DOD (Section 4.1); DOE (Section 4.2); NASA (Section 4.3); NIH (Section 4.4); and NSF (Section 4.5). Section 5 presents the narrative measures. We make extensive use of acronyms used in the federal budget process, both for brevity and comprehension of primary sources cited. A glossary of these acronyms is provided in Section 6. Data Appendix A provides the full details on the construction of the dataset of the enacted full-year appropriations for the budgetary accounts funding the R&D activities of the five agencies.

2 Overview of Narrative Analysis Methodology and Data

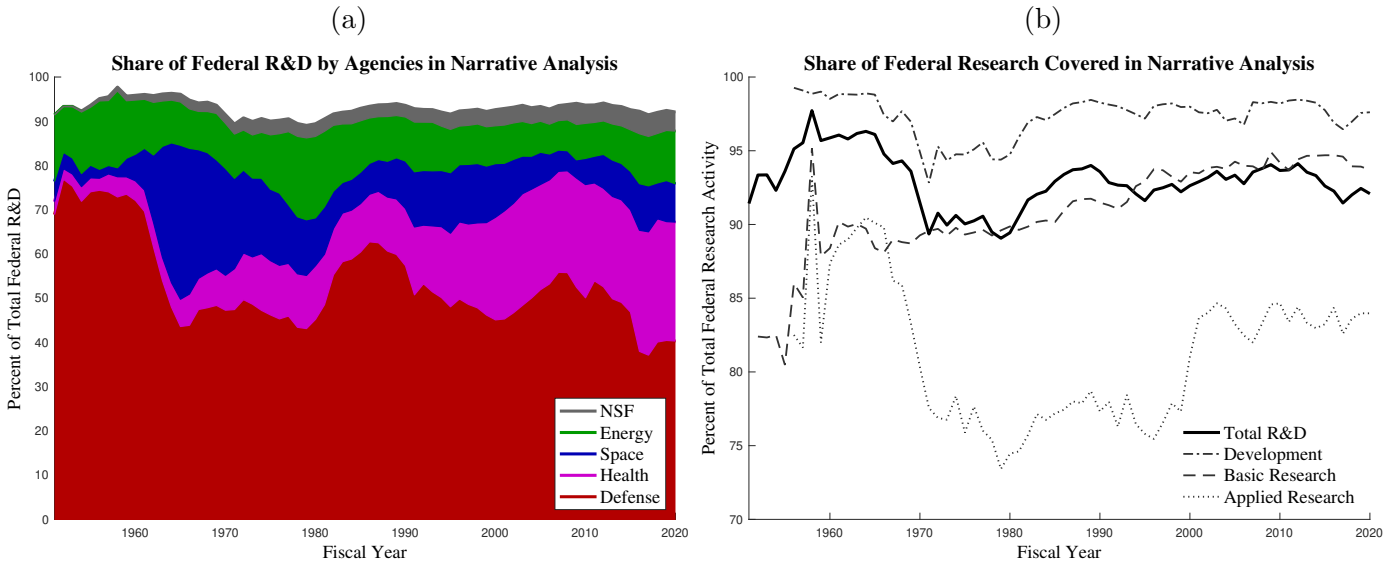
2.1 The Five Federal Agencies of Study

As mentioned in the introduction, we analyze post-war appropriations for the R&D budget accounts of DOD, DOE, NIH, NSF, and NASA. We also include any of the preceding agencies when applicable. More specifically, our analysis of DOD includes the National

Military Establishment before DOD was established by the National Security Act Amendments of 1949. Similarly, the Atomic Energy Commission (AEC) and Energy Research and Development Administration (ERDA) are included as predecessors to the DOE, which was created in 1977.[2] We use the National Advisory Committee for Aeronautics (NACA), a small agency folded into NASA at its creation in 1958, as a baseline for NASA R&D appropriations growth, but ignore earlier annual changes in NACA's R&D appropriations because they were minimal. Our treatment of the NIH includes all related health research centers and institutes that were previously independent agencies under the Department of Health and Human Services (HHS) or its preceding agencies, but are now under the umbrella of the NIH, as detailed in Data Appendix A.[3]

The five agencies we analyze have consistently accounted for the lion's share of federal funding for R&D throughout the post-war period. Figure 1a depicts shares of total federal R&D obligations broken out for each of the five agencies covered in the narrative analysis. DOD (red) consistently accounts for the greatest share of federal R&D funding, but has been trending down, falling from over 75% in FY1952 to just 40% in FY2020. NIH (purple) has steadily risen as a share of total federal R&D, rising to more than 25% in recent years. NASA (blue) accounted for upwards of 35% of federal R&D activity during the height of the space race, but closer to 5-15% of total research since the end of the Cold War. DOE (green) accounted for nearly 20% of total federal R&D in the late 1970s and early 1980s, following the oil crises, but has accounted for roughly 10% of federal R&D in more recent decades. Finally, the NSF (gray) accounts for the smallest share of research of these five agencies, but it has steadily grown since its creation in 1950 and now accounts for roughly 5% of total federal R&D obligations.

Figure 1: Share of Federal R&D Obligations Covered by Narrative Analysis



Notes: Due to data limitations, the series start in FY1951 and the figures reflect obligations for all research funded by HHS, not strictly the NIH, but the NIH accounts for almost all HHS research activity. Our definition of the NIH also includes several preceding HHS institutes later folded into the NIH, see Appendix A.4 for details. *Source*: NSF National Center for Science and Engineering Statistics database.

[2]ERDA was created from the R&D functions of the AEC, which in turn had evolved from the Manhattan Project.
[3]The National Institute of Health was renamed National Institutes of Health in 1949; we use NIH to refer to both.

The five agencies analyzed in this paper also account for the vast majority of federal R&D funding within each of the three types of activity (basic, applied, and development). Figure 1b depicts the shares of R&D activity covered in the narrative analysis broken out by each type of activity. The five agencies consistently account for roughly 90-95% of total federal R&D obligations (solid black line) throughout the available data sample; they also account for roughly 80-95% of federal funding for basic research (dashed gray line), roughly 75-90% of funding for applied research (dotted gray line), and nearly 95-100% of funding for experimental development work (gray dash-dot line).

2.2 Construction of the Data on R&D Appropriations

We first build a dataset of all enacted annual appropriations for all budgetary accounts providing R&D funding for DOD, DOE, NASA, NIH, and NSF. The dataset on appropriations spans FY1947-FY2019 for DOD and NIH, FY1948-FY2019 for DOE, FY1951-FY2019 for NSF, and FY1956-FY2019 for NASA. We focus on appropriations as our measure of government-funded R&D—as opposed to budgetary outlays or expenditures in the National Income and Product Accounts (NIPAs)—to better identify the timing of policy changes. Accounting for the implementation lags between appropriations and eventual government outlays can be important for quantitative macroeconomic analysis. For instance, Leduc and Wilson (2013) estimate the macroeconomic effects of federal grants to states for highway investments, which significantly lead outlays and capture the timing of the effects on economic activity more precisely. Brunet (2022) argues that using appropriations instead of outlays generates larger and more precisely estimated fiscal multipliers. Similarly, Briganti and Sellemi (2023) find that using defense procurement obligations rather than outlays better captures inventory and time-to-build dynamics. Focusing on appropriations rather than outlays is also potentially important for capturing possible 'anticipation effects', which can lead to misleading results when identifying the causal impact of fiscal policy changes using spending data alone, see, e.g., Ramey (2011). Focusing on appropriations is also key for identifying the legislative intent behind R&D policy changes in the narrative analysis.

Congressional appropriations provide legal authority for federal agencies to enter into financial obligations (e.g., contracts, grants, purchase orders) that will immediately or eventually result in payment by the U.S. Treasury, also known as outlays. In recent decades, appropriations are just one of four types of budget authority (BA), all of which can provide the legal authority for federal agencies to incur obligations. In practice, appropriations are by far the most important type of BA as pertains to federal R&D funding. Before BA was introduced as a budgetary concept in the budget process reforms of the 1970s, appropriations were traditionally how Congress provided legal authority for agencies to incur obligations, per Article I Section 9 of the Constitution ("No Money shall be drawn from the Treasury, but in Consequence of Appropriations made by Law"). Appropriations are provided separately for specific purposes, projects, and activities organized by federal budget account (e.g., "Department of the Army, Research and Development"), which enables us to track only those appropriations for budget accounts funding the R&D activities of DOD, DOE, NASA, NIH, and NSF.

Appropriations typically allow agencies to enter into financial obligations only up to a maximum dollar amount and within a specified time window (e.g., one fiscal year, several years, or indefinitely). Appropriations for R&D activities are overwhelmingly made for the upcoming fiscal year or, in the event of emergencies or when the appropriations process is running behind schedule, the current fiscal year. However there are variable lags between

the enactment of appropriations, agencies entering into new obligations, and the eventual associated outlays. Moreover, these lags can vary widely by type of R&D activity. For instance, annual appropriations for meeting NIH payroll is typically almost entirely spent within the same fiscal year. Conversely, when Congress appropriates funds for the development of, for example, intercontinental ballistic missiles or a particle accelerator for a national laboratory, the lag between appropriations and outlays can be many years. For their work as budget scorekeepers, the CBO estimates the lag structure between BA (in the context of R&D, appropriations) and outlays—commonly referred to as the "spendout rate" or "outlay rate"—in order to estimate how proposed changes in BA would affect outlays and the budget deficit; see CBO (2023). The CBO's estimates for defense and nondefense discretionary spending suggest that outlays in a given fiscal year are, on average, reflective of appropriations for that same fiscal year as well as the previous four years, with only roughly 50-65% of outlays in that year stemming from appropriations made in the same year.[4] In other words, outlays in a given fiscal year reflect policy decisions that were made over the last four or five appropriations cycles. For this reason, it would be very difficult to infer policymakers' intent behind changes in outlays for any given year.

Appropriations for R&D are typically made through annual appropriations acts. Every year, Congress is expected to pass twelve annual appropriations bills, each under the jurisdiction of a different subcommittee of the House and Senate Appropriations Committees; the subcommittees draft their respective bills, which then have to pass a committee vote and floor vote in each chamber, often as amended during debate. Differences between the House and Senate versions are then resolved in a conference, and the conference bill needs to be passed by both chambers, which then sends the bill to the President for enactment or veto. These regular order appropriations bills are intended to be enacted before the start of the federal fiscal year. In recent decades this has rarely happened, and Congress has instead relied on continuing resolutions (CRs) to extend appropriations up to a set date, typically a temporary extension to allow more work on the annual bills. Congress has also increasingly used consolidated or omnibus appropriations bills—a single legislative vehicle providing appropriations for agencies covered by several or all of the twelve regular order appropriations bills—to expedite the enactment of appropriations. Appropriations are also supposed to have been previously authorized by legislation passed by the authorizing committee of jurisdiction—bills setting federal policy and ceilings on appropriations.[5] For instance, the House and Senate Armed Services Committees are expected to pass an annual National Defense Authorization Act authorizing appropriations for military R&D and weapons procurement, and then the House and Senate Defense Appropriations Subcommittees are supposed to draft and pass complying appropriations bills. However, authorizing legislation can also appropriate funds in addition to authorizing them. Other emergency or supplemental legislation also periodically appropriates funds for R&D above and beyond previously enacted appropriations bills for the same fiscal year. Regardless of how appropriations have been enacted, subsequent legislation can transfer funds to or from that budget account for the remainder of the fiscal year. At times, and under certain budget rules, appropriations can also be subsequently "sequestered" (i.e., canceled) by presidential order. Using the annual appropriations bills as the primary data source, therefore, risks missing potentially significant subsequent changes in appropriations for R&D activities driven by

[4]CBO is required to produce cost estimates of major pending legislation that project the effect on the federal budget deficit. While budgetary proposals and pending legislation would change BA, the unified budget deficit is always measured in terms of outlays, as cash outlays and receipts determine the need for residual deficit financing.

[5]Unauthorized appropriations can also be enacted but are subject to more stringent procedural hurdles.

authorizing bills, supplemental appropriations, or sequesters. The breakdown of the regular appropriations process and increased reliance on multiple CRs would also greatly complicate the measurement of enacted appropriations from all related legislation.

Given these complications, our principal source for the data on R&D appropriations is the *Budget of the United States Government* and its appendices (henceforth the *Budget*), as opposed to the appropriations bills themselves. Conveniently, the *Budget* for FY(t) reports the actual enacted appropriations for each budget account for FY(*t-2*), adjusted for any supplemental appropriations, budget sequesters, or subsequent transfers between accounts. We principally rely on the FY(t) *Budget* request for data about enacted, adjusted appropriations for FY(*t-2*), similar to the approach used by Brunet (2022) in quantifying historical budget authority for national defense functions.[6] Occasionally, the *Budget* fails to provide detailed appropriations data of interest, in which case we turn to transcripts of appropriations committee hearings about that agency's budget request, which tend to report overlapping budgetary data for the same fiscal years.[7]

We also use information from the *Budget* to identify which budget accounts are funding agencies' R&D activities. While appropriations are made for specific budget accounts, the *Budget* typically provides a breakdown of obligations for each budget account both by activity (e.g., "Research and Development") and type (e.g., "Personnel"), along with brief descriptions of those activities. We focus on accounts appropriating funds for research, development, and R&D plant (i.e., capital equipment and construction of new facilities for R&D activities). These budget accounts include funding for salaries of scientific researchers performing R&D activities, R&D supplies, expenses, contracts, and research grants. These accounts also fund testing and evaluation activities for DOD—later stages of weapons development—but not procurement of fully developed weapons systems or other equipment. For DOD, NASA, and NSF, we track the adjusted appropriations for all entire budget accounts identified as funding R&D activities, and we try to be as consistent as possible in tracking the same or similar accounts over time, as budget accounts are periodically renamed or reorganized.

Our quantification for DOE differs somewhat from that for the other agencies, because the research activities of DOE span two very different roles: National security functions, principally nuclear weapons activities and naval nuclear reactor propulsion programs, as well as non-security functions, largely civilian energy and physics research conducted by the national laboratories. These two functions vary substantially both in terms of the type of research activity (i.e., basic, applied, or development) and galvanizing influences for large changes in appropriations (e.g., nuclear weapons proliferation/arms control treaties as opposed to oil shocks). Moreover, the nuclear security R&D activities of DOE are counted as federal defense R&D expenditures in the NIPAs, whereas DOE's civilian energy and physics R&D are counted as federal nondefense R&D. To develop separate series for defense and nondefense R&D expenditures, we split DOE appropriations into distinct 'Energy: Defense' and 'Energy: Nondefense' functions. Discretionary budget authority and adjusted appropriations are only reported for entire budget accounts, but a single budget account often funds both defense and nondefense activities (e.g., a "Reactor development" account funding both

[6]The *Budget* request for FY(t) is typically published early in calendar year *t-1*, well after FY(*t-2*) has concluded but before FY(*t-1*) is over. The federal fiscal year started on July 1 before 1977 and on October 1 afterward.

[7]For instance, the budget office could not compile timely budget data and requests for DOD during the Korean War, and the R&D activities of the AEC's nuclear weapons activities budget category are not always broken out for certain years, but data from hearing transcripts allows us to fill in these gaps. Hearing transcripts for DOD and DOE's atomic weapons activities are often classified and partly censored, but this is rarely an issue for top-line budget tables.

civilian nuclear reactor development and naval nuclear reactor development). As such, we use data on direct obligations that are separately reported in the *Budget* for each activity of each budget account for our quantification of 'Energy: Defense' and 'Energy: Nondefense' appropriations. We use descriptions of each budget activity from the *Budget* appendices as well as appropriations committee reports to guide our categorization of defense versus non-defense functions. Data Appendix A documents in detail which budget activities and budget accounts are classified as 'Energy: Defense' and 'Energy: Nondefense' appropriations.

We also take a different approach in quantifying NIH appropriations since the *NIH Almanac* Historical Budget Information database conveniently reports the actual enacted appropriations for all affiliated centers and institutes for every fiscal year over FY1938–2020.[8] The organizational structure and budget of the NIH are particularly complex and fluid, with new research centers and institutes frequently being created or merged together, so we principally use this public database instead of constructing our own version from the *Budget* to minimize the scope for measurement error. The *NIH Almanac* Historical Budget Information database similarly accounts for continuing resolutions, budget sequestration cuts, or subsequent transfers between accounts.[9] We also use data from the *Budget* to supplement data from the *NIH Almanac* Historical Budget Information to fill in missing data for the National Institute of Mental Health (NIMH), National Institute on Alcohol Abuse and Alcoholism (NIAAA), and National Institute on Drug Abuse (NIDA) over FY1967-1992. The *NIH Almanac* Historical Budget database only includes appropriations for research centers and institutes currently organized as part of the NIH. For consistency, we treat the NIMH, NIDA, and NIAAA research institutes as uniformly part of the NIH, augmenting the database with appropriations for those institutes in those years.[10]

Budgetary concepts and definitions have periodically changed over our FY1947-FY2019 sample, but we try to be as consistent as possible in measuring adjusted appropriations for R&D activities. For most of our sample, our quantification of appropriations for R&D activities is based on line-items for discretionary "Budget authority," which are typically equal to discretionary appropriations adjusted for any transfers. Prior to the introduction of BA as a budgeting concept, quantification is instead based on line-items for "New obligation authority" or "Appropriations" for each relevant budget account; these historical authorizations of federal spending ostensibly preceded discretionary BA as the relevant budgetary concept for R&D activities in the early post-war era. For a variety of reasons, we ignore BA from reimbursable programs or offsetting collections, which are not appropriated, see Appendix A for details; accordingly, we focus on "Net (discretionary)" BA instead of "Gross" BA when the distinction becomes relevant in the 1990s. We also ignore any mandatory BA, which is authorized on a permanent, formulaic basis (e.g., Social Security) instead of being governed by the annual appropriations process. In practice, almost all funding for R&D activities is discretionary, not mandatory.

Data Appendix A provides a detailed overview of the dataset construction, including the budget concepts and accounts used for each agency in each fiscal year, along with sources.

[8] See https://www.nih.gov/about-nih/what-we-do/nih-almanac/appropriations-section-1.

[9] The *NIH Almanac* database, however, sometimes ignores supplemental appropriations, but documents such exclusions; we manually adjust their appropriations series for supplemental appropriations when appropriate.

[10] The NIMH was established in 1949 under the umbrella of the NIH but was elevated to a bureau of the Public Health Service under the Health Services and Mental Health Administration in FY1967. The NIAAA and NIDA were founded as part of NIMH in the early 1970s, and then NIMH, NIDA, and NIAAA were reorganized as separate research institutes under the new Alcohol, Drug Abuse, and Mental Health Administration in FY1973. In FY1993, the NIMH, NIDA, and NIAAA research institutes were moved back into the NIH. Consequently, the *NIH Almanac* Historical Budget database does not include appropriations for the NIMH, NIDA, and/or NIAAA over FY1967-1992.

2.3 Definition of Significant Changes in R&D Appropriations

After compiling the time series of appropriations for R&D activities of each of the five agencies, we identify agency-fiscal year pairs with "significant" year-over-year changes in real appropriations over FY1948-FY2019. Significant changes are defined as increases in real appropriations of at least 5%, or as decreases of at least 2.5%. To obtain real changes, we deflate the nominal appropriations using the NIPA price indices for federal defense and nondefense gross investment in intellectual property products (IPP). Appropriations for DOD and the 'Energy: Defense' functions of DOE are deflated using the defense IPP price index and appropriations for NASA, NIH, NSF, and the 'Energy: Nondefense' functions of DOE are deflated using the nondefense IPP price index.[11]

We restrict attention to increases in real appropriations of at least 5% or decreases of at least 2.5%, for two reasons. First, it is considerably easier to infer legislative intent when there are relatively large deviations from current policy as opposed to appropriations that largely just maintain real purchasing power. Second, it substantially reduces the number of agency-fiscal year pairs that need to be analyzed in the narrative analysis. There are 218 agency-fiscal year pairs with significant changes in real appropriations over the FY1948-2019 sample. This means we do not analyze 128 other agency-fiscal year pairs with smaller changes in appropriations. Splitting the defense and nondefense functions of DOE, there are 257 policy event-fiscal year pairs with significant changes. The +5% threshold for significant increases in real R&D appropriations is meant to limit focus to roughly above-average increases in appropriations; the average annualized growth rate in real appropriations ranges from 3.3% for DOE to 9.4% for NIH, and averages 5.7% summing appropriations for all five agencies over FY1947-2019. Given the tendency for appropriations to rise in real terms, the lower absolute value of the -2.5% threshold for significant decreases in real R&D appropriations is intended to ensure a more balanced mix of policy changes increasing and decreasing R&D funding. Of the 257 policy event-fiscal year pairs with significant changes in real appropriations, 87 (33.9%) involve reduced R&D funding.

Significant policy events and the related year-over-year change in real appropriations are dated to the quarter in which the newly enacted appropriations bill takes effect, either at the start of that fiscal year or when that appropriations bill was subsequently enacted, if the appropriations process was running late. As such, most policy changes are dated to the fourth quarter after the start of the federal fiscal year was pushed back from July 1 to October 1 in 1977, and to the third quarter prior to 1977. When the appropriations process is working more or less as intended, bills are enacted no more than one quarter ahead of the effective date, and often are enacted in the same quarter they take effect (i.e., just after the start of the fiscal year). When the appropriations process breaks down, we generally ignore the effective dates of any temporary continuing resolutions and date the policy changes based on the full-year consolidated or omnibus appropriations bill; short-term continuing resolutions typically maintain current policy or nominal funding levels and only the full-year consolidated or omnibus appropriations bill typically results in significant changes to real R&D appropriations. However, if the first continuing resolution changes funding levels based on House- or Senate-passed bills for that fiscal year, we date the policy change to that first CR and ignore all subsequent bills merely extending said funding levels. If multiple regular order appropriations bills, or a mix of regular order and supplemental

[11] Using instead the Office of Management and Budget (OMB) fiscal year deflators for defense and nondefense discretionary spending produces very similar time series, see OMB Historical Table 10.1—Gross Domestic Product and Deflators Used in the Historical Tables: 1940–2028.

appropriations bills, provide funding for the same agency and same fiscal year, the effective date of those bills typically falls in the same quarter. When multiple appropriations bills providing funding for one agency take effect in different quarters of the same fiscal year, we date the policy event to the first quarter in which a bill significantly changing real R&D funding took effect.

2.4 Data Sources Used in the Narrative Analysis

We analyze numerous primary and secondary sources to understand the context and motivation for each significant change in policy. For every policy event, we analyze the corresponding *Budget of Message of the President*, relevant parts of the *Budget of the United States Government*, the State of the Union address, any other pertinent speeches, and any related presidential signing statements or veto statements to infer R&D policy intent and broader budgetary priorities of the administration. Primary sources related to the Executive branch were obtained via the Federal Reserve Bank of St. Louis' FRASER digital library or The American Presidency Project, maintained by Gerhard Peters and John T. Woolley.

To infer legislative intent, we also analyze the corresponding House Appropriations Committee and Senate Appropriations Committee reports that accompany each relevant appropriations bill, and scan pertinent parts of any related hearings of the appropriations subcommittees. The appropriations process and subcommittees with jurisdiction over R&D funding have changed periodically. Currently the "Defense" appropriations bill funds R&D activities of DOD, the "Energy and Water Development" appropriations bill funds R&D activities of DOE, the "Commerce, Justice, Science, and Related Agencies" appropriations bill funds R&D activities of NASA and the NSF, and the "Labor, Health and Human Services, Education, and Related Agencies" appropriations bill funds the R&D activities of the NIH. Related appropriations committee reports and hearings for each of these bills are almost always available at an annual frequency for our entire sample, unless the appropriations process breaks down for one more of these bills in a given year.[12] Hearings transcripts almost always include the full budget request of the agency at hand, related written statements of senior agency administrators making their request for funds, and Q&A between members and those agency administrators. We analyze reports and/or hearings of authorizing committees of jurisdiction if needed to fill in any gaps in primary sources from the appropriations committees, or when authorizing committees work in tandem with appropriators in setting R&D policy (e.g., the House and Senate Armed Services Committee reports related to the annual National Defense Authorization Act, which authorizes R&D appropriations for much of our sample). Almost all of the Congressional primary sources were obtained through the *ProQuest Congressional* database or the U.S. Government Publishing Office's govinfo database. We track down alternative scans from the HathiTrust Digital Library if a *ProQuest Congressional* scan of a primary source is of poor quality.

We cross-check all significant policy events with *CQ Almanac*'s analysis of that appropriations bill and any related authorizing bills and/or supplemental appropriations for that agency; *CQ Almanac* has in-depth coverage of every appropriations bill and federal budget cycle for FY1945-2017. We also study *CQ Almanac*'s overview of the federal budget and appropriations cycle for each fiscal year, to infer any broader business cycle influences on top-line budgetary decisions that might not be featured in coverage of specific appropriations bills. We also scan newspapers of record for related coverage of relevant appropriations

[12]The appropriations committees typically continue working and often complete their version of the bill even if an omnibus or consolidated appropriations bill ends up being the legislative vehicle.

bills, primarily *The Washington Post*, *The New York Times*, and *The Wall Street Journal*. All *CQ Almanac* articles covering the appropriations process were accessed through the *CQ Almanac Online* database. All other newspaper articles were accessed via the *ProQuest Historical Newspapers* database or the newspapers themselves.

2.5 Overview of Narrative Classification

Based on a close reading of historical sources, we classify every significant change in real R&D appropriations for each agency as either exogenous or endogenous to short-run macroeconomic conditions. As explained in the introduction, the purpose of the narrative classification is to isolate changes in R&D appropriations that are not systematically related to contemporaneous business cycle shocks. This makes these changes suitable as instrumental variables to help resolve simultaneity problems in empirical analyses of the aggregate dynamic causal effects of public investments in R&D. We emphasize that the aim is to obtain a series that satisfies "contemporaneous exogeneity" in the sense of Stock and Watson (2018). This form of exogeneity is not automatically sufficient for causal identification, which generally requires additional assumptions that may vary depending on the details of the empirical framework being used. We refer to our companion paper, Fieldhouse and Mertens (2023), for additional discussion, as well as Stock and Watson (2018) for a more general discussion of identification requirements for estimating dynamic causal effects. The detailed analysis for each significant change in R&D appropriations can be found in Section 4 below. In this section, we discuss the criteria used for the classification in more general terms.

Our criterion for classifying a policy change as endogenously motivated is evidence from primary or secondary sources that the enacted federal appropriations for a particular fiscal year were influenced by short-run macroeconomic concerns. Specifically, we look for evidence of concerns about a recession or perceived economic weakness compelling an increase in appropriations—including for R&D—as a form of fiscal stimulus. We also look for evidence of concerns about short-run inflationary pressures from the federal budget or supply shocks and related inflationary pressures influencing policy decisions about appropriations for the agencies of interest and discretionary spending totals more broadly. We also classify the reversal of large cyclically motivated increases in appropriations as endogenous, e.g., the sizeable decreases in R&D appropriations in FY2010 resulting from the reversal of ARRA appropriations for FY2009. Keywords indicative of such evidence surfacing in the appropriations process include "unemployment, employment, jobs, recession, stimulus, downturn, emergency, crisis, inflation, rising prices, energy prices, oil, shortage, or embargo."

Most of the policy changes that we classify as endogenous occurred in the late 1960s through the early 1980s, with a mix of cuts to non-energy R&D funding motivated by inflation concerns and increases in energy R&D funding compelled by the energy crises, and again around the Great Recession. Based on our reading of primary sources, increases in R&D funding that are part of larger expansionary fiscal stimulus programs are oriented exclusively towards nondefense functions. Nondefense agencies are also more frequently subjected to budget cuts than defense agencies when there are concerns about the federal budget spurring inflationary pressures. Consequently, we classify more policy events for nondefense agencies as endogenous than for defense agencies.

Our classification of a policy change as exogenous is based on evidence from primary or secondary sources that the enacted federal appropriations for a particular fiscal year were motivated by longer-run considerations, notably national security concerns, changing international treaty obligations, other geopolitical imperatives, long-run public health

concerns, long-run environmental concerns, long-run fiscal sustainability concerns, long-run scientific, technological, or international competitiveness objectives or idiosyncratic political preferences of the president or congressional leadership. Whenever the motivation for a policy change is clearly based on a mix of non-cyclical longer-run considerations and cyclical short-run concerns, we classify the change as endogenous.

Because the non-cyclical motivations for changes in R&D are wide-ranging and vary greatly by agency, there is no easy short list of keywords that is indicative of "exogenous" policy changes. The exogenous nondefense R&D policy events are typically driven by geopolitical events (e.g., the Sputnik crisis and moon mission), concerns about the adequacy of the science, technology, and engineering base (e.g., the creation of the NSF), evolving public health concerns (e.g., Nixon's "war on cancer"), multinational scientific efforts (e.g., the human genome project), mixed diplomatic and scientific objectives (e.g., the International Space Station), or mission-oriented policy successes (e.g., NASA's budget cuts after the moon landing). The exogenous defense R&D policy events are typically driven by shooting wars and/or subsequent demobilizations (e.g., the Korean War), concerns about the adequacy of strategic capabilities relative to geopolitical rivals (e.g., the Sputnik crisis and missile race), the ratification or withdrawal from non-proliferation treaties (e.g., exiting the Anti-Ballistic Missile Treaty in 2002), policy preferences of a new administration (e.g., Reagan's military buildup), diminishing national security threats (e.g., the collapse of the Soviet Union), or new emerging threats (e.g., the Global War on Terror). Long-term deficit reduction packages often pare back nondefense R&D appropriations and occasionally defense R&D appropriations as well (e.g., the Budget Control Act of 2011 and ensuing sequestration cuts to discretionary spending). Such policies are judged to be exogenous if the intent is long-term fiscal sustainability rather than curbing near-term inflationary pressures.

3 A Brief History of Postwar Federal R&D Policy

As broader context for the narrative analysis in Section 4, this section first provides a brief overview of postwar U.S. federal R&D policy, differentiating between defense and nondefense functions. This short history and the narrative analysis that follows are largely based on primary sources related to federal appropriations for the five agencies we study, ignoring any known connections between said federal R&D funding and technological progress or innovation. Many descriptive books have also been written about the R&D activities of specific federal agencies, or government R&D policy more broadly, offering complementary narratives more focused on the relation to U.S. technological development; see, e.g., Smith (1985), Smith (1990), Kleinman (1995), Ruttan (2006), Cohen and DeLong (2016), Block and Keller (2016), Tarter (2018), Gruber and Johnson (2019), and Mazzucato (2018) and Mazzucato (2021), among others.

3.1 Postwar Federal Defense R&D Policy

Following a large increase in defense research during World War II, there have been three major waves of sustained increases in defense R&D spending in the postwar period. The first wave occurred during the 1950s and 1960s against the background of the Korean War (1950-1953) and Sputnik's launch (1957). The Sputnik crisis and fears of technological gaps with the Soviet Union quickly led to the creation of the Advanced Research Projects Agency (ARPA), later renamed the Defense Advanced Research Projects Agency (DARPA), and NASA, both established in 1958. More broadly, the Sputnik crisis ushered in an intercon-

tinental ballistic missile (ICBM) race in addition to turbocharging the space race. The second wave occurred in the 1980s in the context of the Soviet invasion of Afghanistan, the election of President Reagan, and Reagan's subsequent Strategic Defense Initiative (SDI) missile defense program—the predecessor to today's Missile Defense Agency (MDA). The third wave occurred during the George W. Bush administration, in part based on a renewed focus on developing and deploying missile defense systems. The Bush administration withdrew the U.S. from the Anti-ballistic Missile (ABM) Treaty, turned the Ballistic Missile Defense Organization into the MDA in 2002, and considerably expanded its R&D budget. The 9/11 terrorist attacks and invasions of Afghanistan and Iraq also led to large increases in appropriations for DOD, including research budgets, as the Global War on Terror and new realities of asymmetric warfare considerably changed R&D objectives (e.g., the development of military drones). There was also a more minor, short-lived increase in federal funding for defense research following the inauguration of President Trump, who promised a "great rebuilding of America's armed forces" and withdrew from the Intermediate-Range Nuclear Forces (INF) Treaty in response to Russian treaty violations.

Reductions in funding for defense R&D typically follow the end of active military conflict, although this is not always the case or necessarily the only motivation. Demobilization after the Korean War led to sharp cutbacks in defense R&D appropriations, which had increased earlier during the conflict. Unlike in the Korean War, defense R&D appropriations were often cut back during the Vietnam War, as procurement, operations, and expenses of the draft army were prioritized over funding for new weapons research, development, testing, and evaluation (RDT&E). Growing inflationary pressures during the late 1960s and early 1970s—spurred on in part by the war—also influenced reductions in defense R&D appropriations throughout the Vietnam War era. Defense R&D fell substantially throughout the Obama administration, largely as a result of the Budget Control Act of 2011 and related sequestration spending cuts that started in 2013. The reversal in appropriations for defense R&D from the increases during the George W. Bush administration was, however, in part influenced (or facilitated) by the U.S. military withdrawal from Iraq, partial withdrawal from Afghanistan, and the end to the "global war on terror."

In several instances, it was broader geopolitical shifts that lead to reductions in defense R&D activities. Just as withdrawals from arms control treaties opened the door for increases in defense R&D for missile defense systems or nuclear weapons development, nonproliferation treaties have often been followed by reductions in newly disallowed nuclear weapons RDT&E activities, and frequently in R&D funding for other defense functions as well. More specifically, defense R&D fell after the ratification of the Partial Test Ban Treaty (PTBT) in 1963, the Nuclear Non-Proliferation Treaty (NPT) in 1968, the Strategic Arms Limitation Talks Agreement (SALT I) and the ABM Treaty in 1972, the INF Treaty in 1988, the Strategic Arms Reduction Treaty (START I) in 1991, START II in 1996, and New START in 2010.[13] In addition to the INF, START I, and START II treaties, the Soviet Union's exit from Afghanistan (1988-89) and collapse and dissolution of the Soviet Union (1988-91) contributed to a substantial decline in defense R&D and defense spending more broadly in the 1990s. The decline in defense R&D during the Obama administration was also influenced in part by New START and a pivot away from missile defense, in addition to partisan budget battles and the Budget Control Act of 2011.

[13]Defense research did increase following the ratification of the Strategic Offensive Reductions Treaty (SORT) in 2003, in part because the U.S. withdrew from the ABM Treaty.

3.2 Postwar Federal Nondefense R&D Policy

Contrary to defense R&D, there was little federal funding for nondefense research right after World War II. Of the nondefense agencies in our narrative analysis, only the NIH existed when WWII ended.[14] In 1946, the wartime Manhattan Project, which researched, developed, and tested the first atomic weapons under military supervision, was taken over by the AEC, a new agency established to place the Manhattan Project under civilian control. The agency's emphasis on R&D for civilian purposes would gradually grow, but in the immediate aftermath of WWII and the emerging Cold War, military objectives remained the top priority in the late 1940s. However, perceptions that military R&D had been crucial to the Allied victory, as well as the new geopolitical landscape and the emerging threats of the Cold War, soon opened the door for rapid growth in nondefense R&D funding.

Vannevar Bush, the Director of the Office of Scientific Research and Development (OSRD) during the war, had urged President Roosevelt to build on the successes of wartime research and expand the federal government's role in supporting health and basic research for peaceful purposes, a case spelled out in the famous report "Science: The Endless Frontier" (Bush 1945).[15] The effort to create a new government agency to promote research eventually led to the creation of the NSF in 1950, spurred on in part by the Soviet Union's first atomic test in 1949 and growing concerns over scientific and technological competition with the USSR. President Eisenhower was determined to re-purpose wartime nuclear fusion breakthroughs to peaceful civilian uses ("Atoms for Peace") that could advance domestic energy production and serve as a tool for strengthening alliances and promoting democracy abroad. Appropriations for AEC's civilian nuclear reactor research program grew in line with the president's budget requests. However, it was the space race, the Sputnik crisis, the ensuing creation of NASA, and President John F. Kennedy's Moon Mission that greatly expanded federal funding of nondefense R&D.

Congressional interest in appropriating funds for NASA quickly dissipated after the moon landing in 1969. The inflationary environment of the late 1960s and early 1970s resulted in budgetary restraint—including for R&D activities—for most agencies, particularly for nondefense agencies. However, various emergencies and policy priorities at the time generated many exceptions. For example, cancer research was a major policy priority of President Nixon, who declared a "war on cancer" and successfully pushed for increased NIH research funding. The 1973-74 Organization of Petroleum Exporting Countries (OPEC) oil embargo led to the creation of the Energy Research and Development Administration in 1975 and then the Department of Energy in 1977, accompanied by significant increases in appropriations for renewable and alternative energy research motivated by a mix of national security and inflationary concerns. During the Reagan administration, R&D funding generally shifted away from energy and other nondefense areas toward defense R&D. However, after initially being dismissive of the human immunodeficiency virus (HIV)/acquired immunodeficiency syndrome (AIDS) epidemic, the Reagan administration did end up prioritizing a large push in HIV/AIDS research and related funding for NIH during its second term.

The "Peace dividend" from the end of the Cold War generally led to sustained increases in nondefense R&D spending during the presidencies of George H.W. Bush and Bill Clinton, except during the period of budget austerity and deficit reduction early in the Clinton administration. For the first time in decades, NASA found an advocate in President George

[14] NACA, the precursor to NASA that we largely ignore, also existed, but its R&D budget was relatively small and overwhelmingly focused on developing military aircraft for the U.S. Army Air Forces during the war.

[15] See also Gross and Sampat (2023) on the role of the OSRD in shaping U.S. R&D policy and innovation.

H.W. Bush, who announced an ambitious Space Exploration Initiative (SEI) on the 20th anniversary of the Apollo 11 moon landing and viewed the International Space Station as a constructive, cooperative path forward with the Soviet Union as it careened toward dissolution. The Clinton administration championed the human genome project, both as a matter of science policy as well as multinational cooperation and international leadership, and again turbocharged NIH research funding with the 21st Century Research Fund initiative, which had both an idealist and international competitiveness bent. Increased NIH funding maintained some momentum early in the presidency of George W. Bush, particularly following the anthrax terrorist attacks of 2001. Increased homeland security spending following the 9/11 attacks, the invasions of Afghanistan and Iraq, and multiple tax cuts led to budgetary pressures largely borne out by nondefense discretionary spending, including R&D appropriations. Nondefense R&D spending saw a resurgence early in the Obama administration as ARRA increased funding for DOE, NIH, and NSF research as part of the fiscal stimulus response to the Great Recession. A partisan backlash to swollen budget deficits and the policy priorities of the Obama administration—epitomized by the debt ceiling crisis, Budget Control Act of 2011, and subsequent sequestration spending cuts—ushered in a new era of austerity, and sharply squeezed R&D appropriations. Congress, however, grew frustrated with the blunt sequestration cuts and reversed course in 2015 and again in 2017, allowing for some rebound in appropriations for nondefense R&D activities.

4 Narrative Analysis of Federal Appropriations for R&D

This section details our analysis of primary and secondary sources for each significant policy change, chronologically for each agency. Each agency is organized as a separate subsection, all of which begin with a brief history of the organizational structure and evolution of the R&D functions of the agency. We only analyze the context and legislative intent for fiscal years with "significant" policy changes from the enacted, adjusted real appropriations for the previous fiscal year. For each fiscal year with a significant policy event, we start by identifying the pertinent appropriation bill(s) and the associated nominal and real annual changes in appropriations, followed by a summary of the primary motives and context behind the policy change and an overview of the most pertinent narrative evidence and sources supporting our characterization and classification. Policymakers' motivations often evolve or change partway through the appropriations cycle, so we typically present the narrative evidence in chronological order to minimize confusion about the timing of events. We always date each piece of evidence in addition to providing a citation for each primary or secondary source. Consequently, narrative sources are typically presented in an order mirroring the annual federal budget cycle, starting with (a) the State of the Union Address and/or the Budget Message of the President or other pertinent sections of the *Budget of the United States*, followed by (b) authorizing committee reports and/or hearings (if applicable), (c) appropriations committee reports and/or hearings, (d) presidential veto or signing statements (if applicable), and finally, (e) secondary source analysis of the enacted legislation (typically *CQ Almanac* and/or newspaper articles).

4.1 Narrative Analysis of Defense R&D Appropriations

Through WWII, U.S. military functions were split between two cabinet-level departments—the War Department and Department of the Navy—with their own appropriations bills and congressional oversight. The National Security Act of 1947 (P.L. 80-253) split the

War Department into the Department of the Army and the Department of the Air Force (previously the U.S. Army Air Forces) and reorganized the departments of the Navy, Army, and Air Force under the umbrella of the newly created National Military Establishment as a single cabinet-level agency headed by the Secretary of Defense, a newly created cabinet position. In 1949, the National Military Establishment was renamed the Department of Defense (DOD), which has overseen the three subordinate military departments as well as other smaller defense agencies ever since.[16]

Appropriations for each of the three military departments and other defense agencies have been made by the annual DOD Appropriations bills, with separate budget accounts for various activities of each service, including R&D activities for weapons and technology development of each of the services (e.g., missiles, satellites, tanks, submarines, stealth aircraft, drones etc). In recent years, the appropriations process has four principal budget accounts for defense R&D activity: A "Research, Development, Test and Evaluation" (RDT&E) account for each of the Army, Navy, and Air Force as well as one for "Defense Agencies," which notably includes appropriations for R&D activities of DARPA and MDA.[17] For most of our sample, appropriations for defense RDT&E and procurement activities must first be authorized by the National Defense Authorization Act, annual authorizing legislation shepherded through by the House and Senate Armed Services Committees since 1961; because the defense R&D budget is jointly set by the defense authorizing and appropriations committees, we analyze and often cite committee reports and/or hearings of the authorizing committees.[18] We assume some familiarity with the functions of the U.S. Army, Navy, and Air Force, but a brief overview of DARPA and the MDA (and their preceding defense agencies) is merited because both of these more recently established defense agencies receive significant funding for defense R&D activities.

The origins of both DARPA and and the MDA stem from the ICBM race of the 1950s and 1960s. Shortly after the launch of Sputnik, the Department of Defense Reorganization Act of 1958 (P.L. 85–599) created ARPA as a centralized military R&D agency separate from the three military services, which maintained their independent R&D programs. ARPA was originally tasked with researching and developing ballistics missile defense systems, taking over military satellite development from the U.S. Scientific Satellite program, and developing technologies to detect nuclear weapons tests, above and beyond generally pushing scientific frontiers for defense purposes. ARPA was renamed DARPA in 1972, briefly renamed ARPA in 1993-95 by the Clinton administration (which was prioritizing "dual-use" technologies i.e., for both military and civilian purposes), and was renamed DARPA by Congress in 1996 (CRS 2021). Broadly speaking, DARPA is tasked with maintaining and advancing the technological superiority of the U.S. military over other countries and focuses on achieving "transformative change rather than incremental advances," also known as "high-risk, high-reward" R&D (CRS 2021). Over the last quarter century, DARPA has accounted for 20-30% of total DOD Science and Technology (S&T) funding and 3-7% of total DOD RDT&E

[16]The Department of the Navy overseas both the U.S. Navy and U.S. Marine Corps services. During wartime, the U.S. Coast Guard can also be transferred to the jurisdiction of the U.S. Navy, but the Coast Guard is generally the only military service not managed by DOD (currently managed by the Department of Homeland Security and previously the Department of Transportation). As such, and given the relatively small amount of R&D funding involved, we ignore appropriations for the U.S. Coast Guard.

[17]The Defense Agencies budget account has also provided R&D funding for the Chemical and Biological Defense Program and funding at the discretion of the Office of Secretary of Defense, among smaller agencies.

[18]Congress can appropriate unauthorized funds, subject to various points of order (in practice often meaning a higher threshold for votes must be met), so authorizing legislation is a non-binding ceiling on appropriations, but the defense authorizing and appropriations committees typically work closely together in formulating policy and funding levels.

funding (CRS 2022).[19]

Even before the Sputnik crisis and creation of DARPA, the U.S. Army had started developing "hit-to-kill" anti-missile missile interceptors in the 1950s, in response to Soviet efforts to develop ICBMs. The U.S. was also developing its own ICBMs, and the Soviet Union started to deploy its own missile defense systems in the 1960s, leading to a secondary arms race in defensive anti-missile systems. The U.S. and Soviet Union began reducing strategic and tactical nuclear weapons deployments through arms control treaties later in the 1960s and early 1970s, and in 1972 both parties ratified the Anti-Ballistic Missile (ABM) Treaty, which limited both countries to just two missile defense sights and mo more than 100 missile interceptors per site; one effect of the treaty was to curtail R&D spending for missile defense systems.[20] In the early 1980s, the Reagan Administration was concerned about the improvements in the Soviet Union's offensive missile capabilities, and in response established the SDI in 1983, a defense agency that consolidated various existing missile interceptor programs of DARPA and the military services. The Strategic Defense Initiative Organization was tasked with the research, development, and eventual deployment of a missile defense system guarding against widespread missile attacks. The agency was later renamed the Ballistic Missile Defense Organization (BMDO) in 1994. In 2002, the George W. Bush administration withdrew from the ABM Treaty, opening the door for greatly expanded development and testing of missile defense systems, and the BMDO was turned into the MDA that year; appropriations for the development of missile defense systems increased significantly (MDA 2023), and missile defense programs have often been the biggest line-item in the entire DOD RDT&E budget.

Department of Defense R&D Appropriations for Fiscal Year 1949

Primary Bill: Military Functions Appropriation Act, 1949

Public Law: 80-766 **Enacted:** June 24, 1948 **Effective:** July 1, 1948

Secondary: Department of the Navy Appropriation Act, 1949

Public Law: 80-753 **Enacted:** June 24, 1948 **Effective:** July 1, 1948

Nominal change		Real change		Classification
Millions ($)	YOY%	Millions ($2012)	YOY%	
$91.9	19.6%	$494.7	17.1%	Exogenous

Congress appropriated a significant increase in real defense R&D appropriations for FY1949, largely motivated by the escalating Cold War. Defense expenditures were still being drawn down from wartime demobilization (despite ongoing U.S. occupations abroad) and there were prevailing concerns about inflationary pressures from the war effort and stance of the federal budget, but military R&D efforts were spared fiscal restraint as the Cold War intensified. Amidst growing concerns about the Soviet Union's submarine capability and protecting U.S. aircraft carrier groups, R&D efforts for submarine and anti-submarine warfare were prioritized in the appropriations for the Department of the Navy. Appropriations for the National Military Establishment spared Army and Air Force R&D

[19]Basic research, applied research, and advanced development are typically collectively categorized as S&T programs, unlike more advanced advanced component development and prototypes programs, system development and demonstration programs, and operational system development programs, which are focused on the transition from development to production and deployment or upgrading weapons systems that have already been deployed (CRS 2022).

[20]R&D for offensive nuclear weapons is funded and managed by DOE, not DOD, and is thus analyzed in Section 4.2, whereas defensive missile defense systems have always been funded and managed by DOD.

programs from widespread budget cuts to personnel and operations, and military aircraft R&D and procurement were high priorities of both the administration and appropriations committees. The increase in defense R&D funding appears to have been motivated by long-run national security concerns and appears unrelated to any concerns about unemployment or other short-run macroeconomic prerogatives. As such, we classify this policy event as exogenous. Most pertinent narrative evidence:

- "Expenditures for military [R&D]—exclusive of those for atomic weapons, construction of facilities, and pay of military personnel engaged on research projects—will remain at about 550 million dollars in the coming year. A large proportion of these expenditures will be in aviation and related fields." (Budget Message of the President, FY1949, January 6, 1948, p. M15)
- "Whether we wish to recognize it or not, this country today is in the midst of a "cold" war. World-wide hardship and increasing international discord make it difficult to predict what course future events will take. In the midst of this uncertainty the Navy cannot afford to relax. It must not only remain prepared for any emergency, but must also maintain the lead in developing new weapons, countermeasures and, above all, the scientific know-how and leadership which in the modern world is the best insurance in the event of a national emergency." Statement of Read Admiral Paul F. Lee, Chief of Naval Research, March 5, 1948 (Hearings before the House Appropriations Subcommittee on the Department of the Navy Appropriation Bill for 1949, p. 964)
- "The Navy is not preparing to fight yesterday's war, as you frequently read in the newspapers. Our emphasis is and must be directed to underwater attack and defense, to air attack and defense, and to other new methods of attack and defense; indicated by our [R&D]... our intense interest in anti aircraft and anti submarine measures partakes very largely of the nature of self-preservation. It follows, of course, that the funds which we wish to spend for these purposes are not insignificant." Statement of John L. Sullivan, Secretary of the Navy, February 14, 1948 (Hearings before the House Appropriations Subcommittee on the Department of the Navy Appropriation Bill for 1949, p. 4)
- "[W]hen World War II started, Hitler had fewer than 50 submarines and he very nearly won the battle of the Atlantic. There is a nation which has, to our certain knowledge, more than 250 submarines today. I cite those figures merely to indicate to you the degree of our interest in the development of new submarine tactics and new antisubmarine tactics. The Congress has assigned to the Navy the responsibility for antisubmarine warfare. This responsibility is reflected in important requirements for naval land-based, long-range aircraft especially designed and developed for antisubmarine warfare, naval reconnaissance and the protection of shipping" Statement of John L. Sullivan, Secretary of the Navy, February 14, 1948 (Ibid, p. 5)
- "The [House Appropriations] Committee has allowed $45,000,000 for the so-called basic research work as carried under the appropriation "Research, Navy" [up from $34,000,000 for FY1948]" (H. Rpt. 80-2136, June 2, 1948, p. 5)
- "[National Military Establishment] expenditures for civilian employees in the Air Force limited to $305 million, industrial and [R&D] employees excepted... Limitation of $674.5 million on civilian employees, industrial and [R&D] employees excepted... [The House Appropriations Committee] recommended the elimination of 81,500 positions and established limitations on expenditures for all civilian employees except industrial

employees and those in [R&D]... [Rep.] Case pointed out that the Committee had been reluctant to make large reductions in three programs in particular: Industrial mobilization and planning, [R&D], and the reserves." ("National Defense," *CQ Almanac 1948*, 4th ed., 87-95. Washington, DC: Congressional Quarterly, 1949)

Department of Defense R&D Appropriations for FY1950

Primary Bill: National Military Establishment Appropriation Act, 1950

Public Law: 81-434 **Enacted:** October 29, 1949 **Effective:** October 29, 1949

Nominal change		Real change		Classification
Millions ($)	YOY%	Millions ($2012)	YOY%	
$50.5	9.0%	$290.4	8.6%	Exogenous

Congress appropriated a significant increase in real defense R&D appropriations for FY1950, largely motivated by the escalation of the Cold War; the Soviet Union tested its first atomic weapon while the bill was working through the appropriations process. Inflationary pressures from the federal budget continued to be a concern, as articulated in President Truman's State of the Union Address, but defense R&D was spared from budgetary restraint. Congress continued to appropriate increased funding for the next stages of development building on wartime R&D breakthroughs, particularly for developing and deploying Air Force bombers capable of delivering nuclear weapons to Moscow (to the chagrin of the Truman administration, which wanted more "balance" between the services). The U.S. Navy continued to prioritize R&D for submarine and anti-submarine warfare, which Congress willingly funded. The appropriators recognized that defense R&D was subject to long lags between research and operational weapons systems, and current funding levels were intended both to anticipate future military needs and continue development work for weapons systems building from scientific breakthroughs made during WWII. The increase in defense R&D funding appears to have been motivated by long-run national security concerns and appears unrelated to any concerns about unemployment or other short-run macroeconomic prerogatives. As such, we classify this policy event as exogenous. Most pertinent narrative evidence:

- "The 1950 [defense] program gives priority to air power and to strengthening the civilian reserve components, and continues to emphasize [R&D] and industrial mobilization." (Budget Message of the President, FY1950, January 3, 1949, p. M19)
- "For the past several years the Congress has appropriated very sizable sums for [R&D]. Experiences during World War II taught the lesson that most of the battles were battles of scientific techniques." (H. Rpt. 81-417, April 9, 1949, p. 9)
- "Since VJ-day the military have devoted much time to solving problems that arose during the war years and that could not be completely or satisfactorily solved at the time and to improving weapons and equipment." (Ibid, p. 10)
- "The importance of peacetime [R&D] cannot be too highly stressed. Even under the most favorable conditions there is a long period of time between the conception of the need for an item of equipment and its development, test, production, and eventual delivery to the services. Research and development projects initiated after an emergency exists can have little influence on the course of the defense or offense for from 1 to 3 years, due to the time lag involved. Our success or failure in the initial stages

of an emergency could, therefore, very well depend on the adequacy of our peacetime [R&D]" (Ibid, pp. 9-10)

- "In some respects the peacetime [R&D] program is more important than that pursued in time of war. Projects initiated after the outbreak of hostilities rarely produce weapons or other items of material that can be placed in the hands of combat troops in the necessary quantities in a period of less than 2 to 3 years... Many projects initiated during the latter years of the war have now reached the stage of development which requires the construction of engineering models. This is the point in the cycle where we start to "pay off" in practical results, but at the same time is the most expensive. If we are unable to procure prototypes and later continue on to service testing, much practical experience which could cut schedules for mass production in war is needlessly lost. The Army has acquired additional [R&D] responsibilities since the relatively new and revolutionary tools of warfare have necessitated intensive efforts to stay ahead of our competitors in time and design" Statement of Gordon Gary, Acting Secretary of the Army, June 16, 1949 (Hearings before the Senate Appropriations Subcommittee on the National Military Establishment Appropriation Bill for 1950, June 30, 1950, p. 75)
- "On [September 23], 1949, President Harry S. Truman revealed that the Soviet Union had exploded an atomic bomb, ending the American monopoly in nuclear weapons years ahead of what was then thought possible by most U.S. officials and scientists. Some 25 days before Truman's announcement, U.S. monitoring stations had recorded seismic activity within the Soviet Union that carried the hallmarks of an underground nuclear test... Truman reacted to the news by ordering the National Security Council to re-evaluate the nation's Cold War policies. The council's report to the president, issued in early 1950, called for a large increase in military spending and an accelerated effort to build and test a hydrogen bomb" ("Truman reveals Soviet Union is now a nuclear power, Sept. 23, 1949," *POLITICO*, by Andrew Glass, September 22, 2017)

Department of Defense R&D Appropriations for FY1951

Primary Bill: General Appropriation Act, 1951; Defense Appropriation Act, 1951

Public Law: 81-759 **Enacted:** September 6, 1950 **Effective:** September 6, 1950

Secondary: Supplemental Appropriation Act, 1951

Public Law: 81-843 **Enacted:** September 27, 1950 **Effective:** September 27, 1950

Tertiary: Second Supplemental Appropriation Act, 1951

Public Law: 81-911 **Enacted:** January 6, 1951 **Effective:** January 6, 1951

Nominal change		Real change		Classification
Millions ($)	YOY%	Millions ($2012)	YOY%	
$564.0	92.2%	$2,974.0	80.7%	Exogenous

Congress appropriated a significant increase in real defense R&D appropriations for FY1951, largely motivated by the start of the Korean war and the escalating Cold War. The Chinese civil war ended in October 1949 with communist leader Mao Zedong declaring the creation of the People's Republic of China, the Soviet Union tested its first atomic weapon in August 1949, and North Korean troops invaded South Korea in June 1950, scoring early combat victories that unnerved defense policymakers in Washington. Congress enacted four FY1951

emergency supplemental appropriations bills for the escalating war, the first two of which included significant increases in defense R&D funding, particularly for the development of new and improved tanks and antitank weapons for the war on the Korean peninsula. The increases in defense R&D funding appear to have been motivated by a geopolitical emergency and national security concerns, and do not appear to have been influenced by concerns about unemployment or other short-run macroeconomic prerogatives. As such, we classify this policy event as exogenous. The policy change is dated to 1950Q3, when both the General Appropriation Act, 1951 and (first) Supplemental Appropriations Act, 1951 took effect, resulting in a significant increase in defense R&D appropriations. Most pertinent narrative evidence:

- "In Korea the Government forces, which were armed to prevent border raids and to preserve internal security, were attacked by invading forces from North Korea. The Security Council of the United Nations called upon the invading troops to cease hostilities and to withdraw to the 38th parallel. This they have not done, but on the contrary have pressed the attack. The Security Council called upon all members of the United Nations to render every assistance to the United Nations in the execution of this resolution. In these circumstances I have ordered United States air and sea forces to give the Korean Government troops cover and support. The attack upon Korea makes it plain beyond all doubt that communism has passed beyond the use of subversion to conquer independent nations and will now use armed invasion and war." Harry S. Truman, Statement by the President on the Situation in Korea, June 27, 1950 (*The American Presidency Project*, by Gerhard Peters and John T. Woolley, https://www.presidency.ucsb.edu/node/230845)
- "An active program is in progress to develop new weapons in the guided missile field. These weapons will replace or supplement the more conventional weapons employed during the past war... Development is continuing rapidly on surface-to-air and surface-to-surface guided missiles designed to increase both offensive and defensive capabilities. Major matters which are being explored include propulsion, aerodynamics, warheads, the physics of the upper atmosphere, and guidance." (H. Rpt. 81-1797, March 21, 1950, p. 275)
- "Every aspect in the field of tank development is being followed to improve upon present equipment. The armor protection is being improved while, at the same time, weight is being reduced. Power plants are being developed which insure more power per ton and yet are of less weight and greater simplicity in construction and more easily maintained. The armament of tanks is under study for the purpose of producing antitank weapons which will destroy the tanks of any foreign power." (Ibid, p. 276)
- "The $190,000,000 requested in House Document 657 for [first supplemental] Emergency Funds is for [R&D] in the amount of $120,000,000 and industrial mobilization in the amount of $70,000,000... The committee is well aware that emergencies may arise where it would be most desirable to have readily available funds with which to expedite basic research on a certain problem or to accelerate development on some item that research had disclosed as practicable and desirable, or to accelerate and intensify preparedness in the industrial field." (H. Rpt. 81-2987, August 24, 1950, p. 39)
- "The committee and the Congress has recognized the importance of Research and Development and during the past several years has provided annual increments of funds of approximately $600,000,000. With the additional funds provided in the pending [second supplemental appropriations] measure the total sum for the current fiscal year

for [R&D] will approximate $1,100,000,000. In time of mobilization or partial mobilization the role of Research and Development assumes even greater importance and the emphasis may change from research to development. Moreover, the huge sums previously provided for [R&D] are paying dividends of immeasurable significance as we move into the accelerated procurement program. Upon the assurance of departmental witnesses that there are sufficient scientists and technicians available to carry out a program materially greater than is at present being conducted and that there are programs and projects ready and needed the committee is recommending the requested increase in these funds to almost double the amounts that have been expended during the past few years for these purposes. The funds are in part intended to expedite the translation of present research knowledge into prototype weapons and equipment for operational evaluation prior to production. This program should advance the placing of new and advance design weapons in the military forces by some several months." (H. Rpt. 81-3193, December 15, 1950, p. 23)

- "President Truman Sept. 6 signed into law modern history's first omnibus appropriations bill (HR 7786), providing in one lump $36,153,600,425 to operate all government agencies and departments in fiscal 1951. It contained $14,680,084,443 for defense costs... While the General Appropriations Act (HR 7786) was still winding its way through Congress, North Korean Communist troops invaded the American-backed South Korean Republic and the United States, with the sanction of the United Nations, decided to back up the South Koreans with combat forces." ("Second Supplemental Appropriations Bill." In *CQ Almanac 1950*, 6th ed., 139-43. Washington, DC: Congressional Quarterly, 1951)
- "Within a week, the United States, with the backing of the United Nations, had committed its armed strength to the defense of South Korea against the attackers... But America had weakened itself militarily in the post-World War II years, and the weakness showed up immediately in Korea. In the first month, North Koreans, despite American intervention, scored victory after victory and appeared to be winning the fight... The President's request for supplemental military appropriations to finance this added strength was nearly half a billion dollars more than the estimate he had given Congress a few days earlier." (Ibid)
- "A 350-million-dollar increase in the 1951 military budget to keep pace with cold war developments yesterday was approved by the House Appropriations Committee 30 minutes after it was recommended by Defense Secretary Louis Johnson... The House Committee acted immediately, approving 200 million dollars additional contract authority for the Air Force, 100 million dollars more for Navy aviation and 50 million dollars for operation and conversion of surface vessels for anti-submarine warfare... Economy-minded Republicans nonetheless promptly swung behind the defense increase. House Republican Leader Joseph W. Martin, Jr. (Mass.) told newsmen: "While we are for the economy, we have always made an exception of National Defense. We must keep our defenses strong"... In addition to new funds for planes and antisubmarine defenses, Johnson announced arrangements for new defense steps, to be financed by "means of economies elsewhere in the budget" [including].. transfer of 24 million dollars to help speed up [R&D] of certain weapons, particularly anti-tank equipment..." ("$350 Million Chiefly For Aviation; Vinson Switches Stand on Selective Service," Robbery C. Albright, *The Washington Post*, April 27, 1950)
- "In one paragraph [Defense Secretary] Johnson summed up the cold war developments

influencing the reappraisal of defense needs. 'The events to which I allude include the Soviet atomic explosion, the fall of China, the serious situations in Southeast Asia, the break in diplomatic relations with Bulgaria and deteriorating relations with other satellite countries, the Soviet assumption of control over the armed forces of Poland, Soviet naval expansion, the recent attack on a naval aircraft in the Baltic, and the recent Soviet demands relative to the Trieste." (Ibid)

- "The decision to intervene in Korea grew out of the tense atmosphere that characterized Cold War politics. On the eve of the North Korean invasion, a number of events had made Truman anxious. The Soviet Union exploded an atomic bomb in 1949, ending the United States' monopoly on the weapon. In Europe, Soviet intervention in Greece and Turkey had given rise to the Truman Doctrine and the Marshall Plan, which funneled aid to war-torn Europe in the hopes of warding off communist political victories. In early 1950, President Truman directed the National Security Council (NSC) to conduct an analysis of Soviet and American military capabilities. In its report, known as "NSC 68," the Council recommended heavy increases in military funding to help contain the Soviets. Events in Asia also contributed to an increased sense of insecurity. In 1949 China underwent a revolution that brought Mao Zedong and his Communist party into power. The nationalists, led by Chiang Kai-Shek, had retreated to the island of Formosa (Taiwan) while they continued their war with mainland China. Mao quickly moved to ally himself with the Soviet Union, and signed a treaty with the Soviets in 1950." (National Archives 2023)

Department of Defense R&D Appropriations for FY1952

Primary Bill: Department of Defense Appropriation Act, 1952

Public Law: 82-179 **Enacted:** October 18, 1951 **Effective:** October 18, 1951

Nominal change		Real change		Classification
Millions ($)	YOY%	Millions ($2012)	YOY%	
$278.0	23.6%	$1,138.3	17.1%	Exogenous

Congress again appropriated a significant increase in real defense R&D appropriations for FY1952, again motivated by the Korean War and longer-run national security concerns. R&D priorities included accelerated weapons development for the war effort, notably tank and antitank weapons as well as military jet aircraft. Concerns about inflationary pressures were growing, and the administration began raising taxes to fund increased military expenditures, but defense R&D was prioritized and does not appear to have been subjected to any anti-inflationary budget restraint. Similarly, the increase in defense R&D funding appears unrelated to any concerns about unemployment or other short-run macroeconomic prerogatives. As such, we classify this policy event as exogenous. Most pertinent narrative evidence:

- "As we meet here today, American soldiers are fighting a bitter campaign in Korea... Our men are fighting, alongside their United Nations allies, because they know, as we do, that the aggression in Korea is part of the attempt of the Russian Communist dictatorship to take over the world, step by step... We are going to produce all the weapons and equipment that such an armed force will need... We have made remarkable technical advances. We have developed new types of jet planes and powerful new tanks. We are concentrating on producing the newest types of weapons and producing them

as fast as we can... It is a big program, and it is a costly one." Harry S. Truman, State of the Union Address, January 8, 1951 (*The American Presidency Project*, by Gerhard Peters and John T. Woolley, https://www.presidency.ucsb.edu/node/231403)

- "The new emphasis on military preparedness reflects the necessities of the world situation today." (Budget Message of the President, FY1952, January 15, 1951, p. M5)
- "The process of putting military equipment into production will not stop or retard our [R&D] work. On the contrary, we shall increase our efforts to maintain superiority in all kinds of weapons and equipment. Expenditures for the military [R&D] program will amount to nearly a billion dollars in the current fiscal year. The developmental work and the production program will be planned so that our troops will be supplied with the best weapons in the world." (Ibid, p. M16)
- "Research and development funds are of utmost importance to our aeronautical capability and can hardly be overemphasized insofar as necessity to carry out the overall program is concerned. It is axiomatic that technical preeminence is fundamental to superior air power and that only by progressively prosecuting our developmental programs can we retain our technical preeminence. Soundly supported and vigorously prosecuted [R&D] is our only assurance of technical superiority over our Communist protagonists and funds in this area are among our most serious needs. To accomplish this objective, the 1952 program contemplates both a major acceleration of projects currently underway and a rapid prosecution of urgent new projects which were deferred in recent years because of financial limitations." Rear Admiral Thomas S. Combs, U.S. Navy, July 11, 1951 (Hearings before the Senate Appropriations Subcommittee on the Department of Defense Appropriation Bill for 1952, pp. 274-275)
- "Statements are frequently heard to the effect that the ultimate success of our Army in the time of war will be determined largely by its ability to achieve the qualitative superiority in weapons which will be necessary to overcome the numerical superiority of a potential enemy. Present commitments of the United Nations forces bear out on a small scale the truth of such statements. Efforts toward the accomplishment of superiority in weapons is the purpose of the request for [R&D] funds, and reports indicate that significant and encouraging accomplishments have been made in this direction during fiscal year 1951. The program presented in the present request was developed to meet specific objectives established by the Army... stemming from the dictates of operational action in Korea." (H. Rpt. 82-790, August 6, 1951, pp. 41-42)
- "The [House Appropriations] committee feels that the security and welfare of the nation depends today, as never before, upon the rapid expansion, progress, and exploitation of scientific knowledge to locate every possible scientific potentiality for military application, and finally, intensive research in the area of such potentialities to obtain the quickest possible applications to military weapons, equipment, trailing, and other operational problems. The fast, efficient, and effective expansion and application of these basic research programs into the area of applied research projects of immediate importance to military problems, constitute the most significant feature of the request for funds outlined herein. These [Navy] funds will continue the program at a slightly higher level than during 1951. The program of basic research because of its demonstrated effectiveness and productivity should be maintained on a high level. The applied research program should be accelerated and expanded to the greatest extent possible within the funds requested in an effort to translate scientific knowledge into better weapons, equipment, and techniques." (Ibid, pp. 103-104)

- "To accelerate the [Air Force] basic [R&D] in order to speed to the use of our combat men the best we can conceive and build for them in items of aircraft, weapons, and equipment. Enemy equipments already encountered in Korea lends urgent emphasis to this phase of our effort." (Ibid, p. 124)

Department of Defense R&D Appropriations for FY1953

Primary Bill: Department of Defense Appropriation Act, 1953

Public Law: 82-488 **Enacted:** July 10, 1952 **Effective:** July 10, 1952

Nominal change		Real change		Classification
Millions ($)	YOY%	Millions ($2012)	YOY%	
$120.0	8.3%	$536.3	6.9%	Exogenous

Congress appropriated a significant increase in real defense R&D appropriations for FY1953, again largely motivated by the ongoing Korean war, even as Congress began paring back overall defense spending (notably for procurement). The Soviet Union's continued testing of its early atomic weapons was also a motivating factor behind sustained increases in defense R&D. The House Appropriations Committee approved all increases for R&D budget accounts requested by the administration and lower funding levels approved by the Senate Appropriations Committee were largely dropped during conference, with defense R&D appropriations landing much closer to the higher House-approved levels (H. Rpt. 82-1685, April 23 1952, pp. 4-11 and H. Rpt. 82-2483, July 4, 1052, pp. 7-8). The increase in defense R&D funding appears to have been motivated by military conflict, geopolitical rivalries, and long-run national security concerns, and does not appear to have been influenced by concerns about inflation or other short-run macroeconomic prerogatives. As such, we classify this policy event as exogenous. Most pertinent narrative evidence:

- "The thing that is uppermost in the minds of all of us is the situation in Korea. We must, and we will, keep up the fight there until we get the kind of armistice that will put an end to the aggression and protect the safety of our forces and the security of the Republic of Korea... During this past year we added more than a million men and women to our Armed Forces... We have made rapid progress in the field of atomic weapons. We have turned out billion worth of military supplies and equipment, three times as much as the year before." Harry S. Truman, State of the Union Address, January 9, 1952 (*The American Presidency Project*, by Gerhard Peters and John T. Woolley, https://www.presidency.ucsb.edu/node/231465)
- "It is true that the Soviets have run into increasing difficulties. Their hostile policies have awakened stern resistance among free men throughout the world.. Nevertheless, the grim fact remains that the Soviet Union is increasing its armed might. It is still producing more warplanes than the free nations. It has set off two more atomic explosions. The world still walks in the shadow of another world war... Our objective is to have a well-equipped active defense force large enough—in concert with the forces of our allies—to deter aggression and to inflict punishing losses on the enemy immediately if we should be attacked." (Ibid)
- "Eighteen months ago, the unprovoked attack upon the Republic of Korea made it clear that the Kremlin would not hesitate to resort to war in order to gain its ends. In the face of this grim evidence, this Nation and the other nations of the free world realized that

they must rearm in order to survive... Since then, we have made significant progress in rebuilding our defenses... the smaller amount of new obligational authority which I am recommending indicates the substantial portion of the financial requirements for our military build-up that has been met in the appropriations already made by the Congress" (Budget Message of the President, FY1953, January 21, 1952, pp. M5-6)

- "In building our military strength we are providing our forces with the best and most advanced weapons possible. In present-day warfare, and to an even greater extent in the future, technical superiority in weapons can mean the difference between victory and defeat. A strong [R&D] program is essential to ensure that our productive and material resources go into weapons and equipment that are superior in quality and performance to those of any aggressor and that we will be able to maintain this superiority in the years to come... As a result of [R&D] work done in the past few years, our forces are now being equipped with new types of weapons and equipment far superior to those of World War II. More new and improved weapons are now going into production, and we are perfecting the development of still others which will add to our military strength in the years immediately ahead." (Ibid, p. M17)
- "The defense money bill for fiscal 1953 was the largest single appropriation to go through the legislative mill and when President Truman signed it July 10, it carried $46,610,938,912 to finance the military during fiscal 1953. In his budget message to Congress in January, the President asked for $52.4 billion for the military... The House Appropriation Committee on April 3 recommended a total of $46,680,384,270 but the House, when it passed the measure on April 9, trimmed this to $46,207,177,554. It also added a provision limiting expenditures by the military in fiscal 1953 to $46 billion... the Senate Appropriations Committee called for even less than the House allowed... [but] it deleted the $46 billion spending limit which had been attacked sharply by military leaders." ("Defense," *CQ Almanac 1952*, 8th ed., 97-101. Washington, DC: Congressional Quarterly, 1953)
- "After holding extensive hearings, the House Appropriations Committee April 3 recommended a $4.2 billion slash in the defense funds recommended by the Administration... This was about $10 billion below the amount that the military was granted in the previous fiscal year... In making these reductions, the group cut deeply into procurement funds for the Army, shipbuilding funds for the Navy, and plane production funds for the Air Force... [but] on a 30-47 vote, the Senate rejected its [Senate Appropriations] Committee's recommendation to cut from $525 million to $456,750,000 the fund for [R&D] for the Air Force" (Ibid)

Department of Defense R&D Appropriations for FY1954

Primary Bill: Department of Defense Appropriation Act, 1954

Public Law: 83-179 **Enacted:** August 1, 1953 **Effective:** August 1, 1953

Nominal change		Real change		Classification
Millions ($)	YOY%	Millions ($2012)	YOY%	
-$241.0	-15.3%	-$1,312.1	-15.7%	Exogenous

Congress appropriated a significant decrease in real defense R&D appropriations for FY1954, largely motivated by demobilization from the Korean war, policy preferences of the new administration, and backlash to years of "out of control" growth in defense R&D

appropriations, notably duplication of projects across the military services. The incoming Eisenhower administration was initially much less keen on funding Air Force research, development, and procurement, and Republican members of Congress sided with President Eisenhower and pared back defense appropriations, R&D included. The decrease in defense R&D funding does not appear to have been motivated by inflation or other short-run macroeconomic prerogatives. As such, we classify this policy event as exogenous. Most pertinent narrative evidence:

- "As a result of [R&D] work done in the past few years, our forces are now being equipped with many new types of weapons and equipment far superior to those of World War II. Additional new and improved weapons are now going into production, and we are making intensive efforts to perfect still others which will contribute directly to our military strength in the years immediately ahead. These new developments will eventually give our forces capabilities far beyond those of the present. Advances in almost every field of science are being applied to weapons and techniques of warfare. These developments are complex and costly, and the time required to translate new ideas into practical military weapons is long. Our gratification in the progress we are making must be sobered by the realization that parallel developments are undoubtedly underway behind the Iron Curtain... Expenditures of [DOD] for [R&D] are estimated at 1.6 billion dollars in 1954, an increase of 200 million dollars over 1953" (Budget Message of the President, FY1954, January 9, 1953, p. M17)
- "I should next like to draw your particular attention to the Army's Research and Development Program. For fiscal year 1954 we are requesting $370 million of new funds... $70 million less than the sum appropriated last year. Although this represents only 2.7 percent of the total Army budget, still I am convinced that it is one of the most important activities in which the Army is currently engaged and will have a profound effect upon the weapons of the future and upon the ultimate cost of their procurement... The investment by the Army in such [R&D] has been well worth making... intensive [R&D] of more effective and less costly implements of war is essential to our national survival... Scientific and technical superiority can be preserved only by the expenditure of heavy effort and the use of the best brains available to our country. It is our best and the most economical counter to the unlimited manpower and mass of equipment available to the Communists" Robert T. Stevens, Secretary of the Army, March 5, 1953 (Hearings before the House Appropriations Subcommittee on the Department of the Army Appropriations, 1954, p. 64)
- "The 1954 program for [R&D] in the Air Force... is oriented to utilize available dollars to provide us with the most effective tools and weapons for the projected forces during the ensuing years. Although a large continuing effort is being placed on improvement in the force-in-being, emphasis in the fiscal year 1954 program has been placed on expediting the availability of advanced weapons systems capable of overcoming the forecast weapons of our potential adversary." Major General Donald N. Yates, Director of Research and Development, Deputy Chief of Staff, U.S. Air Force, March 6, 1953 (Hearings before the House Appropriations Subcommittee on the Department of the Air Force Appropriations, 1954, p. 56)
- "The amount of new obligating authority requested reflects a concerted effort to achieve [R&D] objectives at the lowest possible cost" Major General M.J. Asensio, Director of Budget, Deputy Chief of Staff, Comptroller, March 6, 1953 (Hearings before the House

Appropriations Subcommittee on the Department of the Air Force Appropriations, 1954, pp. 181-182)

- "While much of our potential strength lies in sound research programs, both basic and applied, it must be recognized that this is a type of activity which can easily get out of control to the extent that research is conducted only for the sake of research. The committee feels that many of the programs within the Services have been and are out of control. Principal defects of the program, as reported by Committee investigators, appear to be (a) ineffective evaluation of requirements, (b) lack of specifically designated objectives, (c) absence of determinations as to what constitutes the scope of projects, and (d) unnecessary duplication by the Services..." (H. Rpt. 83-680, June 27, 1953, p. 8)
- "Research and development is probably the one thing that can keep us out in front in scientific and technical "know-how". Within the limits of the availability of qualified personnel, there are almost unending areas of possible exploration. But the fact is that there are limits to our national research resources and the military is using a large share of them. Moreover, there are no hard and fast rules by which to judge the minimum essential levels of support. A look at the numerous projects, consideration of the many different, yet in some cases identical or similar objectives sought, the many different problems being worked on simultaneously by the services-all these things firmly impress the committee with the possibilities for savings without impeding orderly progress in the many facets involved. More rigorous screening of projects, consolidation of alternative approaches, and elimination of all items of doubtful value should in the committee's opinion produce important savings." (Ibid, pp. 31-32)
- "The Committee is not in a position to evaluate the entire [R&D] program project by project and say to the Air Force to increase the effort on this project and decrease the effort on or eliminate others. However, such an approach is needed, and the Air Force should discipline its own organization in this regard. A little tightening of the purse strings should have this salutary effect." (Ibid, p. 53)
- "Controversy developed over a proposed $5 billion cut in Air Force funds. Ex-President Truman's $40,719,931,000 defense Budget included $16,078,000,000 for the Air Force. The Eisenhower Administration estimated defense needs at $35,771,563,000 with only $11,288,000,000 for the Air Force... The battle over the Air Force appropriation began before the bill got to the floor of Congress, and it was fought mainly along party lines. Democrats upheld the Truman Administration's request... Republicans supported the Eisenhower cuts..." ("Defense." *CQ Almanac 1953*, 9th ed., 03-136-03-140. Washington, DC: Congressional Quarterly, 1954)
- "W.J. McNeil, Assistant Secretary of Defense in charge of the budget, cautiously predicted today a $1,000,000,000 reduction in defense spending during the next eleven months but emphasized that the forecast was based on the assumption that the Korean truce would hold up... Secretary McNeil, in an analysis of defense budget trends reflecting the economy theme of the Eisenhower Administration, said that the funds requested by the Pentagon that congress did not authorize in the new budget would result in some minor difficulties but represented 'no real problem'" ("Defense Fund Cut Expected in Truce," by Austin Stevens, *New York Times*, August 2, 1953)
- "Defense funds are $6,400,000,000 less than former President Truman requested and $1,400,000,000 below the revised requests of General Eisenhower..." ("President Signs Funds Bill Cutting Defense $1.4 Billion," *The Washington Post*, August 2, 1953)

Department of Defense R&D Appropriations for FY1955

Primary Bill: Department of Defense Appropriation Act, 1955

Public Law: 83-458 **Enacted:** June 30, 1954 **Effective:** July 1, 1954

Nominal change		Real change		Classification
Millions ($)	YOY%	Millions ($2012)	YOY%	
-$125.9	-9.4%	-$704.3	-10.0%	Exogenous

Congress appropriated a significant decrease in real defense R&D appropriations for FY1955, largely motivated by demobilization from the Korean War, backlash to the growth in defense R&D appropriations during the war, and new policy priorities of the Eisenhower administration, including deficit reduction and a skepticism of the "military-industrial complex." President Eisenhower was keen to reduce defense spending in an effort to move back toward a balanced budget and reverse the wartime increase in personal income tax rates. Appropriations for the Army took the biggest budgetary hit, reflecting the end of the land war in Korea, while the administration prioritized R&D and procurement for the Air Force and strategic nuclear capabilities as a new "massive retaliation" defense doctrine. As with those for FY1954, the decrease in defense R&D funding for FY1955 does not appear to have been motivated by inflation or other short-run macroeconomic prerogatives. As such, we classify this policy event as exogenous. Most pertinent narrative evidence:

- "As we enter this new year, our military power continues to grow. This power is for our own defense and to deter aggression. We shall not be aggressors, but we and our allies have and will maintain a massive capability to strike back... while determined to use atomic power to serve the usages of peace, we take into full account our great and growing number of nuclear weapons and the most effective means of using them against an aggressor if they are needed to preserve our freedom... the usefulness of these new [atomic] weapons creates new relationships between men and materials. These new relationships permit economies in the use of men as we build forces suited to our situation in the world today. As will be seen from the Budget Message on January 21, the airpower of our Navy and Air Force is receiving heavy emphasis." Dwight D. Eisenhower, State of the Union Address, January 7, 1954 (*The American Presidency Project*, by Gerhard Peters and John T. Woolley, https://www.presidency.ucsb.edu/node/232936)
- "Recently, I announced our plan to withdraw two Army divisions from Korea and return them to the United States as an initial step in the progressive reduction of United States ground forces in Korea. This withdrawal is made possible by the cessation of hostilities, the increased mobility and striking power of our air and other combat forces, and by the increasing capabilities of the Republic of Korea forces." (Budget Message of the President, FY1955, January 21, 1954, p. M43)
- "The launching—this month—of the first atomic submarine, the U.S.S. Nautilus, will be followed in the fiscal year 1955 by the launching of the U.S.S. Seawolf, a second atomic submarine of different design. Research on the more difficult problems of aircraft propulsion by atomic energy will continue." (Budget Message of the President, FY1955, January 21, 1954, p. M49)
- "The reductions in expenditures already accomplished, together with those now proposed, justify the tax reductions which took effect January 1 and the further tax revisions I am recommending. These lower taxes will encourage continued high capital

investment and consumer purchases. Despite the substantial loss of revenue caused by these tax reductions, we have moved closer to a balanced budget." (Ibid, p. M6)

- "Chairman and members of the committee, the objective of Air Force [R&D] is to develop weapon systems, supporting systems, and operating techniques superior to those of any potential enemy. The tremendous destructiveness of atomic and thermonuclear weapons highlights the need for forces in being capable of immediate and effective defensive and retaliatory action. The superiority of such forces is dependent upon a continuing and adequate program of [R&D]." Maj. Gen. Donald N. General, Director of Research and Development, Deputy Chief of Staff, Development, February 11, 1954 (Hearings before the House Appropriations Subcommittee on the Department of the Air Force Appropriation Bill for 1955, p. 641)
- "The [R&D] program as we present it today is the result of a continuing analysis of the Air Force missions and the determination of those tools which promise to accomplish these missions most economically and effectively. Realignments of the program result primarily from new assessments of enemy capabilities, technological breakthroughs or failures and advancements in the plans of the Air Force. Since the average life of a [R&D] project is approximately 5 years, the program must be projected ahead for at least this period of time. The need for stable and continuing support of the [R&D] effort is apparent as only about 20 percent of the operating program for a given year represents the capacity for new work." (Ibid, p. 642)
- "The Committee is greatly encouraged by the increasing determination on the part of both civilian and military leaders within [DOD] to place our military organization on a sound and firm base to which constant improvements can be made in a more orderly manner to give us the required military strength without the waste of taxpayers' dollars. The build-up following the outbreak of hostilities in Korea, admittedly, was wasteful, and the aftereffects of this waste are still present. Much has been done to reduce this waste and still more remains to be done." (H. Rpt. 83-1545, April 26, 1954, p. 3)
- "It is believed that considerable improvement has been made in the control of [R&D] activities in order that we may have better results—and not necessarily for less money... The Committee effected minor reductions in this activity for each of the three services, principally on the basis of substantial unobligated balances projected as of the end of the current fiscal year, and the belief that more careful scrutiny of projects and duplicative activities will result in additional savings." (Ibid, 1954, p. 7)
- "A total of $419,874,900 is included in the bill under this heading for the Navy and the Marine Corps... the Committee has reduced [R&D] requests of all of the military services... the Committee is convinced that there is further room for weeding out of projects and activities of doubtful value when viewed in light of the overall defense-wide research program." (Ibid, p. 32)
- "The Eisenhower Administration's "new look" defense program, with its increased emphasis on air power and atomic energy, and the doctrine of instant, "massive retaliation," was sharply debated as Congress considered the defense budget for fiscal 1955. The President's $29.9 billion request was $4.5 billion less than Congress granted [DOD] for fiscal 1954; the entire reduction was reflected in the Army budget..." ("Defense," *CQ Almanac 1954*, 10th ed., 03-153-03-156. Washington, DC: Congressional Quarterly, 1955)

Department of Defense R&D Appropriations for FY1956

Primary Bill: Department of Defense Appropriation Act, 1956

Public Law: 84-157 **Enacted:** July 13, 1955 **Effective:** July 13, 1955

Nominal change		Real change		Classification
Millions ($)	YOY%	Millions ($2012)	YOY%	
$202.5	16.8%	$843.1	13.4%	Exogenous

Congress appropriated a significant increase in real defense R&D appropriations for FY1956, largely motivated by countering strategic nuclear weapons threats from the Soviet Union and "Communist China." Overall defense spending continued to fall due to the demobilization from the Korean War, but President Eisenhower prioritized funding for the development of atomic weapons as well as R&D for Air Force and Navy strategic capabilities for launching nuclear strikes. Funding was also prioritized for anti-missile defense systems. The increase in defense R&D funding appears to have been motivated by geopolitical rivalries and long-run national security concerns, and does not appear to have been influenced by concerns about unemployment or any other short-run macroeconomic prerogatives. As such, we classify this policy event as exogenous. Most pertinent narrative evidence:

- "The massive military machines and ambitions of the Soviet-Communist bloc still create uneasiness in the world. All of us are aware of the continuing reliance of the Soviet Communists on military force, of the power of their weapons, of their present resistance to realistic armament limitation, and of their continuing effort to dominate or intimidate free nations on their periphery. Their steadily growing power includes an increasing strength in nuclear weapons. This power, combined with the proclaimed intentions of the Communist leaders to communize the world, is the threat confronting us today... To protect our nations and our peoples from the catastrophe of a nuclear holocaust, free nations must maintain countervailing military power to persuade the Communists of the futility of seeking their ends through aggression." Dwight D. Eisenhower, State of the Union Address, January 6, 1955 (*The American Presidency Project*, by Gerhard Peters and John T. Woolley, https://www.presidency.ucsb.edu/node/231403)
- "To keep our armed forces abreast of the advances of science, our military planning must be flexible enough to utilize the new weapons and techniques which flow ever more speedily from our [R&D] programs. The forthcoming military budget therefore emphasizes modern airpower in the Air Force, Navy, and Marine Corps and increases the emphasis on new weapons, especially those of rapid and destructive striking power. It assures the maintenance of effective, retaliatory force as the principal deterrent to overt aggression. It accelerates the continental [missile] defense program and the build-up of ready military reserve forces." (Ibid)
- "The advent of nuclear weapons has profoundly affected our concepts of military strategy and tactics as well as our national security policies. Such weapons multiply many fold the striking power of any military force. This budget, therefore, continues the emphasis on the development and maintenance of effective nuclear-air retaliatory power of the Air Force and Naval aviation as the principal deterrent to military aggression. Such power is being supplemented by other military forces of great strength, flexibility, and mobility and b y the forces of our allies. In order to safeguard our striking power and resources, we are giving continued high priority to the accelerated development of

continental defense programs. Priority is also being given to the development and introduction into operating units of new weapons and techniques adapted to the radically changed conditions imposed by the potential of nuclear warfare." (Budget Message of the President, FY1956, January 17, 1955, p. M27)

- "This budget also provides for continuation of the present high level of [R&D] in [DOD]. Major emphasis is being placed on developments which will more effectively utilize nuclear energy in military operations. New equipment and techniques are being developed to provide the mobility needed to meet the changed requirements of nuclear warfare. We shall continue to concentrate on those programs which show the greatest promise of providing reliable new weapons and significant improvements in both our offensive and defensive capabilities under the conditions of modern warfare. It is my belief that increased returns in military [R&D] can best come from maintaining a stable high-level program. Although this level of program utilizes, either through direct employment or on a contractual basis, about one-half the research scientists and engineers in the United States, it also permits a high level of nonmilitary [R&D] essential to an expanding economy." (Ibid)
- "A comprehensive and vigorous [R&D] effort is directed toward the future air defense system which will encompass radars of increased range and height finding capability; high performance long-range, medium-range, and short-range piloted and pilotless interceptors; more versatile surface-to-air guided missiles; improved devices for submarine detection; and nuclear weapons applications to continental defense." Charles E. Wilson, Secretary of Defense, January 31, 1955 (Hearings before the House Appropriations Subcommittee on the Department of Defense Appropriations, 1956, p. 11)
- "It is quite apparent from what I have said that science and technology are playing an important role in our military planning. The effectiveness of a military [R&D] program cannot be measured solely in terms of the number of dollars we expend for this purpose. I am confident that the present level of Department of Defense [R&D] expenditures is just about right. It is important to maintain stability in the overall level of expenditures in this field in order to facilitate sound planning... Our fiscal year 1956 program lays particular stress on the utilization of nuclear energy in military operations. The U.S.S. Nautilus [nuclear submarine] was put to sea on January 17, and its performance has exceeded expectations. This event is typical of what [R&D] can do, and opens up an entire new field of propulsion, not only for ships, but eventually for aircraft. Our program also emphasizes new equipment and techniques required to provide the mobility needed to meet the changed requirements of nuclear warfare, and the development of operational guided missiles to meet the urgent requirements of our air defense and retaliatory forces." (Ibid, p. 12)
- "In our [R&D] program for fiscal year 1956 we plan to obligate about $367 million. This compares with $369 million for fiscal year 1955. This indicates that even though we are reducing in other areas we are maintaining the [R&D] program to make our forces more effective... We are constantly striving to improve the weapons contributed by the Army to the antiaircraft defense of the United States. High-priority problems in this field remaining to be solved are improvements in defense against low-level air attacks, a defense against certain types of guided missiles, and an extension of the range and destruction capability of our own missiles. The advent of new weapons as well as other technological advances are causing significant changes in methods of fighting.

These changes impose grave and urgent requirements on our [R&D] program. I cannot emphasize too strongly the continuing requirement for a vigorous [R&D] program if we are to maintain our ability to field an army equipped to fight and inevitably win a war in this atomic age." Charles C. Finucane, Under Secretary of the Army, April 6, 1955 (Hearings before the Senate Appropriations Subcommittee on the Department of the Air Force Appropriations, 1956, p. 178)

- "The bill includes a budget estimates of $431,933,000 for this Navy-wide appropriation... the amount recommended is $9,400,000 more than 1955... The Committee is providing this large amount of money for [R&D] in the firm belief that the work must be fully supported to permit our military services to constantly strive to improve their weapons and techniques." (H. Rpt. 84-493, May 5, 1955, p. 42)
- "The amount recommended for [R&D] is $570,000,000 as requested in the budget. This is $151,930,000 more than was appropriated for 1955. However, the apparent increase is deceptive since approximately the equivalent of $144,000,000 has been transferred into this appropriation from other Air Force appropriations. This makes the real increase over 1955 only about $8,000,000...The Committee has been assured that all reasonable effort is being expended toward the development of long-range missiles. Nevertheless, should there be developments in this field that require additional funds and resources it is expected that the Department will not hesitate to proceed as rapidly as possible" (Ibid, p. 48)

Department of Defense R&D Appropriations for FY1957

Primary Bill: Department of Defense Appropriation Act, 1957

Public Law: 84-639 **Enacted:** July 2, 1956 **Effective:** July 2, 1956

Nominal change		Real change		Classification
Millions ($)	YOY%	Millions ($2012)	YOY%	
$275.6	19.6%	$1,158.1	16.2%	Exogenous

Congress appropriated a significant increase in real defense R&D appropriations for FY1957, largely motivated by countering strategic nuclear weapons threats from the Soviet Union and heightened concerns about the ballistic missile race. Missile and naval nuclear reactor research, development and testing continued to be the highest defense R&D priorities, and progress on the missile race was proving quite costly. As Defense Secretary Charles E. Wilson explained to the Senate Appropriations Committee, testing missiles in development necessarily involves destroying each prototype, unlike developing and testing durable military hardware, rendering missile development particularly costly. Motivated by the same long-run national security concerns, Congress approved almost all of the increases in defense R&D appropriations requested by the Eisenhower administration. The increase in defense R&D funding does not appear to have been motivated by concerns about unemployment or any other short-run macroeconomic prerogatives. As such, we classify this policy event as exogenous. Most pertinent narrative evidence:

- "In the face of Communist military power, we must, of course, continue to maintain an effective system of collective security. This involves two things—a system which gives clear warning that armed aggression will be met by joint action of the free nations, and deterrent military power to make that warning effective... We have improved

the effectiveness and combat readiness of our forces by developing and making operational new weapons and by integrating the latest scientific developments, including new atomic weapons, into our military plans... The development of long-range missiles has been on an accelerated basis for some time. We are moving as rapidly as practicable toward nuclear-powered aircraft and ships. Combat capability, especially in terms of firepower, has been substantially increased. We have made the adjustments in personnel permitted by the cessation of the Korean War, the buildup of our allies, and the introduction of new weapons. The services are all planning realistically on a long-term basis." Dwight D. Eisenhower, State of the Union Address, January 6, 1956 (*The American Presidency Project*, by Gerhard Peters and John T. Woolley, https://www.presidency.ucsb.edu/node/233132)

- "This budget provides for increased expenditures for the military functions of [DOD], emphasizing air-atomic power, guided missiles, [R&D], continental defense, and the re-equipping of our forces with new types of weapons. Outlays for conventional weapons and for stockpiling will be decreased." (Budget Message of the President, FY1957, January 16, 1956, p. M10)
- "Research and development expenditures will be somewhat higher in the fiscal year 1957 than in the current year. Major emphasis will be placed on projects related to guided missiles, continental air defense, and to the application of nuclear energy for the propulsion of aircraft and ships. It is my belief that increased returns in military [R&D] can be obtained through a relatively stable program at approximately the present level which can utilize effectively our scientific and technological resources. Military [R&D] now engages a substantial proportion of the scientists and engineers employed in [R&D] in the Nation. Care must be exercised in selecting the projects to be supported, and efforts must be concentrated on those of high priority." (Ibid, p. M26)
- "When we start to make hardware, you first go through the planning phase where you think maybe something is possible, and then you get your engineers, technicians, and scientists together, and you cook up something to make some progress with. You make a prototype unit. Then it looks better all the time. Then you decide to make five of them for test purposes. But in the missile field it is more difficult because to try the missile out you destroy it. It is a little different than the development of a tank or airplane. You fly the airplane and if there is something you do not like about it you fix that up and you fly it again. When you test a missile and shoot it, it is gone... So the costs in the [R&D] field for missiles are much more expensive for that particular reason. Then we get into very complicated proving ranges and testing setups, because to get the information on that missile you have to try to get some measurements in flight and other kinds of technical radar information so you know whether you have made some progress, and whether you have a good missile or not. So it all gets highly expensive." Charles E. Wilson, Secretary of Defense, May 8, 1956 (Hearings before the Senate Appropriations Subcommittee on the Department of the Navy Appropriation Bill for 1957, pp. 29-30)
- "The Army is very proud of its role in guided missile, ballistic missile, and rocket developments... Illustrative of the importance attached to forging ahead in the ballistic missile field is the effort at all levels of [DOD] behind the development of the 1,500-mile ballistic missile, Jupiter. I would have you note that it is a ballistic missile. This surface-to-surface weapon is being developed jointly with the Navy to provide both a land-based and ship-based launching capability. It will provide a ballistic missile

system which will give the land force commander the capability of supporting a deep penetration with an atomic weapon completely responsive to his needs. In defensive operations, it will provide support of the action in depth from a completely secure area." Wilbur B. Brucker, Secretary of the Army, May 8, 1956 (Hearings before the Senate Appropriations Subcommittee on the Department of the Navy Appropriation Bill for 1957, pp. 72)

- "The reliance on technology and science for a strong and effective military force is constantly increasing. Advances in Soviet education in the scientific and engineering fields could under present conditions result in their overcoming our present marginal superiority in the development of advanced and up-to-date weapons and equipment without which war, as it is known today or as it will be fought in the future, cannot be won—if it can be said that either antagonist can win a war in this age. The Committee and the congress, as a result of testimony and recent evidence of Soviet progress in weapons development are greatly concerned over the continuing trend in this area and feel that an immediate and bold approach must be made if we are to solve this pressing problem." (H. Rpt. 84-2104, May 3, 1956, p. 6)
- "Testimony led to "considerable apprehension on the part of some Members as to whether or not the Department is adequately financing many vital research activities for 1957." The [House Appropriations] Committee approved the amounts requested by the Administration for [R&D] except for a $1 million cut in Navy funds... The U.S. concern is to have an Air Force "equipped with the best modern aircraft to act as a deterrent to any possible aggression," rather than to "stay ahead of the Soviets in the overall size of our Air Force and in the numbers of aircraft to be produced." ("Air Force Funds Raised in Defense Bill," *CQ Almanac 1956*, 12th ed., 03-609-03-616. Washington, DC: Congressional Quarterly, 1957)
- "The [House Appropriations] Committee recommends approval of the full amount of the budget estimate [for Army R&D], $410,000,000, which is an increase of $77,000,000 over that appropriated for 1956. The amount recommended will support a level of effort approximately the same as that of the past two years, though the program has been altered to place greatly added emphasis on guided missiles and an increase of support [R&D] in the field of electronics. While the Committee is pleased to see greater emphasis being placed in these fields, there is the feeling that in light of recent world developments the Army should place even more pronounced stress on developing and bringing into use the guided missiles, new weapons, new and modernized equipment necessary to insure a highly mobile force with the utmost capability and firepower." (H. Rpt. 84-2104, May 3, 1956, p. 27)
- "The appropriation request for [Air Force] [R&D] is $610,000,000. This is $40,000,000 more than the amount appropriated for fiscal year 1956... The [House Appropriations] Committee has approved the full request." (Ibid, p. 55)

Department of Defense R&D Appropriations for FY1958

Primary Bill: Department of Defense Appropriation Act, 1958

Public Law: 85-117 **Enacted:** August 2, 1957 **Effective:** August 2, 1957

Secondary: Supplemental Defense Appropriation Act, 1958

Public Law: 85-322 **Enacted:** February 11, 1958 **Effective:** February 11, 1958

Tertiary: Air Force Installations Construction for National Security, 1958
Public Law: 85-325 **Enacted:** February 12, 1958 **Effective:** February 12, 1958

Nominal change		Real change		Classification
Millions ($)	YOY%	Millions ($2012)	YOY%	
$226.5	13.4%	$908.3	10.9%	Exogenous

Congress appropriated a significant increase in real defense R&D appropriations for FY1958, motivated by countering strategic nuclear weapons threats from the Soviet Union and heightened concerns about the ballistic missile race following the Sputnik crisis. Sputnik was launched in October 1957, shortly after the regular order Department of Defense Appropriation Act, 1958 had been enacted that August. Defense policymakers had thought that they were roughly keeping abreast of the Soviet Union in missile development—perhaps a bit ahead in guided missiles, a bit behind in ballistic missiles—and were racing to develop new missiles, particularly the Polaris submarine-launched ballistic missile. But Sputnik's launch catalyzed a new urgency: In response to the USSR winning the satellite race, Congress appropriated additional defense R&D funds for the fiscal year, passing both a Supplemental Defense Appropriation Act, 1958 and the Air Force Installations Construction for National Security, 1958 in February 1958; the latter bill established ARPA, which was tasked with satellite development and R&D for anti-ballistic missile defense systems, among other objectives. Short-run macroeconomic conditions do not appear to have been an alternative consideration, and we classify this policy event as exogenous. The Department of Defense Appropriation Act, 1958 resulted in a relatively muted change in real defense R&D appropriations for FY1958, and this policy event is instead dated to 1958Q1, when both the Supplemental Defense Appropriation Act, 1958 and Air Force Installations Construction for National Security, 1958 took effect, resulting in a significant increase in DOD R&D appropriations. Most pertinent narrative evidence:

- "The existence of a strongly armed imperialistic dictatorship poses a continuing threat to the free world and thus to our own Nation's security and peace. There are certain truths to be remembered here... Another truth is that our survival in today's world requires modern, adequate, dependable military strength. Our Nation has made great strides in assuring a modern defense, so armed in new weapons, so deployed, so equipped, that today our security force is the most powerful in our peacetime history. It can punish heavily any enemy who undertakes to attack us. It is a major deterrent to war... By our [R&D] more efficient weapons—some of amazing capabilities—are being constantly created. These vital efforts we shall continue." Dwight D. Eisenhower, State of the Union Address, January 10, 1957 (*The American Presidency Project*, by Gerhard Peters and John T. Woolley, https://www.presidency.ucsb.edu/node/233260)
- "In the field of missiles we are in a nip and tuck race with Russia. We are no doubt ahead of the Soviets in the field of guided missiles generally... probably behind the Soviet Union in progress made in perfection of the Intermediate Range Ballistic Missile [IRBM]." (H. Rpt. 85-471, May 21, 1957, p. 5)
- "The [House Appropriations] Committee recommends an appropriation of $392,000,000 [for Army R&D], a reduction of $8,000,000 [from the budget request]. This amount is $18,000,000 below the 1957 appropriation... The Committee recommends $495,000,000 [for Naval R&D], a reduction of $10,000,000 in the budget estimate of $505,000,000, and $3,000,000 greater than the funds appropriated for the current fiscal year... For [Air

Force] R&D the budget included an appropriation request of $661,000,000. The Committee is recommending an appropriation of $649,000,000, a reduction of $12,000,000 or 1.8 percent in the budget request..." (Ibid, pp. 38, 61, 82)

- "The fiscal 1958 Defense Department appropriation totaled $33,759,850,000, nearly $2.4 billion less than President Eisenhower had requested. Spurred by the economy drive, the House originally cut $2.5 billion from the requests. The Administration, charging that such cuts "would amount to gambling unwisely with the security of the Nation," asked the Senate to restore $1.2 billion. The Senate responded by adding $971 million to the bill. In conference, however, Senate conferees were unable to press their demands in the face of strong House resistance, stiffened by an about-face on the part of the Administration... Secretary of Defense Neil H. McElroy Oct. 28 rescinded an Aug. 17 directive by his predecessor, Charles E. Wilson, that would have cut fiscal 1958 research and development spending by at least $170 million, or a minimum of 10 percent. The directive was not made public until Oct. 19. The Defense Department had programmed $5 billion for fiscal 1958 research spending... The Wilson order directed the three services to make research spending cutbacks equal to 10 percent of each service's portion of the $1.7 billion research and development fund." (""Defense Funds," *CQ Almanac 1957*, 13th ed., 03-712-03-716. Washington, DC: Congressional Quarterly, 1958)
- "Our [R&D] program emphasizes three areas—antisubmarine warfare, striking power, and fleet air defense. Much remains to be done in all of these important, areas in order to develop the superior new weapons systems required. To counter the threat posed by enemy submarines, we are conducting a vigorous program in antisubmarine warfare. We must improve our ability to locate and destroy enemy submarines. In addition to the development of aircraft, air-launched missiles, and other similar weapon systems, we are developing the fleet ballistic missile. This is our largest [R&D] program. This fleet ballistic missile, Polaris, will use a solid propellant. It will be suitable for installation on both nuclear-powered submarines and surface ships. Integral with this program is a requirement for a highly accurate navigational system. For this development, we must conduct much oceanographic research." Admiral Arleigh Burke, Chief of Naval Operations, May 23, 1957 (Hearings before the Senate Appropriations Subcommittee on the Department of Defense Appropriation Bill for 1958, p. 227)
- "The big thing on the mind of the returning Congress—the need to catch Russia in the missile-space race—was reflected in a flood of new bills introduced yesterday... the overwhelming concern was to provide tools to wrest back from Russia the lead in the race to space. Civil rights, taxes, and other favorite legislative fields took a seat far back." ("Missile-Space Race With Russians Reflected in First Bills Introduced," by Richard L. Lyons, *The Washington Post*, January 8, 1958)
- Supplemental Appropriation Bill: "We live in the age of ever-increasing danger. In military strength, the Soviet Union has been progressing more rapidly than the United States... Our chief difficulty arises out of the fact that in critical areas of space satellites and ballistic missiles, we are generally behind the USSR... Steps must be taken to expedite our IRBM and ICBM, and other programs for weapons of the future" (H. Rpt. 85-1288, January 21, 1958, pp. 3-4)
- "Funds were requested and are included [in the Supplemental Defense Appropriation Act, 1958] in the amount of $10,000,000 for this new [Advanced Research Projects] Agency, to be derived by transfer from such annual appropriations available to [DOD]

as may be designated by the Secretary. As set forth in the H. Doc. 298 this agency is "to be responsible for the [R&D] phases of advanced science programs, including satellites and other outer-space projects, the development of an anti-ballistic-missile missile system, and such other special projects that might be designated by the Secretary of Defense." (H. Rpt. 85-1288, January 21, 1958, p. 5)

- "The Senate approved unanimously today a $1,410,000,000 emergency defense appropriations bill... The measure is the first Congressional response to the Administration's appeal for more money to meet the challenge of recent Soviet successes. It provides funds to speed up ballistic missile programs, build atomic power missile launching submarines, provide new detection systems for enemy aircraft and missiles, and construct additional bases for the Strategic Air Command." ("SENATE APPROVES 1.4 BILLION TO AID DEFENSE PROGRAM: Votes 78-0 to Provide Fund for Missiles, Air Bases and Detection Systems," by Allen Drury, *The New York Times*, February 4, 1958)

Department of Defense R&D Appropriations for FY1959

Bill: Department of Defense Appropriation Act, 1959

Public Law: 85-724 **Enacted:** August 22, 1958 **Effective:** August 22, 1958

Nominal change		Real change		Classification
Millions ($)	YOY%	Millions ($2012)	YOY%	
$1,509.5	66.9%	$6,922.1	63.5%	Exogenous

Congress appropriated a significant increase in real defense R&D appropriations for FY1959, well above the funding level requested by the administration, largely motivated by the Sputnik crisis and heightened concerns about the Soviet Union's ballistic missile capabilities. Funding priorities for defense R&D activities included ICBMs and the POLARIS submarine-launched ballistics missile system as well as military satellites and anti-ballistic missile systems (the latter being tasked to the newly created ARPA). The increase in defense R&D funding appears to have been motivated by geopolitical rivalries and long-run national security concerns, and appears unrelated to any concerns about unemployment or other short-run macroeconomic prerogatives. As such, we classify this policy event as exogenous. Most pertinent narrative evidence:

- "All of us realize that, as this new session begins, many Americans are troubled about recent world developments which they believe may threaten our nation's safety... We now have a broadly based and efficient defensive strength, including a great deterrent power, which is, for the present, our main guarantee against war; but, unless we act wisely and promptly, we could lose that capacity to deter attack or defend ourselves... The threat has become increasingly serious as this expansionist aim has been reinforced by an advancing industrial, military, and scientific establishment... The Soviets are, in short, waging total cold war." Dwight D. Eisenhower, State of the Union Address, January 9, 1958 (*The American Presidency Project*, by Gerhard Peters and John T. Woolley, https://www.presidency.ucsb.edu/node/233817)
- "At this moment, the consensus of opinion is that we are probably somewhat behind the Soviets in some areas of long-range ballistic missile development. But it is my conviction, based on close study of all relevant intelligence, that if we make the necessary effort, we will have the missiles, in the needed quantity and in time, to sustain

and strengthen the deterrent power of our increasingly efficient bombers. One encouraging fact evidencing this ability is the rate of progress we have achieved since we began to concentrate on these missiles... The intermediate ballistic missiles, Thor and Jupiter, have already been ordered into production. The parallel progress in the [ICBM] effort will be advanced by our plans for acceleration. The development of the submarine-based Polaris missile system has progressed so well that its future procurement schedules are being moved forward markedly. When it is remembered that our country has concentrated on the development of ballistic missiles for only about a third as long as the Soviets, these achievements show a rate of progress that speaks for itself." (Ibid)

- "In the 1959 budget, increased expenditures for missiles, nuclear ships, atomic energy, [R&D], science and education, a special contingency fund to deal with possible new technological discoveries, and increases in pay and incentives to obtain and retain competent manpower add up to a total increase over the comparable figures in the 1957 budget of about $4 billion." (Ibid)
- "Since the first launching of an earth satellite it has become increasingly apparent that major accomplishments in our defense effort... have a significant bearing on our position in the so-called cold war... The Soviet successes in rocketry have demonstrated that there is a definite relationship between preparation for a possible hot war and progress in the current cold war... spectacular accomplishments based on sound scientific and technological advances will also assist in giving us the advantage needed for the development of those weapons of the future necessary to deter military aggression by the Communist bloc of nations." (H. Rpt. 85-1830, May 25, 1958, p. 4)
- "Not only are the Soviets making rapid technological progress... but they are also continuing to improve the equipment of existing present-day military forces... The Soviet Union has also obviously expanded its program for the development and testing of nuclear weapons and ballistic missiles as well as its [R&D] programs generally." (Ibid, p. 5)
- "The Soviets are also making rapid progress in science and technology and now constitute a real challenge to our position in these areas. It is generally agreed that the United States must step up its efforts in newer areas of military technology. These include the inter-continental and intermediate-range ballistic missiles; the fleet ballistic missile system (POLARIS); ballistic missile detection, tracking, and the antiballistic-missile missiles; military satellites and other outer space vehicles; and basic and applied research generally... The Committee has provided additional support over and above that in the budgetary requests for most of these critical areas" (Ibid, pp. 6-7)
- "In what is generally considered as "[R&D]" appropriations, apart from appropriations for procurement that are also available for development work, the budget request for fiscal year 1959 is over $2,582,000,000, as compared with $1,855,000,000 in similar appropriations for fiscal year 1958. The Committee is recommending for appropriation in this bill $2,732,985,000 plus $100,000,000 in transfer authority provided under the Emergency Fund... It should be pointed out that $520,000,000 of this increase is for so-called space research in the funds provided for [ARPA]... The Committee insists that these funds be used for only those projects having a direct relationship to military needs. This principle should also apply insofar as possible to so-called basic research, that is, such research should at least have indications of some possible bearing on future military needs..." (Ibid, p. 18)

- "The January budget contained an estimate of $340,000,000 to finance the proposed work of [ARPA] during fiscal year 1959. This request was increased by a $180,000,000 amendment to the budget submitted April 2, 1958... The total budgeted amounts have been approved as requested... The agency is to be responsible under the Secretary of Defense for the [R&D] phases of advanced science programs, including military satellites and other so-called outer space projects, the development of an anti-ballistic-missile missiles system, and such other special projects..." (Ibid, p. 25)
- "The Committee recommends $821,285,000 for [Naval] [R&D], an increase of $71,200,000 in the budget estimate of $750,085,000 and $294,085,000 more than the funds appropriated for the current fiscal year. The rapid achievements being achieved in scientific and technical fields reflect themselves in changing [R&D] requirements... The increases recommended by the Committee over the budget estimate are related solely to the increase in the fleet ballistic missile program" (Ibid, pp. 57-58)
- "The launching of the first Soviet earth satellite in October 1957 was a decided blow to United States prestige. It was obvious that there had been an underestimate of the scientific advancement and capability of the USSR." (Ibid, p. 69)
- "Congress appropriated $39,602,827,000 for the Army, Navy, Air Force, and other Defense Department activities in fiscal 1959. This represented an $815,857,000 increase over the President's total requests of $38,786,970,000 for [DOD] – the biggest dollar increase Congress made in any fiscal 1959 fund request. By contrast, Congress made its biggest fiscal 1958 dollar reduction in [DOD] appropriation bill for fiscal 1958. Russian success at launching an earth satellite accounted for much of the change of attitude in Congress." ("Defense Appropriation," *CQ Almanac 1958*, 14th ed., 04-344-04-347. Washington, DC: Congressional Quarterly, 1959)
- "The [Submarine Warfare] report said the United States had "dangerously inadequate" program facilities and finances for submarine development construction and operations. It said the Soviet Union, by the early 1960s, could "mount a devastating nuclear warhead attack from the sea against the U.S." Sen. Jackson, in releasing the study, said the U.S. was "in grave danger" of losing its lead in the one military area where it currently had superiority. Major recommendations of the Subcommittee's panel included: Doubling the Navy's [R&D] budget for undersea warfare in fiscal 1959, with substantial and continued increases thereafter... Making a substantial and continuing increase in the Navy's budget for basic research not immediately related to operational requirements... Seeking greater use of universities, private research centers, and industry for carrying out both basic and applied research on undersea warfare problems." (Ibid)

Department of Defense R&D Appropriations for FY1960

Bill: Department of Defense Appropriation Act, 1960

Public Law: 86-166 **Enacted:** August 18, 1959 **Effective:** August 18, 1959

Nominal change		Real change		Classification
Millions ($)	YOY%	Millions ($2012)	YOY%	
$443.4	11.8%	$1,843.3	10.3%	Exogenous

Congress appropriated a significant increase in real defense R&D appropriations for FY1960, largely motivated by the Sputnik crisis and heightened concerns about the Soviet

Union's ballistic missile capabilities. Defense R&D priorities included ballistic missile defense, early warning systems for ballistic missile attacks, military satellites, and submarine-launched ballistic missile capabilities. The increase in defense R&D funding appears to have been motivated by geopolitical rivalries and long-run national security concerns, and appears unrelated to any concerns about unemployment or other short-run macroeconomic prerogatives. As such, we classify this policy event as exogenous. Most pertinent narrative evidence:

- "Possession of such [nuclear] capabilities helps create world suspicion and tension. We, on our part, know that we seek only a just peace for all, with aggressive designs against no one. Yet we realize that there is uneasiness in the world because of a belief on the part of people that through arrogance, miscalculation, or fear of attack, catastrophic war could be launched... we can have no confidence in any treaty to which Communists are a party except where such a treaty provides within itself for self-enforcing mechanisms. Indeed, the demonstrated disregard of the Communists of their own pledges is one of the greatest obstacles to success in substituting the Rule of Law for rule by force." Dwight D. Eisenhower, State of the Union Address, January 9, 1959. (*The American Presidency Project*, by Gerhard Peters and John T. Woolley, https://www.presidency.ucsb.edu/node/235339)
- "Our outlook is this: 1960 commitments for our armed forces, the [AEC] and Military Assistance exceed 47 billion dollars. In the foreseeable future they are not likely to be significantly lower... A major segment of our national scientific and engineering community is working intensively to achieve new and greater developments. Advance in military technology requires adequate financing but, of course, even more, it requires talent and time... In these days of unceasing technological advance, we must plan our defense expenditures systematically and with care, fully recognizing that obsolescence compels the never-ending replacement of older weapons with new ones" (Ibid)
- "Research will be conducted on, among other things, very early warning systems, ballistic missile defense, solid fuel chemistry, and the use of military satellites and other military vehicles for navigation and communication purposes. I am also requesting $150 million for [DOD] emergency fund—the same amount as provided for 1959—to provide for the exploitation of breakthroughs or unanticipated developments which may occur during the coming year." (Budget Message of the President, FY1960, January 19, 1959, p. M34)
- "The President's defense estimates for the 1960 fiscal year that starts next July 1 have already provoked more than the normal amount of attack and defense... the [congressional] opposition has advertised widely—sometimes in extravagant terms—the weaknesses of the Army and Marines and the dangers of an alleged "missile gap," or a lag on the part of the United States in the development and production of long-range ballistic missiles. [Defense Secretary] McElroy denied the "missile gap" Thursday, and President Eisenhower accused his budget critics of being "schizophrenic" or torn between more spending and greater saving at the same time... "Using the best available intelligence estimates of the Soviet power as a yardstick, the 1960 defense budget would seem to be a closely paired document... The much-advertised missile gap would seem to be—at this juncture—of less importance than some other potential and actual weaknesses." ("DEFENSE ISSUE CRUCIAL IN THE BUDGET BATTLE: Soviet Gains and Politics Generate More Than the Usual Controversy," by Hanson W. Baldwin, *The New York Times*, January 25, 1959)

- "The [ICBM] era is now upon us. It is estimated that during this calendar year, the U.S.S.R and the United States will have ICBM's ready for operational deployment... The predominant weapons carrier today is the manned aircraft but missile predominance is definitely on the way" (H. Rpt. 86-408, p. 4)
- "The threat is expected to worsen. As Secretary of Defense Neil H. McElroy stated to the [House] Committee last January: 'My opinion is that as the long-range ballistic missile comes into the arsenals of the two countries, the peril to those countries will be greater than it is now when the delivery of the strategic weapon must be done by aircraft. I say this because we have some defense against aircraft. We are still developing a defense against long-range ballistic missiles.'" (Ibid, p. 5)
- "Fortunately, all are reasonably in agreement that the retaliatory forces now in existence are sufficient, for the present... however, the concept of massive retaliation as a deterrent is invalid unless enough of the retaliatory force is invulnerable to surprise attack so that it is able to retaliate effectively, even after such surprise attack." (Ibid, p. 10)
- "It would appear from the estimates presented to the committee that the Soviet Union could have three times as many ICBMs in a position and ready to fire in anger as the United States will have during the period of the early 1960's." (Ibid, p. 12)
- "This is one of the special threats incident to a significant ICBM capability in the possession of an adversary– especially during the period when we have no anti-ICBM weapon and no effective system to detect the approach of the ICBM." (Ibid, p. 13)
- "The [House] Committee recommends an appropriation of $1,015,920,000 for this [Navy RDT&E] program, an increase of $45,000,00 in the budget request of $970,920,000. The increase has been recommended for the purpose of expanding and expediting research in the critical area of anti-submarine warfare... The amount recommended for fiscal year 1960 is $36,144,700 more than the fiscal year 1959 appropriation... In his statement to the Committee, Rear Ad. John T. Hayward, Assistant Chief of Naval Operations (Research and Development) stated the following principal objectives of the Navy RDT&E program: 'Increased [anti-submarine warfare] effectiveness. Improved striking force capability, including POLARIS, the application of nuclear propulsion to Naval systems, improved electronic countermeasures capability, and increased effectiveness of offensive and defensive missiles and aircraft systems. Increased air defense effectiveness, especially in long-range detection, tactical data processing, and control of aircraft and missiles. Increased amphibious capability with emphasis on dispersed and vertical envelopment operations. The exploitation of space technology for the improvement of the Navy's combat capabilities. A broad and comprehensive program of basic and supporting research to provide for our future capability'" (Ibid, p. 69)
- "The [House Appropriations] Committee recommends appropriation of $1,159,000,000 for this [Air Force RDT&E] program, and increase of $10,000,000 in the budget estimate of $1,119,000,000. The increase is for the purpose of accelerating the development program for the MINUTEMAN intercontinental ballistic missile..." (Ibid, p. 70)

Department of Defense R&D Appropriations for FY1962

Bill: Department of Defense Appropriation Act, 1962

Public Law: 87-144 **Enacted:** August 17, 1961 **Effective:** August 17, 1961

Nominal change		Real change		Classification
Millions ($)	YOY%	Millions ($2012)	YOY%	
$1,075.8	25.1%	$4,844.7	24.4%	Exogenous

Congress appropriated a significant increase in real defense R&D appropriations for FY1962, largely motivated by the Berlin crisis of 1961 and concerns about the Soviet Union's strategic nuclear capabilities. Newly elected President John F. Kennedy noted in his inaugural State of the Union address that he was taking office "in the wake of seven months of recession, three and one-half years of slack, seven years of diminished economic growth, and nine years of falling farm income," but economic weakness seemed to exert no influence on defense R&D policy. Fears of a "missile gap" between the strategic capabilities of the U.S.S.R. and U.S.—a recurring rhetorical theme of Kennedy's in the recent presidential campaign—were easing, the Soviet Union's aggression in Berlin sparked a new crisis. The Kennedy administration immediately requested an additional $3.5 billion in emergency defense funds, including those for R&D, and the Berlin crisis galvanized bipartisan support for increased defense spending; Congress quickly approved the request. The increase in defense R&D funding appears to have been motivated by geopolitical rivalries and long-run national security concerns, and appears unrelated to any concerns about unemployment or other short-run macroeconomic prerogatives. As such, we classify this policy event as exogenous. Most pertinent narrative evidence:

- "Our greatest challenge is still the world that lies beyond the Cold War—but the first great obstacle is still our relations with the Soviet Union and Communist China. We must never be lulled into believing that either power has yielded its ambitions for world domination—ambitions which they forcefully restated only a short time ago...we must strengthen our military tools... I have directed prompt action to accelerate our entire missile program" John F. Kennedy, State of the Union Address, January 30, 1961 (*The American Presidency Project*, by Gerhard Peters and John T. Woolley, https://www.presidency.ucsb.edu/node/234534)
- "Aircraft development in 1962—in line with the declining emphasis on manned aircraft—will be slightly lower than in 1961. Funds are provided for the development of a new vertical takeoff and landing transport aircraft prototype, to be developed jointly by the military departments. The Army will initiate the development of a new surveillance aircraft, and the Air Force will continue to support its part of the aircraft nuclear propulsion program conducted jointly with the [AEC]... Funding for the Dynasoar, a boost-glide rocket vehicle, designed to explore the fringes of space in suborbital flight, will be at a somewhat higher level than in 1961... a large and diversified program of research on antisubmarine warfare will be carried forward. A large number of antisubmarine warfare developments, including surveillance systems and continued work on antisubmarine weapons such as the Subroc will be supported." (Budget of the US Government FY1962, p. 485)
- "In the midst of gathering international crises, with the explosive Berlin issue in the forefront, Congress in 1961 approved a defense appropriation of $46,662,556,000 for fiscal 1962 – the largest defense appropriation in any single year since the Korean War. The figure included almost all of the $3,454,600,000 in increased appropriations recommended by President Kennedy in his July 25 address to the nation on the Berlin crisis. His total request was $46,396,945,000... The appropriation was $266 million higher than the President requested, mostly because Congress provided $695 million more

than he had asked for long-range bomber development and production..." ("Congress Increases Kennedy Defense Budget," *CQ Almanac 1961*, 17th ed., 142-47. Washington, DC: Congressional Quarterly, 1961)

- "The figure appropriated was $6.4 billion over the fiscal 1961 defense appropriations and $5.9 billion over President Eisenhower's January 1961 estimates for the fiscal 1962 defense budget." (Ibid)
- "In July 26-27 testimony before Senate Committees Secretary of Defense Robert S. McNamara said the over-all aim of the $3.5 billion increase in defense funds was to prepare to cope with not only Berlin but "Communist threats and pressures all around the globe." (Ibid)
- "At a February 1961 press conference Secretary of Defense Robert S. McNamara told reporters that there really was no missile gap. Although his remarks were officially not for attribution, they were soon traced back to him. Republican leaders quickly issued critical statements pointing out that during the Presidential campaign, Mr. Kennedy had charged there was a widening missile gap. At his Feb. 8 press conference, President Kennedy said that Defense Department studies on the question of a possible missile gap had not been completed... The Administration made no further statements regarding the missile gap. Officially inspired reports in October indicated, however, that the Administration had completed a reassessment of Soviet missile construction and had concluded, in effect, that no gap existed... The acceleration during 1961 of Polaris missile construction was intended to make sure that the U.S. would not fall behind in the missile field, Administration officials said." (Ibid)
- "President Kennedy last night asked for $3,247,000,000 of the additional military appropriations for the fiscal year just begun, as the first installment of a partial mobilization to check the Reds at West Berlin and throughout the world... The language Mr. Kennedy employed was addressed toward Khrushchev's ear at least as much as ten millions of Americans... first was the "hard" line—a strong exposition of willingness to fight Berlin. "We cannot and will not permit the Communists to drive us out of Berlin, either gradually or by force." ('Kennedy Asks $3,247,000,000 Added Military Funds For Fiscal 1962 to Check Reds in Berlin, Elsewhere" *Wall Street Journal* by a Wall Street Journal Staff Reporter, July 26, 1961)
- "President Kennedy sent to Congress today his plans for the armed forces build-up that he announced in his address to the nation last night... He won the immediate bipartisan support in both houses. Mr. Kennedy, who spoke last night on the possibilities of wars resulting from Soviet pressure on Berlin and elsewhere, sent a brief note to Congress today on the proposed budget amendments." ("Note to Congress: President Seeks Rise in Funds and Right to Call Reserves—Kennedy Backed on Defense Plan," by Jack Raymond, *New York Times*, July 27, 1961)

Department of Defense R&D Appropriations for FY1963

Bill: Department of Defense Appropriation Act, 1963

Public Law: 87-577 **Enacted:** August 9, 1962 **Effective:** August 9, 1962

Nominal change		Real change		Classification
Millions ($)	YOY%	Millions ($2012)	YOY%	
$1,620.8	30.2%	$7,434.0	30.1%	Exogenous

Congress appropriated a significant increase in real defense R&D appropriations for FY1963, largely motivated by the escalation of the Cold War, concerns about vulnerability to ICBM and submarine-launched nuclear missile attacks, and the adequacy of offensive strategic capabilities. While strategic missile capabilities had received sustained R&D increases for the better part of a decade, concerns mounted in Congress that manned strategic capabilities had taken a back seat to missile development. Congress prioritized funding for the development of new long-range strategic bombers (reimagined as "reconnaissance-strike aircraft") for a more "balanced" nuclear posture, appropriating considerably more funding than had been requested by the administration; the Senate Appropriations Committee was particularly concerned that the administration was overly reliant on ICBMs "which have not yet been tried in combat" for offensive strategic capabilities. That said, the emphasis for offensive strategic forces was much more on the procurement and deployment—following years of related R&D funding increases—save the development of long-range bombers and air-to-ground missiles; funding for defensive strategic capabilities, including military space programs, continued to focus more on R&D than deployment and procurement. The increase in defense R&D funding appears to have been motivated by geopolitical rivalries, perceived existential threats from the communist block, and long-run national security concerns. President Kennedy noted in his budget message that the federal budget played a key role in supporting "economic growth and stability," particularly in funding a large share of U.S. R&D activities, but we find no evidence that the increase in appropriations was influenced by concerns about unemployment or any other short-run macroeconomic prerogatives. Former President Eisenhower vocally derided the rapid growth in the defense budget as unnecessary, and based on overblown threats, but defense R&D spending was nonetheless spared fiscal restraint and unaffected by broader deficit reduction efforts. We thus classify this policy event as exogenous. Most pertinent narrative evidence:

- "In the past 12 months our military posture has steadily improved. We increased the previous defense budget by 15 percent—not in the expectation of war but for the preservation of peace. But our strength may be tested at many levels. We intend to have at all times the capacity to resist non-nuclear or limited attacks—as a complement to our nuclear capacity, not as a substitute. We have rejected any all-or-nothing posture which would leave no choice but inglorious retreat or unlimited retaliation." John F. Kennedy, State of the Union Address, January 11, 1962 (*The American Presidency Project*, by Gerhard Peters and John T. Woolley, https://www.presidency.ucsb.edu/node/236917)
- "At home, we began the year in the valley of recession—we completed it on the high road of recovery and growth... But recession is only one enemy of a free economy–inflation is another. Last year, 1961, despite rising production and demand, consumer prices held almost steady–and wholesale prices declined. This is the best record of overall price stability of any comparable period of recovery since the end of World War II... Our first line of defense against inflation is the good sense and public spirit of business and labor—keeping their total increases in wages and profits in step with productivity. Within this same framework of growth and wage-price stability:... I am submitting for fiscal 1963 a balanced Federal Budget." (Ibid)
- "The key elements in our defense program include: a strategic offensive force which would survive and respond overwhelmingly after a massive nuclear attack; a command and control system which would survive and direct the response; an improved anti-bomber defense system; a civil defense program which would help to protect an important proportion of our population from the perils of nuclear fall-out; combat-ready

limited war forces and the air and sealift needed to move them quickly to wherever they might have to be deployed; and special forces to help out allies cope with the threat of Communist-sponsored insurrection and subversion." (Budget Message of the President, FY1963, January 18, 1962, p. 11)

- "For the coming year, the budget provides for further significant increases in the capabilities of our strategic forces, including additional Minuteman missiles and Polaris Submarines. These forces are large and versatile enough to survive any attack which could be launched against us today and strike back decisively... This assurance is based on an exhaustive analysis of all the available data on Soviet military forces and the strengths and vulnerabilities of our own forces under a wide range of possible contingencies." (Ibid, pp. 11-12)
- "The Federal budget has a major role to play in achieving these objectives [of economic growth and stability]. Basic investments and services of large importance to the Nation are provided through the Government. Striking evidence of this contribution is that the Federal budget today supports about two-thirds of all the scientific [R&D] going forward in the Nation." (Budget Message of the President, FY1963, January 18, 1962, p. 24)
- "Fiscal 1963 appropriations for [DOD]... totaled $48,136,247,000. This was $1.6 billion more than in fiscal 1962, almost $8 billion more than in fiscal 1961 and the largest defense budget since the Korean War... Most of the increase went for [R&D], procurement of aircraft for the Air Force, and aircraft and missiles for the Navy. Reductions below fiscal 1962 levels were made in outlays for military personnel and operations and maintenance, reflecting the planned release of Reservists called to active duty to meet the 1961 Berlin crisis." ("Largest Defense Budget Since Korea Enacted," *CQ Almanac 1962*, 18th ed., 04-147-04-153. Washington, DC: Congressional Quarterly, 1963)
- "The final bill granted $193.1 million more than requested for Air Force R&D (but made minor reductions in R&D funds for the Army and the Defense agencies). The increases in Air Force funds included $191.6 million more than requested for the development of the 2,000 mile-an-hour RS-70 long-range bomber and reconnaissance aircraft, and $42 million more than requested for the development of the Dyna-Soar, a manned space glider designed for orbital flights." (Ibid)
- "The 1962 controversy over funds for the development of the RS-70 resembled a controversy over funds for the procurement of bombers in 1961. It reflected concern among Air Force officials and sympathetic Congressmen that the Administration was placing undue reliance on missiles as the core of the nation's strategic retaliatory forces... "Bomber men" said that missiles were unreliable and lacked flexibility in use; "missile men" said that bombers were expensive and vulnerable to advanced anti-aircraft defenses." (Ibid)
- "Former President Dwight D. Eisenhower, addressing a June 22 Republican fundraising rally in Washington, D.C., said that the defense budget reflected "unjustified fears, plus a reluctance in some quarters to relinquish outmoded concepts," and should be "substantially reduced." He said that "mere spending" did not lead to "increased strength."" (Ibid)
- "The Department of Defense reports that the longer range programs proposed in this area will provide by 1967, a force of over 700 B-58 and B-52 bombers equipped with HOUND DOG and SKYBOLT missiles, well over 1,000 land-based ICBM's, and 41

submarines with more than 650 POLARIS missiles aboard. It was this increase in strategic force that was the basis for Secretary McNamara's statement to the Committee: "...that the strategic retaliatory forces programmed for the next few years are fully adequate to the task of deterring war through the ability of destroying the attacker, even after absorbing the first strike." (H. Rpt. 87-1607, April 13, 1962, p. 7)

- "The system for defense against manned bomber attack has, for the most part, been funded and is already largely in place, including the surveillance, warning, and control network, the manned interceptors, and the surface-to-air missiles. The problem here is that the existing system is vulnerable to intercontinental missile attack... For defense against ICBM attack we have only the warning system, BMEWS, still in part under construction... MIDAS, a system of orbiting satellites for warning against ICBM attacks, is still under development and is included in the R&D program... Funds are included in this bill for space surveillance systems, and for some defense against attack by submarine-launched missiles... the Committee considers the growing threat from submarine-launched missiles to be approaching in significance the threat from manned aircraft, and expects that a much greater defense effort in this area may soon become necessary and perhaps vital to our national security " (Ibid, p. 9)
- "One of the major questions in the [R&D] program is what should be the future scope, pace, and orientation of the military space program—especially in view of the paid expansion of the total Federal Government effort in this field. For fiscal year 1963, the new obligational authority requested for space by all agencies totals nearly $5.5 billion—three times the amount requested in fiscal year 1961. During this period... funds for military space have doubled—from $800 million to $1.5 billion" (Ibid, p. 12)
- "The [House] Committee recommends the appropriation of $6,860,358,000 for [RDT&E]. The recommended amount is $17,358,000 more than the budget request of $6,843,000,000 and $1,616,428,000 more than the $5,243,930,000 appropriated for fiscal year 1962... The increase is the net result of increases of $42,000,000 for the DYNA-SOAR [manned space glider] program, $52,900,00 for the RS-70 [bomber] program, and $7,000,000 for the Mark 46 torpedo program." (Ibid, p. 47)
- "It is a matter of grave concern to the committee that the current Department of Defense development planning does not include a follow-on weapons system for the B-52 long-range bombers of the Strategic Air Command... The only manned system that logically could be provided to replace the B-52's and B-58's is the RS-70, formerly designated the B-70... The committee recommends $491 million to proceed with the full development of the RS-70 weapons system... Under the constitutional responsibilities of Congress to provide for the national defense, the committee is of the opinion that the full amount should be provided for the development of the RS-70 in order to assure ourselves that our national security shall be maintained. It urges the executive branch to weigh carefully any decision which will, in effect, force us to depend solely upon [ICBMs] which have not yet been tried in combat." (S. Rpt. 87-1538, June 8, 1962, pp. 4-5)

Department of Defense R&D Appropriations for FY1965

Bill: Department of Defense Appropriation Act, 1965

Public Law: 88-446 **Enacted:** August 19, 1964 **Effective:** August 19, 1964

Nominal change		Real change		Classification
Millions ($)	YOY%	Millions ($2012)	YOY%	
-$511.1	-7.3%	-$2,478.0	-7.8%	Exogenous

Congress appropriated a significant decrease in real defense R&D appropriations for FY1965, largely motivated by the reduced concerns about a deficit in offensive strategic capabilities and the Partial Nuclear Test Ban Treaty, as well as a pivot to domestic non-defense priorities. The House Appropriations Committee declared mission accomplished on U.S. ICBM capabilities, stating that the "rapid and successful development and deployment of a large force of intercontinental ballistic missiles has been an outstanding national achievement... A serious military threat has been turned into a military advantage as the United States has outperformed the Soviet Union in the development, production, and deployment of these weapons" (H. Rpt. 88-1329, April 17, 1964, p. 42). And the committee seemed generally perplexed as to what R&D for futuristic strategic capabilities should be prioritized, now that the U.S. had such entrenched ICBM capabilities; laser death rays, non-lethal chemical and biological weapons, and various space-based weapons systems were floated as possibilities in a committee report. Congress continued to prioritize the development of a new generation of strategic bombers and defensive strategic capabilities, but overall military R&D funding fell because development of the POLARIS, ATLAS, and TITAN ICMBs had been completed. Secretary of Defense Robert S. McNamara's budget discipline and "'cost-effectiveness' yardstick for selecting weapon systems" also contributed to the decline of military R&D spending, much to the ire of presidential candidate (and Major General in the Air Force Reserve) Barry Goldwater, who put President Johnson on the defensive about military R&D on the campaign trail. That said, the pendulum swung from the development and deployment of strategic capabilities to arms control treaties and nonproliferation efforts under President Johnson, who also declared a "war on poverty" in his State of the Union Address and pledged to reduce uranium enrichment, close "nonessential" military bases, and cut the budget deficit. The decrease in defense R&D funding does not appear to have been motivated by any concerns about inflation or other short-run macroeconomic prerogatives. As such, we classify this policy event as exogenous. Most pertinent narrative evidence:

- "First, we must maintain—and our reduced defense budget will maintain—that margin of military safety and superiority obtained through 3 years of steadily increasing both the quality and the quantity of our strategic, our conventional, and our anti guerilla forces. In 1964 we will be better prepared than ever before to defend the cause of freedom, whether it is threatened by outright aggression or by the infiltration practiced by those in Hanoi and Havana, who ship arms and men across international borders to foment insurrection. Second, we must take new steps—and we shall make new proposals at Geneva—toward the control and the eventual abolition of arms. Even in the absence of agreement, we must not stockpile arms beyond our needs or seek an excess of military power that could be provocative as well as wasteful." Lyndon B. Johnson, State of the Union Address, January 08, 1964 (*The American Presidency Project*, by Gerhard Peters and John T. Woolley, https://www.presidency.ucsb.edu/node/242292)
- "This administration today, here and now, declares unconditional war on poverty in America. I urge this Congress and all Americans to join with me in that effort." (Ibid)
- "Along with the high level of preparedness we have now achieved, vigorous efforts to promote economies in the management of our Armed Forces have been producing significant savings. We are therefore able to propose a decrease of $800 million in cash

outlays ($1.3 billion in the administrative budget) for national defense in fiscal year 1965 while maintaining our position of strength." (Budget Message of the President, FY1965, January 21, 1964, p. 19)

- "Although we continue to seek a relaxation of tensions, we cannot relax our guard. While the [Partial Nuclear Test Ban Treaty of 1963] is a hopeful sign, neither that treaty nor other developments to date have, by themselves, reduced our defense requirements. We will continue underground nuclear testing, maintain our above-ground testing facilities in ready condition, maintain strong weapons laboratories, and continue the development of detection devices." (Ibid, p. 20)
- "There seems to be agreement among Defense officials generally, both civilian and military, that the United States now occupies a position of military superiority in relation to any other power... There exists considerable uncertainty among our senior civilian and military leaders as to what the precise direction of Defense programs in the area of new strategic weapons should be. For several years, substantial amounts of money have been expended in [R&D] for intercontinental ballistic missiles including the POLARIS. This has been the most spectacular development in strategic weaponry since the advent of the hydrogen bomb" (H. Rpt. 88-1329, April 17, 1964, p. 4)
- "There is yet today no operational system which can make a nation invulnerable to attack from intercontinental ballistic missiles. Both the United States and the Soviet Union are spending great sums of money and much effort in the development of such systems. It is likely that offense will stay ahead of the defense in this area for many years. But sooner or later, it is likely that sufficiently effective defenses will be developed that a new and better strategic delivery system than the ICBM will be required" (Ibid, pp. 4-5)
- "The [House] Committee is, of course, gratified by the current superior qualitative and quantitative military position which the United States holds. Nevertheless, the Committee is well aware that military weaponry is a dynamic area. Being ahead does not necessarily ensure that one will stay ahead... Major large weapons systems similar to, or in replacement of, the bomber aircraft and the [ICBM] constitute the basis for much study in [R&D]. What will our future strategic system be? The Committee interrogated a number of witnesses, knowledgeable in the [R&D] area, but was unable to find any one who would venture a prediction as to what type of system might someday supplant the ICBM. There are, of course, many possibilities. A death-ray-type weapon might evolve from LASER research. Efforts in chemical and biological warfare might produce incapacitating agents that could render persons helpless for short periods of time without causing large numbers of fatalities. It might be that future military systems will be some type of space-based system—either space platforms from which weapons can be launched or orbiting weapons which themselves can be caused to deorbit and strike targets on command" (Ibid, p. 5)
- "Defense against ballistic missiles, both submarine and land-based, remains the most critical aspect of the defensive task. Although it is now fully operational, the Ballistic Missile Early Warning System (BMEWS) will be further improved in 1965... The bill would also provide for the continued high-priority development of the NIKE-X, an improved anti-missile defense system... If an enemy were to develop a satellite-based strategic threat, there would certainly be a need for some means to counter it. The bill supports several research efforts in this area as well as significant improvements in satellite detection and tracking capabilities... " (Ibid, p. 10)

- "The fiscal year 1965 Budget estimate for the [RDT&E] accounts included in this Title of the bill is $6,722,000,000. The Committee recommends $6,476,320,000, which is $245,680,000 less than the amount requested. The sum recommended is $472,910,000 less than the $6,949,230,000 appropriated for these functions for fiscal year 1964... The amount recommended for each of the accounts in this Title of the bill is less than the amount authorized for the account by [the National Defense Authorization Act, 1965]... The decline in funding for fiscal year 1965 as compared with the previous two years is basically the result of the virtual completion of the development of the POLARIS, ATLAS, and TITAN [ICBMs] and the nearing of completion of the development of the MINUTEMAN program... Seldom is a weapon development so significant that national survival can be said to depend upon its successful accomplishment. The [ICBM] and the nuclear device are probably the only two developments in this category since World War II" (Ibid, p. 44)
- "The fiscal impact of the ICBM development programs was great but was essential, and overall, was money well spent. There is no good reason to continue spending the same or greater sums when the specific need no longer exists." (Ibid, p. 42)
- During the 1964 Presidential campaign the Republican party, led by its nominee, Sen, Barry Goldwater (R Ariz.), a Major General in the Air Force Reserve, mounted an attack on Administration defense procurement and research policies. In particular, the GOP charged that [DOD] planned to replace manned bombers with untried and unreliable missiles and had failed to develop a new manned strategic aircraft. In addition, it charged that the Department, under the management of Secretary Robert S. McNamara, had not pushed the development of other major new weapons. The result, said the 1964 Republican platform, was the "fearsome possibility that Soviet advances, in the decade of the 1970s, may surpass America's present lead" in weaponry and that U.S. military forces would be armed with obsolete equipment. To a great extent the attacks reflected the dissatisfaction of some military officers with Administration defense policies and Secretary McNamara's "cost-effectiveness" yardstick for selecting weapon systems. Particularly dissatisfied were bomber advocates in the Air Force, who found strong support in Congress." ("Defense Procurement and Research Act," *CQ Almanac 1964*, 20th ed., 444-51. Washington, DC: Congressional Quarterly, 1965)
- "Congress in 1964 appropriated $46,752,051,000 to [DOD] for fiscal 1965 in the annual defense appropriations bill (HR 10939). The sum was $718,949,000 less than was requested by [DOD] and $1,471,159,000 less than was appropriated for the same purposes in fiscal 1964 (including deficiencies and supplementals)... Of the reductions made by Congress, $208,680,000 was accomplished by reductions made in the fiscal 1965 procurement, [R&D] authorization bill." ("Defense Appropriations Drop to $46 Billion," *CQ Almanac 1964*, 20th ed., 153-60. Washington, DC: Congressional Quarterly, 1965)

Department of Defense R&D Appropriations for FY1967

Bill: Department of Defense Appropriation Act, 1967

Public Law: 89-687 **Enacted:** October 15, 1966 **Effective:** October 15, 1966

Nominal change		Real change		Classification
Millions ($)	YOY%	Millions ($2012)	YOY%	
$426.5	6.3%	$1,762.1	5.7%	Exogenous

Congress appropriated a significant increase in real defense R&D appropriations for FY1967, largely motivated by the escalating Vietnam War and rising Cold War tensions. Defense R&D policy priorities receiving increased funding included the development and deployment of the Nike-X anti-ballistic missile system as well as the development of newer submarine-launched ballistic missiles, manned long-range bombers, and nuclear-powered guided missile frigates. Budgetary restraint constraining most nondefense programs was not applied to defense R&D appropriations, and the R&D funding increases do not appear to have been motivated by concerns about unemployment or any other short-run macroeconomic prerogatives. As such, we classify this policy event as exogenous. Most pertinent narrative evidence:

- "Tonight Vietnam must hold the center of our attention... Tonight I can tell you that we are strong enough to keep all of our commitments. We will need expenditures of $58.3 billion for the next fiscal year to maintain this necessary defense might. While special Vietnam expenditures for the next fiscal year are estimated to increase by $5.8 billion, I can tell you that all the other expenditures put together in the entire Federal budget will rise this coming year by only $0.6 billion. This is true because of the stringent cost-conscious economy program inaugurated in [DOD], and followed by the other departments of Government..." Lyndon B. Johnson, State of the Union Address, January 12, 1966 (*The American Presidency Project*, by Gerhard Peters and John T. Woolley, https://www.presidency.ucsb.edu/node/238437)
- "A second principle of policy is the effort to control, and to reduce, and to ultimately eliminate the modern engines of destruction. We will vigorously pursue existing proposals-and seek new ones–to control arms and to stop the spread of nuclear weapons." (Ibid)
- "Aggressive forces are now testing our will and commitment to help a brave ally under attack. This Nation will continue to seek a just settlement in Vietnam. At the same time, we must provide the funds and forces required to sustain us until that goal is reached. The 1967 budget meets those requirements as we now see them. The costs will not be light... In 1967, we will: Improve our strategic missile forces with additional Minuteman II and Polaris A-3 missiles, with further development of the Poseidon submarine-launched missile, and with initial procurement of the Minuteman III missile to be delivered in future years... [and] Continue the vigorous [R&D] programs vital to our continued ability to field the most modern and potent forces in the world." (Budget Message of the President FY1967, January 24, 1966, p. 20)
- "The Committee [House Appropriations] recommends the appropriation of $6,928,959,000 for [RDT&E] activities of [DOD] for fiscal year 1967. The recommended amount is $23,600,000 more than the budget estimate of $6,905,359,000 and is $207,809,000 more than the $6,721,150,000 appropriated for fiscal year 1966... (H. Rpt. 89-1652, June 24, 1966, p. 27)
- "Congress in 1966 authorized appropriations to [DOD] of $10,437,500,000 for procurement of aircraft, missiles, naval vessels and tracked combat vehicles, and $7,043,259,000 for [R&D]... The total authorization provided by S2950 was $533.9 million more than the Administration requested and $2.1 billion more than the total authorized for the same purposes in the fiscal 1966 procurement and R&D authorization legislation... In the field of [R&D], Congress provided an additional $137.9 million above Administration requests. This increase included $50 million more for the Air Force Manned Orbiting Laboratory (MOL), $14.4 million more for Army Nike-X development program

costs associated with preparing for production, and $11.8 million to initiate "contract definition" for an advanced manned strategic aircraft (AMSA) for the Air Force to replace the B-52 strategic bomber in the 1970s. The, increases also included $26.6 million for the Navy's Condor air-to-surface missile... The sums authorized for [R&D] included approximately $300 million in funds requested by the Administration for the development of the Navy's Poseidon sea-launched ballistic missile." ("Defense Procurement and Research Authorization," *CQ Almanac 1966*, 22nd ed., 605-10. Washington, DC: Congressional Quarterly, 1967)

- "Congress in 1966 passed a bill (HR 15941) appropriating a near-record $58,067,472,000 for [DOD] in fiscal 1967. Reflecting the spiraling costs of U.S. involvement in Southeast Asia, HR 15941 was the largest single appropriations measure of any kind since passage of a record $59-billion appropriation for the combined Army and Air Corps in fiscal 1944... Of the $403.12 million appropriated above Administration requests, $167.9 million was provided for procurement of long lead time items and related [R&D] activity preparatory to construction of the controversial Nike-X antiballistic missile system and $150.5 million for nuclear-powered guided missile frigates... [The bill also] provided $22.8 million, $11.8 million more than requested, for development work on an advanced manned strategic bomber (AMSA)–a proposed successor to the nation's current bomber fleet." ("Largest Defense Bill Since 1943 Passed," *CQ Almanac 1966*, 22nd ed., 144-53. Washington, DC: Congressional Quarterly, 1967)

Department of Defense R&D Appropriations for FY1970

Bill: Department of Defense Appropriation Act, 1970

Public Law: 91-171 **Enacted:** December 29, 1969 **Effective:** December 29, 1969

Nominal change		Real change		Classification
Millions ($)	YOY%	Millions ($2012)	YOY%	
-$222.2	-2.9%	-$2,399.1	-7.3%	Endogenous

Congress appropriated a significant decrease in real defense R&D appropriations for FY1970, largely motivated by rising inflationary pressure and Congressional (and broader societal) backlash to both the military budget and the Vietnam war. President Johnson had continued to prioritize nonproliferation agreements and diplomatic curbs to arms races, decreasing the need for (and legality of) military R&D for strategic weapons. After defeating Johnson in the 1968 election, President Nixon maintained this emphasis on nonproliferation, urging Senate ratification of the Nuclear Non-proliferation Treaty and pursuing the SALT talks in Helsinki, Finland. Nixon also took a hatchet to the FY1970 defense budget initially proposed by the Johnson administration, and Congressional backlash to perceived "waste and inefficiency" in defense budgets and the Vietnam war led to further cuts during the appropriations process. Because the decrease in defense R&D funding appears to have been motivated in part by efforts to curb short-run inflationary pressures from the federal budget, we classify this policy event as endogenous. Most pertinent narrative evidence:

- "I think it is most important that we all realize tonight that this Nation is close to full employment—with less unemployment than we have had at any time in almost 20 years. That is not in theory; that is in fact. Tonight, the unemployment rate is down to 3.3 percent. In any event, I think it is imperative that we do all that we responsibly can to resist inflation while maintaining our prosperity." Lyndon B. Johnson, State of

the Union Address, January 14, 1969 (*The American Presidency Project*, by Gerhard Peters and John T. Woolley, https://www.presidency.ucsb.edu/node/236130)

- "Americans, I believe, are united in the hope that the Paris talks will bring an early peace to Vietnam. And if our hopes for an early settlement of the war are realized, then our military expenditures can be reduced and very substantial savings can be made to be used for other desirable purposes, as the Congress may determine. In any event, I think it is imperative that we do all that we responsibly can to resist inflation while maintaining our prosperity." (Ibid)
- "The quest for a durable peace, I think, has absorbed every administration since the end of World War II. It has required us to seek a limitation of arms races not only among the superpowers, but among the smaller nations as well. We have joined in the test ban treaty of 1963, the outer space treaty of 1967, and the treaty against the spread of nuclear weapons in 1968... This latter agreement—the nonproliferation treaty—is now pending in the Senate, and it has been pending there since last July. In my opinion, delay in ratifying it is not going to be helpful to the cause of peace. America took the lead in negotiating this treaty, and America should now take steps to have it approved at the earliest possible date." (Ibid)
- "The 1970 budget program calls for: Support for our commitments in Southeast Asia, and necessary improvements to maintain and strengthen our overall military capabilities... A budget surplus in the year ahead, as well as in the current fiscal year, to relieve the inflationary pressures in the economy and to reduce the strains that Federal borrowing would place on financial markets and interest rates. (Budget Message of the President, FY1970, January 15, 1969, p. 7)
- "In periods of inflationary pressure, such as we are now experiencing, the need for holding down Federal outlays is beyond dispute." (Ibid, p. 15)
- "The most significant changes in the 1969 [defense authorization] bill had been made by the Administration itself and the Congressional Armed Services Committees, acting partly in response to the antimilitary pressure and also to the Government-wide anti-inflation drive to cut spending." ("Congress Authorizes Defense Funds After Long Debate," *In CQ Almanac 1970*, 26th ed., 02-380-02-413. Washington, DC: Congressional Quarterly, 1971)
- "The [House Appropriations] Committee is well aware of the requirements of the fiscal situation and realizes that without a healthy economy and a reasonably sound dollar, the probability of maintaining our military superiority would be greatly jeopardized. The great national need to halt the erosion of the economy by inflation, a painful burden to millions of Americans, is as important to the Defense effort as to any other sector of the economy. As the largest purchaser of goods and services, [DOD] has itself been hard hit by economic inflation. The Committee has joined with the President and the Secretary of Defense in making reductions in spending wherever reasonably possible in an effort to reduce inflation. Some otherwise attractive programs are not funded at this time because of the need to hold the line on the overall budget." (H. Rpt. 91-698, December 3, 1969, p. 4)
- "Following a year of unexpected Congressional rebellion against swelling defense budgets, the House and Senate Dec. 18 cleared a $69.6-billion military appropriations bill for fiscal 1970. The appropriations measure (HR 15090), totaling $69,640,568,000, was the final result of a year of hectic debate and budget-cutting which saw the Nixon

Administration and Congressional committees reduce the original fiscal 1970 defense appropriations request of the outgoing Johnson Administration by more than $8 billion." ("Biggest Cut Made in Defense Funds Since Fiscal 1954," *CQ Almanac 1969*, 25th ed., 454-63. Washington, DC: Congressional Quarterly, 1970)

- "First, the incoming Nixon Administration reduced the Johnson request of $77.7 billion by $2.5 billion. The House Appropriations Committee continued the process by knocking out another $5.3 billion in programs and funds requested, followed by the Senate Appropriations Committee which cut another $627 million from the bill as passed by the House. The $5.6 billion cut by the Congress in the final Nixon request was also the largest reduction in a defense appropriations bill since the $6.4 billion taken out of the fiscal 1954 request." (Ibid)
- "The [House Appropriations] Committee recommended $7,197,600,000 for research, $1,024,800,000 less than the request and $352,228,000 less than the total appropriated in fiscal 1969. In commenting on the research appropriations, the group criticized the poor reliability in weapons, duplication, cost growth, and the lack of management of funds. It also criticized the increased emphasis on high performance rather than dependability, durability, and costs." (Ibid)
- "The Joint Economic Subcommittee on Economy in Government Dec. 23 climaxed a year of aggressive inquiry into waste and inefficiency in defense spending with recommendations which included a $10-billion reduction in military expenditures... Concerning the military budget, the report stated that testimony disclosed substantial fat in a defense budget characterized by lack of controls or fiscal restraints and by over-optimism in forecasts and cost estimates. It added that contractors and Defense Department officials frequently "played games" with Congress by underestimating costs in order to get funding for weapons with little hazard of being penalized." ("Joint Committee Urges Reduction in Defense Spending," *CQ Almanac 1969*, 25th ed., 476-79. Washington, DC: Congressional Quarterly, 1970)
- "United States defense programs and policies in 1969 became the target of rare Congressional and public skepticism and hostility. Defense plans were questioned in a flurry of Congressional investigations, criticized by individual Members of Congress, the public and the press and attacked with unusual boldness by disarmament and peace pressure groups. The noisy rebellion lasted the entire session and tied up the Senate for two summer months during debate over the annual defense procurement authorization bill. During the year the nation was bombarded by emotional rhetoric and somber claims and counterarguments on nuclear war and the arms race and the phrase "the military-industrial complex" became a household epithet. This unrest had some effect, forcing a re-examination and modification of the antiballistic missile system, leading to the creation of a loosely organized but potent Congressional resistance to military programs and spurring the Nixon Administration to cut defense spending plans and renounce biological warfare. The Administration and the Congressional Committees involved in 1969 did respond to the pressure of inflation, the need to reduce federal spending, and defense critics by voluntarily cutting back projects in anticipation of Congressional reductions." ("Defense Spending, Policies Criticized in Congress," *In CQ Almanac 1969*, 25th ed., 1011-16. Washington, DC: Congressional Quarterly, 1970)

Department of Defense R&D Appropriations for FY1971

Bill: Department of Defense Appropriation Act, 1971
Public Law: 91-668 **Enacted:** January 11, 1971 **Effective:** January 11, 1971

Nominal change		Real change		Classification
Millions ($)	YOY%	Millions ($2012)	YOY%	
-$340.3	-4.6%	-$2,962.6	-9.7%	Endogenous

For the second year in a row, Congress significantly decreased real defense R&D appropriations for FY1971, largely motivated by congressional backlash to the large defense budget, the Vietnam War winding down, and a reprioritization of funding from military to nondefense budget priorities in an era of high inflation and tight budget constraints. President Nixon touted his proposal of an "anti-inflationary budget" that shifted emphasis from military to domestic priorities. Congressional appropriators further pared back defense R&D funding relative to the administration's request, being even more keen to repurpose funding away from the wartime defense budget. The Nixon administration had proposed $7.34 billion for defense R&D functions, $24 million below FY1970 funding levels, but the House appropriations provided $391 million less than requested in their allowance. The Senate committee only restored $5 million of these funds that the House had cut, and the Senate was reportedly eager to "shift spending priorities from military to domestic program." Backlash to the recent growth of the DOD's budget and the Vietnam War influenced the appropriations process, as it had the previous year, and the House Appropriations Committee accused the Defense Department of "inefficiency and mismanagement." Given the overarching prerogative of curbing short-run inflationary pressures from the federal budget and intent to reshuffle federal spending from defense to domestic priorities without increasing total spending and exacerbating inflationary pressures, we classify this policy event as endogenously motivated. Most pertinent narrative evidence:

- "Now, I realize it is tempting to blame someone else for inflation. Some blame business for raising prices. Some blame unions for asking for more wages. But a review of the stark fiscal facts of the 1960s clearly demonstrates where the primary blame for rising prices must be placed... We had a balanced budget in 1969. This administration cut more than $7 billion out of spending plans in order to produce a surplus in 1970, and in spite of the fact that Congress reduced revenues by $3 billion, I shall recommend a balanced budget for 1971. But I can assure you that not only to present, but to stay within, a balanced budget requires some very hard decisions. It means rejecting spending programs that would benefit some of the people when their net effect would result in price increases for all the people... The major immediate goal of our foreign policy is to bring an end to the war in Vietnam" Richard Nixon, State of the Union Address, January 22, 1970 (*The American Presidency Project*, by Gerhard Peters and John T. Woolley, https://www.presidency.ucsb.edu/node/241063)
- "I have pledged to the American people that I would submit a balanced budget for 1971. This is particularly necessary because the cost of living has been rising rapidly for the past five years. This anti-inflationary budget begins the necessary process of reordering our national priorities. For the first time in two full decades, the Federal Government will spend more money on human resource programs than on national defense... To contain inflation, we must maintain a policy of fiscal restraint in the current fiscal year and continue it in 1971... About 41% of estimated outlays in the 1971 budget will be devoted to human resources—spending for education and manpower, health,

income security, and veterans benefits and services. Spending for national defense, despite continued improvements in our military forces, will claim a smaller percentage of the budget than in any year since 1950." (Budget Message of the President, FY1971, February 2, 1970, pp. 7, 11, 20)

- "The 1971 [military] program will provide for the procurement of carefully selected weapons systems and for a prudent [R&D] program designed to assure our future military strength. This can be accomplished within a lower budget total because not all of the outlays planned when this Administration took office are required to meet our needs. Older systems, which are ineffective or expensive to maintain, are being retired, and our manpower requirements are being reduced... In scientific research, emphasis will be on efforts offering high promise for military applications such as electronics, sensor physics, aerodynamics, propulsion, and high-strength materials. The need to establish technical confidence in proposed new weapons systems prior to committing them to production will result in increased emphasis on testing and evaluation." (Budget of the United States, FY1971, p. 83, 87) of $600 million over 1970
- "President Nixon Oct. 7 signed into law (PL 91-441) a bill (HR 17123) authorizing $19.9 billion for defense procurement and research programs in fiscal 1971. The bill, which had tied up the Senate in floor debate for more than one month, authorized a total of $19,929,089,000—$676,400,000 less than the amount originally requested by the Administration, $308,400,000 less than approved by the House May 6, $686,200,000 more than allocated by the Senate Sept. 1 and $781,413,000 less than the amount authorized by Congress for fiscal 1970... It was the second straight year that the annual procurement authorization bill had served as the primary target for those Members of Congress who questioned the merits of specific weapons programs and the level of defense spending in general" ("Congress Authorizes Defense Funds After Long Debate," *In CQ Almanac 1970*, 26th ed., 02-380-02-413. Washington, DC: Congressional Quarterly, 1971)
- "The total of new obligational authority requested for [DOD], $71,251,131,000 is some $5.8 billion below the estimated outlays for fiscal 1970. This reduction comes at a time of rising prices, increased personnel costs, and increased strategic threat... The [House Armed Services] Committee recommends a reduction to the budget requested for [RDT&E] totaling $136,000,000." (H. Rpt. 91-1022, April 24, 1970, pp. 8, 17)
- "The [House] Committee on Appropriations is dedicated to maintaining the military superiority of the United States. Over the years Congress has provided the money to accomplish this, and the funds recommended in the accompanying bill are deemed sufficient for fiscal year 1971... In order to maintain our capability over the long pull, a better job of managing defense dollars must be done. This fact has been a dominant consideration in the drafting of the bill which accompanies this report... The effectiveness of [DOD] cannot be measured solely in terms of the dollar level of expenditures. Unlimited resources do not overcome inefficiency and mismanagement. What this country needs is more defense for the dollar, not necessarily more dollars for defense." (H. Rpt. 91-1570, April 24, 1970, pp. 4-5)
- "The Strategic Arms Limitations Talks have not as yet become a significant factor in permitting a major reduction in defense spending." (Ibid, p. 5)
- "The [Senate Armed Services] Committee in making its recommendations on the authorization request of $20,271,489,000 as recommended by the Department of Defense

and the $20,237,489,000 as approved by the House, was mindful of a number of basic considerations including: (1) the necessity of recommending an authorization which would be the lowest dollar amount consistent with the requirements of national security in view of the serious financial condition of the Federal government and the problems of our domestic economy... (9) The continuing spiral of inflation which should be recognized in measuring dollar levels alone as an indicator of Defense spending; and the tendency to overlook the increased cost in absolute dollars for the more sophisticated and complex weapons needed to outperform any adversaries." (S. Rpt. 91-1016, July 14, 1970 pp. 11-12)

- "The [House Appropriations] Committee recommended $6,954,700,000 for [R&D], $390.9 million less than the request. The fiscal 1970 appropriation was $7,368,820,000. In this area, the Committee provided full-funding for the trouble-plagued Cheyenne Army helicopter, reduced by $20 million funds for hard-site missile defenses, reduced by $10 million the request for the LAMPS destroyer helicopter, approved the full $44 million authorized for the advanced underwater long-range missile system (ULMS) strategic submarine, approved the $75 million authorized for the B-1 bomber, denied the entire $33.6 million sought for development of the subsonic cruise armed decoy (SCAD) missile, cut $50 million for additional Minuteman defense research, cut $24.2 million for SRAM research and reduced by $23.5 million funds for the airborne warning and control system (AWACS)." ("Defense Funds: Reductions Continue for Second Year," *CQ Almanac 1970*, 26th ed., 02-414-02-421. Washington, DC: Congressional Quarterly, 1971)
- "The [Senate Appropriations] Committee's recommendation for all research appropriations totaled $6,960,100,000, $5.4 million more than the House appropriation and $385.5 million less than the request... In specific actions, the Senate Committee voted to seek restoration of funds cut or reduced by the House for the Pershing missile system, the LAMPS destroyer helicopter, the subsonic cruise armed decoy (SCAD) missile, the Minuteman defense and testing programs and the airborne warning and control system (AWACS)." (Ibid)
- "The Senate Defense Appropriations Subcommittee, ignoring Nixon Administration requests to restore some of the military funds deleted by the House, has decided to cut 300-million more from the defense appropriations bill... the Democratic-controlled Congress has achieved the underlying political goal of demonstrating its willingness to shift spending priorities from military to domestic programs." ("$300-MILLION CUT IN ARMS PLANNED BY SENATE PANEL: Decision, Overriding Laird, Would Bring Reductions to Total of $2.2-Billion Arms Fund Cut Planned by Senate Panel," by John W. Finney, *New York Times*, December 3, 1970)

Department of Defense R&D Appropriations for FY1974

Bill: Department of Defense Appropriation Act, 1974

Public Law: 93-238 **Enacted:** January 2, 1974 **Effective:** January 2, 1974

Nominal change		Real change		Classification
Millions ($)	YOY%	Millions ($2012)	YOY%	
$219.2	2.8%	-$1,391.0	-4.9%	Endogenous

Congress appropriated a modest nominal increase in defense R&D appropriations for FY1974, resulting in a significant real decrease, largely motivated by inflationary pressures

and the related need for fiscal restraint. Given inflationary and budgetary pressures, the appropriations committees scoured for and denied funding for defense requests "which might be nice to have but are certainly not essential," including R&D activities. The Nixon administration touted strength through diplomacy as an alternative to military spending, notably negotiating an end to the Vietnam war, nuclear nonproliferation treaties, and diplomatic rapprochement with China. Inflation, particularly pay increases for personnel, and the devaluation of the dollar were also pushing up costs in the defense budget, crowding out R&D spending, which could legally be cut to curb inflationary pressures (unlike salaries). New geopolitical concerns about Soviet development of ICBMs with multiple reentry vehicles and Chinese advances in ICBM technology did not trump the prerogatives of fiscal and inflationary restraint. Because the decrease in defense R&D funding appears to have been motivated in part by efforts to curb short-run inflationary pressures from the federal budget, we classify this policy event as endogenous. Most pertinent narrative evidence:

- "We expect inflation to be reduced even further in 1973—for several reasons. A fundamental reason is the Nation's growing opposition to runaway Federal spending. The public increasingly perceives what such spending does to prices and taxes. As a result, we have a good chance now, the best in years, to curb the growth of the Federal budget... Finally, we now have a new system of wage and price controls—one that is the right kind of system for 1973... I have fulfilled my pledge that I would not recommend any programs that would require a general tax increase or would create inflationary pressures." Richard Nixon, State of the Union Message to the Congress on the Economy, February 22, 1973 (*The American Presidency Project*, by Gerhard Peters and John T. Woolley, https://www.presidency.ucsb.edu/node/256029)
- "This is a budget that will continue to move the Nation's economy toward a goal it has not achieved in nearly two decades: a high employment prosperity for American's citizens without inflation and without war." (Budget Message of the President, FY1974, January 29, 1973, p. 3)
- "During the past two years, with the economy operating below capacity and the threat of inflation receding, the Federal budget provided fiscal stimulus that moved the economy toward full employment... However, instead of operating primarily as a stimulus, the budget must now guard against inflation... The surest way to avoid inflation or higher taxes or both is for Congress to join me in a concerted effort to control Federal spending. I therefore propose that before the Congress approves any spending bill, it establish a rigid ceiling on spending, limiting total 1974 outlays to the $268.7 billion recommended in this budget" (Ibid, p. 4)
- "We have made substantial progress toward ending our involvement in the difficult war in Southeast Asia... In the past four years, we have concluded more significant agreements with the Soviet Union than in all previous years since World War II, including the historic agreement for limiting strategic nuclear arms... We have ended nearly a quarter century of mutual isolation between the United States and the People's Republic of China and can look forward to the development of peaceful cooperation in areas of mutual interest." (Ibid, pp. 14-15)
- "Improvements in the efficiency of the R&D and procurement processes will be sought by emphasizing prototypes, improving test and evaluation, minimizing simultaneous development and production, and by cooperating with our allies to make more efficient use of joint technical resources." (Budget of the United States, FY1974, p. 77)

- "Congress has passed, and I have signed into law, an extension of the Economic Stabilization Act. This legislation will permit the continuation of a constructive and orderly program to restore price stability, and I congratulate the Congress on its action. After 18 months of great progress against inflation, prices soared again in February and March... The price-wage control system is part of a larger anti-inflation program the cornerstone of which is a responsible budget policy. The healthy expansion of our economy, which is creating more jobs and better wages today, could be transformed into a dangerously inflationary boom tomorrow if the rise in Federal spending accelerates. We must not let that happen." Richard Nixon, Statement About Signing a Bill Extending the Economic Stabilization Act of 1970 (Public Law 93-28) May 2, 1973 (*The American Presidency Project*, by Gerhard Peters and John T. Woolley, https://www.presidency.ucsb.edu/node/255391)
- "The [House Appropriations] Committee believes that full appropriations should be made available for valid military requirements... The Committee feels, however, that not all of the money requests of [DOD] are related to military requirements. As is set forth in this report, the committee has found a number of areas in which requests are made for items that might be nice to have but are certainly not essential. At a time when the dollar has declined in international exchanges, when economic inflation continues to plague the American people, and when the American taxpayer is already heavily burdened, the Committee feels that every effort must be made to reduce government spending wherever possible consistent with providing for strong military forces." (H. Rpt. 93-662, November 26, 1973, pp. 14-15)
- "Program changes have been made on the part of our potential adversaries over which we have had little or no control and no amount of spending on our part would have prevented these gains on their part. The fact that the Soviet Union is advancing its nuclear missile technology into the areas of multiple independently targeted reentry vehicles and that the Chinese are beginning the construction of ICBMs is the natural result of an improving technology within these nations and is not the result of shortcomings in our Defense program. There is no assurance that the addition of large numbers of strategic missiles or anti-ballistic missiles to our inventory would make us more secure. The Committee is convinced that this Nation now has and must continue to have the ability to bring upon any potential enemy a degree of damage which is so absolutely devastating that rational men could never opt for a nuclear attack upon the United States." (Ibid, p. 13)
- "The [House] Committee recommends the appropriation of $2,998,000,000 for the [RDT&E] activities of the Air Force in fiscal year 1974. The sum recommended is $194,000,000 less than the $3,192,000,000 requested in the revised budget and $124,940,000 less than the $3,122,940,000 appropriated for the previous fiscal year... The Committee recommends deletion of all of the funds requested for the continued development of a new medium [STOL] transport aircraft for the Air Force... " (Ibid, p. 214)
- "The FY 1974 budget request for continued effort under the Advanced Ballistic Reentry System line item (ABRES) is $95,300,000. The Committee recommends the appropriation of $90,000,000, a reduction of $5,300,000... The ABRES program develops and tests various ballistic reentry systems. One of the primary goals of the program is to develop warheads that are capable of penetrating enemy ABM systems. With the SALT treaty limiting ABM development and with the slowdown in ABM deployment, it appears that this part of the ABRES effort is not as urgently required as it once

was." (Ibid, p. 216)

- "We need not belabor these familiar needs: a brake on inflation, a solution to our dollar problems abroad, and a long list of social, economic, and environmental needs-many of them urgent-requiring large-scale expenditures over the foreseeable future. How to provide adequately for our national defense without either impairing the funding necessary for these high priority social and economic needs or recommending large-scale appropriations that would have a perilous inflationary impact was the problem addressed by the committee." (S. Rpt. 93-617, December 12, 1973, p. 7)
- "The impact of inflation and currency revaluation on defense spending was dramatically illustrated in September after our hearings were virtually concluded. Largely as a result of price increases and a shift of emphasis from Southeast Asia, the President submitted budget amendments involving over $1.5 billion in necessary budget adjustments. Currency revaluation, petroleum costs, and food price changes had added about $1 billion to the fiscal year 1974 costs between November 1972—when the budget was prepared—and June 1973. During the same period, inflation on other items had added another $2 billion to the cost of services, supplies, and equipment... The obvious result, however, is less defense for the same money... Swollen demands for funds to maintain personnel strengths have resulted in the curtailment of procurement and [R&D]. As a consequence, despite inflation and the increased sophistication of advanced weaponry, the funds requested for the procurement and development of ships, aircraft, tanks, and missiles are only slightly higher than those appropriated for 1964." (Ibid, pp. 8-9)
- "Although the fiscal 1974 defense budget was amended after the Vietnam cease-fire in January, the spending levels were not noticeably lower as a result of the ceasefire. Inflation—particularly in defense personnel costs—the devaluation of the dollar and the cost of U.S. assistance to Israel during the war in October all contributed to a high defense budget, even though 1973 marked the first time in a decade that the United States was not fighting in a foreign war." ("Congress Clears $73.7-Billion Defense Appropriation," *CQ Almanac 1973,* 29th ed., 167-77. Washington, DC: Congressional Quarterly, 1974)
- "The Army's new Site Defense anti-ballistic missile system was given $60-million less than the request of $170-million. Opponents of the system argued that the [SALT] treaty prevented the development of the ABM system, but Congress approved $110-million for continued development of Site Defense as a hedge against possible abrogation of the treaty. The House had initially deleted all funds for the program..." (Ibid)
- "In his opening remarks on the bill, the chairman of the Appropriations Committee, John L. McClellan (D Ark.), said the proposed budget reflected the need for a strong defense posture that did not contribute to runaway inflation. "It is the opinion of the committee," McClellan told the Senate, "that the amounts provided are about the maximum sum that the economy of the country can afford to spend and the minimum amount that will reasonably assure an adequate defense posture for our country." (Ibid)

Department of Defense R&D Appropriations for FY1975

Bill: Department of Defense Appropriation Act, 1975

Public Law: 94-437 **Enacted:** October 8, 1974 **Effective:** October 8, 1974

Nominal change		Real change		Classification
Millions ($)	YOY%	Millions ($2012)	YOY%	
$395.2	4.8%	-$1,203.8	-4.4%	Endogenous

Congress appropriated a modest nominal increase in defense R&D appropriations for FY1975, resulting in a significant real decrease, which was in part motivated by inflationary pressures, selective fiscal restraint, and the worsening recession. Perceptions of new strategic threats from the Soviet Union led to a renewed emphasis on weapons modernization and the prioritization of R&D funding for the B-1 strategic bomber and Trident sea-based ballistic missile. As the result of recent arms control treaties and negations on the ABM treaty, less emphasis was to be placed on defensive strategic capabilities, such as surface-to-air missile and ABM systems, but not as soon as to affect FY1975 defense R&D funding. The nominal increase in defense appropriations was in part intended to "offset the erosion of defense purchasing power through pay an price increases." President Nixon had pushed for spending restraint to curb inflation, but after he resigned in August 1974, President Gerald Ford pivoted to prioritizing more fiscal stimulus and jobs programs to counteract the worsening recession. Senators trying to cut back the defense budget argued that military spending worsened problems of inflation and unemployment by producing goods that households cannot consume and doing less to boost employment or capacity than other government spending. Tellingly, President Ford enacted a fiscal stimulus package of emergency extended unemployment benefits and a direct jobs program shortly after the FY1975 Defense Appropriations bill was enacted, but the appropriators had already significantly pared back the defense budget request in light of inflationary pressures. Because the decrease in defense R&D funding appears to have been motivated in part by efforts to curb short-run inflationary pressures from the federal budget, we classify this policy event as endogenous. Most pertinent narrative evidence:

- "Despite this record of achievement, as we turn to the year ahead we hear once again the familiar voice of the perennial prophets of gloom telling us now that because of the need to fight inflation, because of the energy shortage, America may be headed for a recession... Primarily due to our energy crisis, our economy is passing through a difficult period. But I pledge to you tonight that the full powers of this Government will be used to keep America's economy producing and to protect the jobs of America's workers. We are engaged in a long and hard fight against inflation... But if this Congress cooperates in our efforts to hold down the cost of Government, we shall win our fight to hold down the cost of living for the American people." Richard Nixon, State of the Union Address, January 30, 1974 (*The American Presidency Project*, by Gerhard Peters and John T. Woolley, https://www.presidency.ucsb.edu/node/256218)
- "During the past year, our economy operated at close to full capacity... At the same time, adverse weather and other conditions cut into the world's food supplies, including ours, while the policies of exporting countries cut supplies of oil and raised its price sharply. These developments created severe inflation during calendar year 1973, particularly in prices of food and energy. Our budget policy has been a key element in the effort to control inflation. Strict limitation of expenditures in 1973 applied fiscal restraint to an economy that was expanding at an unsustainable rate. The budget totals recommended here continue a policy of fiscal responsibility as part of a continuing anti-inflation program." (Budget Message of the President, FY1975, February 4, 1974, p. 5)

- "Supplemental appropriations in 1974, and an increase from $88.2 billion budget authority in 1974 to $95.0 billion in budget authority in 1975, are necessary to maintain a level of U.S. military strength consistent with the achievement of these goals. These increases are the minimum required to ensure the combat readiness and modernization of American forces, to provide for the development of future weapons, and to offset the erosion of defense purchasing power through pay and price increases." (Budget of the United States, FY1975, pp. 59-60)
- "Because the time required for the development and deployment of major weapon systems is long, decisions made today will shape the ability of the United States to maintain its strength 5 to 10 years from now. Although American forces are adequate today, the United States must begin the [R&D] efforts necessary to prepare for the future... In view of the extensive development of strategic weapons now underway in the Soviet Union, the United States must maintain a wide range of weapons development programs. Development of the Trident sea-based ballistic missile system and the B-l advanced manned strategic bomber will continue." (Ibid, pp. 61-62)
- "In response both to the interim strategic arms limitations agreement and to a reassessment of the nature of the strategic threat, the United States will continue a major reorientation of the strategic defensive forces... In recognition of the reduced threat of a massive bomber attack, the Nike-Hercules surface-to-air missile batteries located in the United States, and some fighter interceptor squadrons, are being phased out." (Ibid, p. 63)
- "The Soviet Union continues to upgrade its already powerful military forces. Several Soviet advances in the area of intercontinental ballistic missiles are underway simultaneously. New ships and new classes of ships regularly enter the Soviet fleet. Advances in weapons modernization of tactical ground and air forces do not indicate reductions in the maintenance and modernization of Soviet tactical forces. In the face of active military force modernization on the part of the Soviets, the Committee believes that the military forces of the United States must also be modernized... It seems unlikely that a significant agreement between the United States and the Soviet Union to reduce armaments will occur in time to have an impact on the fiscal year 1975 Defense Budget. The recent further reduction in anti-ballistic missile systems is welcome; as are bilateral arms reductions generally, but is of little military significance at this time" (H. Rpt. 93-1255, August 1, 1974, p. 5)
- "Recent testimony indicated that the impact of unanticipated economic inflation will not permit [DOD] to fund within the budgeted amounts the projected program for fiscal year 1975... it is the intention of the Committee that the funds required to continue high priority programs be obtained and eliminating and stretching out lower priority programs. Further supplemental appropriation requests should not be made." (Ibid, p. 6)
- "The [House Appropriations] Committee recommends the appropriation of $8,790,125,000 for the RDT&E activities of [DOD] for fiscal year 1975. The sum recommended is $532,344,000 less than the budget estimate of $9,322,469,000. The recommended amount is $108,609,000 less than the $8,898,734,000 authorized for these purposes. All reductions and increases recommended in the authorizing legislation are reflected in the appropriation reduction. The $8,790,125,000 recommended for fiscal year 1975 is $614,267,000 more than the appropriation for fiscal year 1974." (Ibid, p. 136)

- "It was widely anticipated that after we could disengage ourselves from the war in Southeast Asia we could anticipate sharp reductions in Defense spending. Instead, ever since the war ended, Defense, spending has been increasing, and now it is increasing at a more rapid rate. At a time when the President is talking with the leaders of the Soviet Union and has visited with the leaders of Red China, at a time when we have agreed to limitations on antiballistic missile systems and on strategic weapons, it would seem that we could if not reduce Defense spending, at least maintain a constant level of Defense spending without the rapid acceleration which has taken place." Separating views by Joseph P. Addabbo (D-NY), Robert N. Giaimo (D-CT), David R. Obey (D-WI), and Edward R. Roybal (D-CA) (Ibid, p. 155)
- "Congress Sept. 24 cleared for the President HR 16243—PL 93-437, appropriating $82.6-billion for [DOD] for fiscal 1975... the largest appropriations bill ever passed by Congress. The enormity of the defense bill made it the focal point of pressure for federal spending cuts in the fight against the nation's current two-digit inflation. Although Congress in response cut the administration's $87 billion request by $4.5 billion, some members argued that the final bill still was unjustifiably high. No major weapons systems were eliminated or sharply reduced. Overall, the bill exceeded the fiscal 1974 defense appropriation by $3.6 billion, with the increases spread across the board. Although the largest increases were for pensions and for operation and maintenance, substantial boosts also were approved for weapons procurement and for research on new weapons systems." ("Congress Sends Ford $82.6-Billion Defense Bill," *CQ Almanac 1974*, 30th ed., 41-49. Washington, DC: Congressional Quarterly, 1975)
- "To fight inflation, the [Senate] committee carved deeply into the administration's request. The $82,079,358,000 recommended in the bill was $4,978,139,000—5.7 percent —below the budget request. The committee's figure was $1,314,412,000 below the House-passed allowance but still $3,108,612,000 above the amount appropriated for fiscal 1974." (Ibid)
- "The version of HR 16243 that finally was approved was the result of a lopsided compromise in which Congress settled on a defense appropriation that was $817.3 million less than the House had approved and $478.4 million more than the Senate had approved. The unusual willingness of the House conferees to give away more than they gained in part was a reflection of the strong anti-inflationary mood of Congress." (Ibid)
- "Today I signed into law H.R. 16596, the Emergency Jobs and Unemployment Assistance Act, and H.R. 17597, the Emergency Unemployment Compensation Act. These are important measures which provide much-needed help to our unemployed fellow citizens. On October 8, when I outlined to Congress my proposals to fight inflation and unemployment, I pointed out that the Conference on Inflation had made us all aware of the undue burden being carried by those who lost their jobs during this period of worsening economic conditions. I proposed a temporary program to expand unemployment assistance and create jobs..." Gerald R. Ford, Statement on Signing Emergency Jobs, Unemployment Assistance and Compensation Legislation (P.L. 93-567), December 31, 1974 (*The American Presidency Project*, by Gerhard Peters and John T. Woolley, https://www.presidency.ucsb.edu/node/256303)

Department of Defense R&D Appropriations for FY1981

Primary Bill: Department of Defense Appropriation Act, 1981

Public Law: 96-527 **Enacted:** December 15, 1980 **Effective:** December 15, 1980

Secondary: Supplemental Appropriations and Rescission Act, 1981

Public Law: 97-12 **Enacted:** June 5, 1981 **Effective:** June 5, 1981

Nominal change		Real change		Classification
Millions ($)	YOY%	Millions ($2012)	YOY%	
$3,048.6	22.6%	$3,652.7	12.3%	Exogenous

Congress appropriated a significant increase in real defense R&D appropriations for FY1981, largely motivated by the Soviet invasion of Afghanistan, the Iranian Embassy crisis, and perceptions that Soviet R&D—particularly for strategic capabilities—had been eclipsing that of the U.S. in recent years. In the aftermath of the Iranian crisis, President Carter wanted to appear strong on defense on the campaign trail for reelection and requested significant increases in defense funding; the Soviet invasion of Afghanistan also prompted countervailing efforts to bolster the North Atlantic Treaty Organization (NATO) alliance. And for the first time in years, Congress appropriated significantly more for DOD than requested in the administration's budget, including unrequested funds for developing a new strategic bomber. Recent rates of inflation contributed to the increase in nominal defense appropriations, particularly for fuel, operations, military pay, and shipbuilding, but had less of an influence on R&D activities, and appropriators were not concerned about defense R&D funding fueling inflationary pressures. After defeating Carter in the 1980 election, President Reagan requested a supplemental appropriations bill and in June 1981 enacted a bill adding an additional $11.8 billion in defense funds for FY1981, largely covering increased military pay and fuel costs; the supplemental only appropriated $508 million in additional R&D funding (only 4% of the total), less than the administration requested. This policy event is instead dated to 1980Q4, when the Department of Defense Appropriation Act, 1981 took effect, resulting in a significant increase in DOD R&D appropriations even before the enactment of the Supplemental Appropriations and Rescission Act, 1981. The increase in defense R&D funding appears to have been motivated by long-run national security concerns and unrelated to any concerns about unemployment or other short-run macroeconomic prerogatives. As such, we classify this policy event as exogenous. Most pertinent narrative evidence:

- "But now the Soviet Union has taken a radical and aggressive new step. It's using its great military power against a relatively defenseless nation. The implications of the Soviet invasion of Afghanistan could pose the most serious threat to the peace since the Second World War... The Soviet Union must pay a concrete price for their aggression." Jimmy Carter, State of the Union Address, January 23, 1980 (*The American Presidency Project*, by Gerhard Peters and John T. Woolley, https://www.presidency.ucsb.edu/node/249681)
- "The region which is now threatened by Soviet troops in Afghanistan is of great strategic importance: It contains more than two-thirds of the world's exportable oil. The Soviet effort to dominate Afghanistan has brought Soviet military forces to within 300 miles of the Indian Ocean and close to the Straits of Hormuz, a waterway through which most of the world's oil must flow. The Soviet Union is now attempting to consolidate a strategic position, therefore, that poses a grave threat to the free movement of Middle East oil... Let our position be absolutely clear: An attempt by any outside force to gain control of the Persian Gulf region will be regarded as an assault on the

vital interests of the United States of America, and such an assault will be repelled by any means necessary, including military force. (Ibid)

- "We've helped to strengthen NATO and our other alliances, and recently we and other NATO members have decided to develop and to deploy modernized, intermediate-range nuclear forces to meet an unwarranted and increased threat from the nuclear weapons of the Soviet Union." (Ibid)
- "The long decline in real spending for defense that began in 1969 has been reversed. The uncertain and sometimes hostile world we live in requires that we continue to rebuild our defense forces... I cannot ignore the major increases in Soviet military spending that have taken place inexorably over the past 20 years. I cannot ignore our commitment to our NATO allies for mutual real increases in our investment in national defense. I cannot ignore the implications of terrorism in Iran or Soviet aggression in Afghanistan... I am committed as a matter of fundamental policy to continued real increases in defense, and I plan increases in my defense budgets through 1985" (Jimmy Carter, Budget Message of the President, FY1981, January 28, 1980, pp. M4-5)
- "The 1981 budget continues my long-standing commitment to reverse the trends of the past two decades and provide for major and sustained increases—above the rate of inflation—for [R&D] programs." (Ibid, p. M6)
- "The United States and its NATO allies have made that commitment, each promising to increase its defense spending by 3% or more per year in real terms." (Budget of the United States, FY1981, p. 89)
- "The principal objective of strategic forces is to act as an effective deterrent to both nuclear and conventional warfare. The 1981 program provides $1.6 billion for the new [ICBM] program, the MX, which is in full-scale development. The MX is scheduled to become operational in 1986... the 1981 budget proposes the modernization of each component of the strategic triad. Our land-based intercontinental ballistic missiles will be enhanced by the larger, more accurate, and less vulnerable MX." (Ibid, pp. 91-92)
- "Congress completed action Aug. 26 on a $52.8 billion weapons research and procurement authorization bill for fiscal 1981 (HR 6974—PL 96-342). The final version represented a huge—$11.4 billion—increase over the fiscal 1980 weapons bill. The increase reflected the more militant mood that took hold in Congress after the seizure of the U.S. Embassy personnel in Iran in November 1979 and the Soviet invasion of Afghanistan that December. Congress insisted on adding $5.9 billion on top of a $5.5 billion increase in defense spending already proposed by President Carter in his fiscal 1981 budget... Carter urged the House to reject the fiscal 1981 congressional budget resolution because it allowed too much spending for defense, and friends of the Pentagon in Congress reacted angrily" ("Congress Clears $52.8 Billion Defense Bill," *CQ Almanac 1980*, 36th ed., 47-65. Washington, DC: Congressional Quarterly, 1981)
- "Even with the $16.7 billion in the [defense authorization] bill for research, the committee said the Soviet Union still would spend twice as much as the United States in this area." (Ibid)
- "The budget presented by the President in January anticipated that inflation would continue. The appropriation as proposed by the Committee should not cause inflation any greater than that anticipated in the budget. To a large extent, the increase proposed by the budget and being recommended by the Committee is due to inflation in prior years. The real growth in Defense spending will have little inflationary effect in

comparison to the forecasted $2,842 billion in gross national product for 1981." (H. Rpt. 96-1317, September 11, 1980, p. 9)

- "A strong technology base is needed in order to (1) maintain technological superiority in military weapons, thus offsetting adversary numerical advantages, (2) avoid technological surprise that could cause premature obsolescence of major weapons systems, and (3) lead to the acquisition of effective but less costly capabilities by using innovative products built on new technology." (S. Rpt. 96-1020, November 19, 1980, p. 205)
- "For the first time in recent years, both houses of Congress added money to the president's defense spending recommendations... The bill's [R&D] appropriation was $453 million lower than Carter's request, but much of that difference reflected allowances for anticipated inflation that the House Appropriations Committee refused to approve. The House-Senate conference committee on the bill agreed to appropriate large amounts for weapons development that had not been requested by Carter, including $300 million for a new manned bomber that would fill the void caused by Carter's cancellation of the B-1 in 1977." ("Congress Votes Hefty Increases for Defense," *CQ Almanac 1980*, 36th ed., 185-97. Washington, DC: Congressional Quarterly, 1981)
- "To develop a new manned strategic bomber, the conference [committee] approved $300 million, the amount approved by the Senate... The conferees also included funds added by the Senate to speed up work on an anti-ballistic missile system ($15 million) and a longer-range version of the Trident submarine-launched missile ($28.1 million)... To develop the MX mobile missile, the final version provided $1.5 billion, $60 million less than the budget request; the House had cut $120 million. To develop a new satellite communications system, the report provided $36.9 million; the House had provided $34 million, the Senate $39.8 million." (Ibid)
- "The supplemental appropriations bill (HR 3512—PL 97-12) added $514.2 million to President Reagan's request to cover higher-than-estimated inflation in defense operations and maintenance, shipbuilding and military pay... [conferees] recommended $11.801 billion for defense programs... In assuming that inflation would be higher than the administration projected, both houses had added money to the bill in order to pay for higher costs due to inflation... In a compromise, conferees accepted the Senate's higher inflation estimates for the bill's operations and maintenance accounts and added $514.2 million for those items... But conferees accepted the administration's more optimistic inflation estimates for the procurement and research accounts. In explaining the conference compromise, House Appropriations Defense Subcommittee Chairman Joseph P. Addabbo, D-N.Y., said he accepted administration assurances that it would request another supplemental if more money was needed for procurement and research." ("Money Bill Adds $9 Billion for Defense," *CQ Almanac 1981*, 37th ed., 352-55. Washington, DC: Congressional Quarterly, 1982)

Department of Defense R&D Appropriations for FY1982

Bill: Department of Defense Appropriation Act, 1982

Public Law: 97-114 **Enacted:** December 29, 1981 **Effective:** December 29, 1981

Nominal change		Real change		Classification
Millions ($)	YOY%	Millions ($2012)	YOY%	
$3,439.9	20.8%	$4,012.8	12.1%	Exogenous

Congress appropriated a significant increase in real defense R&D appropriations for FY1982, largely motivated by the Soviet Union's invasion of Afghanistan and expansion of nuclear forces deployed near Western Europe, as well as President Reagan's desired military buildup to counter perceived Soviet threats. President Carter had sought a significant increase in real defense spending and real R&D spending in his FY1982 budget request, in part to meet NATO commitments of at least 3% real defense spending growth to counter increased Soviet threats. Shortly after the inauguration, the incoming Reagan administration requested an even larger increase in defense appropriations for FY1982 over Carter's final budget request, roughly half of which was eventually enacted; the request was subsequently pared back due to backlash against defense spending growth in an era of fiscal restraint for nondefense budget programs. The Reagan administration was particularly concerned with the development of the manned B-1 strategic bomber, which Carter had canceled in 1977, as well as the development of missile defense systems and the MX ICBM. Concerns about the budget deficit and inflationary pressures took a back seat to Reagan's military buildup and efforts to modernize U.S. strategic defense forces. The increase in defense R&D funding appears to have been motivated by long-run national security concerns and appears unrelated to any concerns about unemployment or other short-run macroeconomic prerogatives. As such, we classify this policy event as exogenous. Most pertinent narrative evidence:

- "During the last decade we withstood a series of economic shocks unprecedented in peacetime. The most dramatic of these were the explosive increases of OPEC oil prices. But we have also faced world commodity shortages, natural disasters, agricultural shortages, and major challenges to world peace and security. Our ability to deal with these shocks has been impaired by slower productivity growth and persistent, underlying inflationary forces built up over the past 15 years... This inflation requires that we hold down the growth of the budget to the maximum extent, while still meeting the demands of national security and human compassion." (Jimmy Carter, Budget Message of the President, FY1982, January 15, 1981, p. M4)
- "In order to meet the security needs of the Nation, real spending for defense increased in 1979 and 1980 by more than the 3% target I set at the NATO ministerial meeting in 1977. This real growth rate in defense spending has been maintained despite the adverse effects of higher-than-anticipated inflation, and restrained budgets... The budget request reflects a careful balance between the need to meet all critical defense needs while maintaining fiscal restraint." (Ibid, pp. M6-7)
- "My budgets have reversed a long period of decline in Federal support for basic research. The 1982 budget continues that policy by providing for 4% real growth in support for the conduct of basic research across all Federal agencies." (Ibid, p. M9)
- "I'm asking that you join me in reducing direct Federal spending by $41.4 billion in fiscal year 1982... I'm sure there's one department you've been waiting for me to mention, [DOD]. It's the only department in our entire program that will actually be increased over the present budgeted figure... I believe that my duty as President requires that I recommend increases in defense spending over the coming years. I know that you're all aware—but I think it bears saying again—that since 1970 the Soviet Union has invested $300 billion more in its military forces than we have. As a result of its massive military buildup, the Soviets have made a significant numerical advantage in strategic nuclear delivery systems, tactical aircraft, submarines, artillery, and anti-aircraft defense. To allow this imbalance to continue is a threat to our national security" Ronald Reagan,

State of the Union Address, February 18, 1981 (*The American Presidency Project*, by Gerhard Peters and John T. Woolley, https://www.presidency.ucsb.edu/node/246567)

- "The [House Appropriations] bill reported will provide $196,607,809,000. This is an increase of $25,026,944,000 over the amount appropriated for similar purposes for fiscal year 1981. It is also $4,195,525,000 below the budget request for fiscal year 1982. The appropriation as proposed by the Committee should not cause inflation to as great an extent as would enactment of the budgeted amount. The real growth in Defense spending will have little inflationary effect" (H. Rpt. 97-333, November 16, 1981, p. 5)
- "The [Senate Appropriations] Committee supports the need for increased defense spending to meet the threats to U.S. national security interests in the 1980's. The major increase in Soviet defense spending throughout the 1970's as well as Soviet adventurism in Africa, Asia, and Latin America pose a serious threat to U.S. security interests throughout the world." (S. Rpt. 97-273, November 17, 1981, p. 8)
- "The Committee is also committed to the reduction of overall Federal spending to meet the goals of a balanced budget as well as a sound economy. U.S. national security must be based on a strong economy. The Committee, therefore, views with favor the efforts of [DOD] to combat waste, fraud, and abuse within the Department as well as to undertake efforts to make defense programs more efficient" (Ibid)
- "The estimated dollar costs of Soviet strategic nuclear forces in the period from 1970 to 1980 were two and two-thirds the comparable United States expenditures in the same field of weaponry, according to a research study by the Central Intelligence Agency. American expenditures for strategic forces fell slightly in the 1971-1980 period while Soviet costs rose. The growth was uneven because of procurement "cycles" for major weapons systems... Over the 1971-1980 period, the report went on, "Soviet estimated dollar costs for RDT&E were half again as much as U.S. outlays, and during the late 1970's they were about twice as much" ("Arms Outlays: Soviet in Lead: C.I.A. Finds a U.S. Lag In 1971-80 Expenditures," by Drew Middleton, *New York Times*, February 8, 1981)
- "The Reagan Administration won a key round in the fight for its controversial B-1 bomber and MX basing proposals when the Senate Appropriations Committee approved a $208-billion defense appropriations bill providing full funding for both programs... The committee, in approving the appropriations bill, ignored the plea of its chairman, Sen. Mark O. Hatfield (R-Ore.), to pare down what he called a "bloated" defense budget... Hatfield said that a "Russians are coming" mentality is leading the Senate to cut spending on human services "so that the war machine can rumble on unobstructed." ("Senate Committee Backs President, Votes B-1 Funds," by David Wood, *Los Angeles Times*, November 18, 1981)
- "The [Senate Armed Services Committee] warmly applauded Reagan's pledge of a sustained buildup in U.S. weaponry that was to be substantially more rapid than the one planned by President Carter. But it warned that the buildup might come under heavy political pressure as the administration continued its drive to restrain other federal spending... The committee approved Reagan's request for nearly half a billion dollars for research on anti-ballistic missile defense. But it expressly refused to increase the administration request for research on powerful laser-armed space satellites that some scientists argued could destroy attacking ICBMs." ("Defense Bill Makes Most of Reagan's Cuts," *CQ Almanac 1981*, 37th ed., 212-30. Washington, DC: Congressional Quarterly, 1982)

- "Reagan originally requested $222 billion in new budget authority for Defense Department programs in fiscal 1982—almost $26 billion over the January request of President Carter... But as part of his effort to trim the deficit, Reagan in October reduced his defense request to $214 billion, an $8 billion cut from his March estimates." ("Reagan Defense Plan Given Final Approval," *CQ Almanac 1981,* 37th ed., 311-29. Washington, DC: Congressional Quarterly, 1982)
- "Almost without exception, President Reagan got the defense programs that he wanted in 1981. But it turned out that he did not want many of the radical changes espoused by some of his most ideologically committed supporters. With the $26 billion he initially added to President Carter's proposed defense budget for fiscal 1982, Reagan embarked on a program that slightly accelerated the rate at which existing forces would be modernized with new tanks and warplanes. The Reagan plan did incorporate two substantial additions to the Carter program: the B-1 bomber, and a bigger Navy with more aircraft carriers." ("Defense 1981: Overview," CQ Almanac 1981, 37th ed., 191-94. Washington, DC: Congressional Quarterly, 1982)
- "I am pleased to sign into law H.R. 4995, [DOD] Appropriation Act, 1982. This legislation is a significant step in this administration's commitment to enhancing the defense posture of the United States and maintaining our responsibilities to the nations of the free world. This is just a beginning, and in the years ahead we will need to sustain the effort mandated by the American people and supported by Congress so that we will succeed in strengthening the nation's defense... I would like to express my appreciation for the strong bipartisan support that this legislation received..." Ronald Reagan, Statement on Signing [DOD] Appropriation Act, 1982, December 29, 1981 (*The American Presidency Project*, by Gerhard Peters and John T. Woolley, https://www.presidency.ucsb.edu/node/246424)

Department of Defense R&D Appropriations for FY1983

Bill: Department of Defense Appropriation Act, 1983

Public Law: 97-377 **Enacted:** December 21, 1982 **Effective:** December 21, 1982

Nominal change		Real change		Classification
Millions ($)	YOY%	Millions ($2012)	YOY%	
$2,739.0	13.7%	$3,148.9	8.4%	Exogenous

Congress appropriated a significant increase in real defense R&D appropriations for FY1983, largely motivated by President Reagan's desired military buildup to counter vulnerabilities to Soviet strategic threats and modernize U.S. military forces. The administration and defense hawks in Congress were concerned that the Soviet Union had been outspending the U.S. on defense R&D in recent years and had developed and deployed significantly more sophisticated ICBMs and long-range bombers. Defense policymakers were also concerned about Soviet advances in anti-satellite weapons. Major defense R&D priorities included the development of a stealth bomber, defenses against Soviet ICBM and long-range bomber attacks, and space-based laser weapons and communications systems. Frustrated with the imbalance between large increases in defense spending and widespread cuts to social spending, Congress modestly pared back President Reagan's budget request for defense funding, but predominantly for procurement of the MX missile; appropriations for weapons modernization and defense R&D continued to rise in real terms. The increase in defense R&D

funding appears to have been motivated by long-run national security concerns and unrelated to any concerns about unemployment or other short-run macroeconomic prerogatives. As such, we classify this policy event as exogenous. Most pertinent narrative evidence:

- "In the last decade, while we sought the moderation of Soviet power through a process of restraint and accommodation, the Soviets engaged in an unrelenting buildup of their military forces. The protection of our national security has required that we undertake a substantial program to enhance our military forces... The budget plan I submit to you on February 8th will realize major savings by dismantling the Departments of Energy and Education and by eliminating ineffective subsidies for business. We'll continue to redirect our resources to our two highest budget priorities—a strong national defense to keep America free and at peace and a reliable safety net" Ronald Reagan, State of the Union Address, January 26, 1982 (*The American Presidency Project*, by Gerhard Peters and John T. Woolley, https://www.presidency.ucsb.edu/node/245636)
- "At the same time that Congress joined in these long-overdue efforts to pare back the size of the Federal budget and slow its momentum of growth, it has fully supported our ambitious but essential plan to rebuild our national defense. A year ago every component of military strength was flashing warning lights of neglect, under-investment, and deteriorating capability. Today, health is being restored... Critical investments in conventional and strategic force modernization are now moving rapidly forward. A new bomber for early deployment and an advanced (Stealth) bomber for the 1990s have been approved to retain our capability to penetrate Soviet air defenses. Development of a new, larger, and more accurate MX missile to preserve our land-based deterrent is proceeding" (Ronald Reagan, Budget Message of the President, FY1983, February 8, 1982, p. M10)
- "Our review pointed to serious deficiencies in force survivability, endurance, and the capability to exercise command and control during nuclear war. Current communications and warning systems were found to be vulnerable to severe disruption from an attack of a very modest scale... The 1983 budget funds programs to correct these deficiencies. The 1983 strategic program of $23.1 billion, an increase of $6.9 billion over 1982, provides for both near-term improvements and longer-term programs. These initiatives include... development of advanced technology (Stealth) bomber for deployment in the 1990s to provide a continued capability to penetrate Soviet defenses... development of a survivable deployment plan for the MX missile, development of a new submarine-launched ballistic missile, continued improvements in the survivability of warning and communications systems, and improvements in strategic defenses against both bomber and missile attacks." (Ibid, p. M20)
- "In the last decade, the Soviet Union introduced large quantities of highly capable, new-generation tactical equipment including combat ships, tanks, and aircraft, which must be countered by modernized U.S. forces. Also, the traditional U.S. superiority in system quality has been considerably narrowed, making Soviet quantitative advantages more serious." (Ibid, p. M21)
- "There is general agreement that Soviet improvements in missile accuracy and warhead technology will put them in a position to destroy 90 percent of our land-based Minuteman ICBMs in the near future with an expenditure of one-third to one-fifth of their ICBMs. This capability dramatically changes the strategic equation on which U.S. security and that of our friends have depended through most of the postwar period. The revolution in the strategic balance is aggravated by a comparable buildup

of Soviet aircraft and missiles that threatens to overturn the American advantage in theater-based nuclear forces." (H. Rpt. 97-482, April 13, 1982, p. 19)

- "During the past six years, the Soviets have annually outspent the United States by an estimated $85 billion on all defense activities excluding [R&D]. In [R&D] they are outspending us two to one... The committee believes that the prime national security objective is the development and implementation of an improved defense posture to be financed through a real and progressive increase in the defense budget" (Ibid)
- "Principal [DARPA] research thrusts in FY1983 involve: new material developments utilizing techniques such as rapid solidification processing; computer and communication sciences to develop new information processing technology that will form the basis for future intelligence, network-based, military systems; unconventional detection and target penetration research; and geophysical research to develop new technological options for monitoring nuclear explosion events. Major thrusts in exploratory development during FY 1983 involve: space-based infrared (IR) surveillance, laser communications, high energy laser technologies, target acquisition and engagement technologies, particle beam technology, integrated command, control and communications, material processing technologies, and advanced composite aerodynamic structures." (Hearings before the Senate Armed Services Committee on Military Posture and Department of Defense Authorization for Appropriations for FY1983, Part 1, pp. 225-226)
- "Space Weapons: The increasing capabilities of military space systems and the operating forces' reliance on them mark military satellites as attractive targets and underscores the importance of free access to space for our national systems. The Soviet Union's deployment of an operational antisatellite system demonstrates their understanding of that situation and provides additional rationale for DOD's consideration of the role of space weapons. [Deleted.] We must [deleted] develop the means to deter an enemy from using antisatellite weapons against our military satellites." Dr. Robert Cooper, Director, Defense Advance Research Projects Agency, March 10, 1982 (Hearings before the Senate Armed Services Committee on [DOD] Authorization for Appropriations for FY1983, Part 7, p. 4617)
- "For the second year in a row, President Reagan won congressional approval for the bulk of his defense buildup. In spite of apparently growing concern about the level of defense spending in an era of economic trauma, Congress cut only 7 percent of the president's budget request for defense in fiscal 1983... the bulk of the cut came from routine congressional efforts to tighten bureaucratic belts... Reagan's request for $3.5 billion in MX programs was the most heatedly contested defense issue in the House-Senate conference committee on H J Res 631. The rejection of Reagan's MX budget—the first time Congress ever had denied production of a major nuclear weapon requested by a president—was a powerful political blow to the program." ("Defense Bill Cuts 7 Percent, Removing Funding for the MX Missile Program," *CQ Almanac 1982*, 38th ed., 277-92. Washington, DC: Congressional Quarterly, 1983)

Department of Defense R&D Appropriations for FY1984

Bill: Department of Defense Appropriation Act, 1984

Public Law: 98-212 **Enacted:** December 8, 1983 **Effective:** December 8, 1983

Nominal change		Real change		Classification
Millions ($)	YOY%	Millions ($2012)	YOY%	
$4,071.6	17.9%	$5,359.0	13.2%	Exogenous

Congress appropriated a significant increase in real defense R&D appropriations for FY1984, largely motivated by strategic threats posed by the Soviet Union and President Reagan's emphasis on a continued military buildup. Defense policymakers were particularly concerned that the Soviet Union had been outspending the U.S. on the development and deployment of strategic weapons systems and that the U.S. needed to restore "strategic balance." Defense R&D priorities included modernizing ICBMs, developing new long-range bombers, cruise missiles, and submarine-launched ballistics missiles, and continued work on ballistic missile defense systems. Defense R&D was shielded from general spending restraint, and the increase in defense R&D funding appears to have been motivated by long-run national security concerns. We find no evidence that the policy change was influenced by concerns about unemployment or other short-run macroeconomic prerogatives; as such, we classify this policy event as exogenous. Most pertinent narrative evidence:

- "The Federal budget is both a symptom and a cause of our economic problems. Unless we reduce the dangerous growth rate in government spending, we could face the prospect of sluggish economic growth into the indefinite future... Let's be clear about where the deficit problem comes from. Contrary to the drumbeat we've been hearing for the last few months, the deficits we face are not rooted in defense spending. Taken as a percentage of the gross national product, our defense spending happens to be only about four-fifths of what it was in 1970." Ronald Reagan, State of the Union Address, January 25, 1983 (*The American Presidency Project*, by Gerhard Peters and John T. Woolley, https://www.presidency.ucsb.edu/node/263103)
- "We have put in place a defense program that redeems the neglect of the past decade. We have developed a realistic military strategy to deter threats to peace and to protect freedom if deterrence fails... Most of the major systems needed for modernizing our defenses are already underway, and we will be addressing one key system, the MX missile, in consultation with Congress in a few months." (Ibid)
- "We will not gamble with our national survival. As a percent of GNP, the level I am requesting for defense spending in 1984 is less than the United States spent during the decade of the 1960's. As a percent of the total Federal budget it is far less than was allocated for national defense in those years. We are two years into the program to rearm America. Sustaining the momentum of this program is essential if we are to avoid slipping back into the inefficient and counterproductive pattern of wildly fluctuating defense spending levels." (Budget Message of the President FY1984, January 31, 1983, p. M10)
- "My administration recognizes the Federal responsibility to maintain U.S. leadership in scientific research. Although support of basic scientific research represents a small share of the Federal budget, it is a vital investment in the Nation's future. Such research lays the foundation for a strong defense in the years to come, and for new technologies and industries that will help maintain our industrial competitiveness, create new jobs, and improve our quality of life. By carefully establishing budget priorities, my administration has been able to reinvigorate Federal support for basic scientific research. With my 1984 budget proposals, such support across the Government will have increased by more than 20% over the 1982 level." (Ibid, pp. M13-14)

- "The administration's strategic modernization program is continued in the 1984 budget. The program consists of six reinforcing elements: improvement of our command, control, communications, and intelligence systems; modernization of our long-range bomber force by procurement of the new B-1B bomber and by [R&D] on an advanced technology (stealth) bomber; continued deployment of the Trident I submarine-launched ballistic missile and development of a new, more powerful and accurate, Trident II missile; development and deployment of cruise missiles; improvements in the capability of our land-based intercontinental ballistic missiles with the Peacekeeper (M-X) missile; and enhancement of our strategic defenses. Other projects under development include submarine-launched cruise missiles, new missile warheads, and anti-satellite systems." (Budget of the United States, p. 5-9)
- "The Soviets place great importance on closing the "technology gap. Figure 1-6 shows the current estimated dollar investment in RDT&E by the Soviets is nearly double that of the U.S. Soviet military [RDT&E] has been increasing in real terms at about 7% per year since 1970, and has also been growing relative to total Soviet military investments during the past seven years..." Richard D. DeLauer, Under Secretary for Defense for Research and Engineering, March 3, 1983 (Hearings before the Senate Appropriations Subcommittee on Department of Defense Appropriations, 1984, Part 2, p. 88)
- "It has been over a year since President Reagan announced his comprehensive plan for the modernization of our strategic nuclear forces. His program was intended to end the relative decline of U.S. strategic capabilities, to begin the restoration of the U.S.-Soviet strategic balance in the years ahead, and to increase Soviet incentives to negotiate meaningful strategic arms reductions." (Ibid, p. 91)
- "The [House Appropriations] Committee recommendations in the accompanying bill with respect to a number of significant and highly visible programs are as follows: Funded the authorized total of $508,875,000 for Ballistic Missile Defense;... Funded $1,496,406,000, the budgeted amount, for Trident II missile development; Allowed the full $2,034,389,000 requested in the amended budget for development and test activities for the MX program; Provided $279,000,000 to initiate the development of a small, mobile ICBM, and $75,000,000 to begin a study of a launcher for that missile; Funded the full budgeted amount of $749,900,000 to continue development and flight testing of the B-1B bomber..." (H. Rpt. 98-427, October 20, 1983, pp. 6-7)
- "The fiscal year 1984 [DOD RDT&E] amended budget totaled $28,498,840,000. The accompanying bill recommends a total program of $26,465,715,000 in new obligational authority. The total amount recommended is $3,759,931,000 above the total program provided in fiscal year 1983." (Ibid, p. 202)
- "Congress completed action on a fiscal 1984 defense appropriations bill (HR 4185—PL 98-212) that provided $249.8 billion to continue President Reagan's defense buildup and most of the major weapons involved. While the final appropriation was $11.1 billion below the budget requests, it was $17.3 billion above the fiscal 1983 level. That was roughly a 4 percent increase, after adjustment for inflation... The reductions incorporated in HR 4185 were distributed across the Pentagon budget without imposing fundamental changes on Reagan's defense policy. The only major weapons program blocked by the bill was a new nerve gas, called binary munitions. It was the second year in a row that Congress had blocked the Reagan administration's effort to resume production of chemical weapons." ("Budget Passed for Reagan Defense Buildup,

With Funding for Chemical Weapons Denied," *CQ Almanac 1983*, 39th ed., 479-94. Washington, DC: Congressional Quarterly, 1984)

- "Besides the $6.4 billion earmarked for 10 B-1 bombers and further development, the [House Appropriations Committee] bill contained a secret amount to continue development of the so-called "stealth bomber, intended to evade detection by enemy radar. The committee also recommended $422 million as requested to continue production of long-range, nuclear-armed cruise missiles (or ALCMs) which could be launched from existing B-52 bombers outside the reach of Soviet air defenses. The bill contained a secret amount to develop a new air-launched cruise missile." (Ibid)

Department of Defense R&D Appropriations for FY1985

Bill: Department of Defense Appropriations Act, 1985

Public Law: 98-473 **Enacted:** October 12, 1984 **Effective:** October 12, 1984

Nominal change		Real change		Classification
Millions ($)	YOY%	Millions ($2012)	YOY%	
$4,450.9	16.6%	$6,371.5	13.9%	Exogenous

Congress appropriated a significant increase in real defense R&D appropriations for FY1985, largely motivated by the "Evil Empire" threat posed by the Soviet Union and President Reagan's emphasis on a continued military buildup. Defense R&D priorities included modernizing ICBMs and developing new long-range bombers, developing space-based and anti-satellite weapons systems, and developing ballistic missile defense systems (the cornerstone of the new SDI). DARPA funding also prioritized the development of supercomputers and artificial intelligence. The increase in defense R&D funding appears to have been motivated by long-run national security concerns and appears unrelated to any concerns about unemployment or other short-run macroeconomic prerogatives. As such, we classify this policy event as exogenous. Most pertinent narrative evidence:

- "Now, some insist that any further budget savings must be obtained by reducing the portion spent on defense. This ignores the fact that national defense is solely the responsibility of the Federal Government; indeed, it is its prime responsibility... We are just now restoring, through the essential modernization of our conventional and strategic forces, our capability to meet our present and future security needs. We dare not shirk our responsibility to keep America free, secure, and at peace" Ronald Reagan, State of the Union Address, January 25, 1984 (*The American Presidency Project*, by Gerhard Peters and John T. Woolley, https://www.presidency.ucsb.edu/node/261634)
- "In the face of large improvements in Soviet military capabilities, U.S. forces must be strengthened to meet the Soviet challenge and to protect our national interests... Achievement of these objectives requires sustained increases in defense resources over the coming years... Funding is provided for a range of technology initiatives to explore possibilities of eliminating the threat of ballistic missile attacks. These initiatives include expanded efforts in directed energy technology; surveillance, acquisition, and tracking; and high-velocity missiles. The budget also proposes continued development of an antisatellite system, and improvements in our strategic command, control, communications, and intelligence systems." (Budget of the United States, FY1985, pp. 5-8-9)

- "New and improved weapon systems must be developed and tested in response to changing requirements for military equipment. At the same time, a strong research and technology base must be maintained for purposes of longer-term weapon development. An increase of 26% in budget authority for [R&D] is proposed for 1985, with a continuing emphasis on strategic programs. Major strategic efforts, described earlier, include the Peacekeeper and Trident II missiles, the B-1B and advanced technology bombers, and the new strategic defense initiative." (Ibid, p. 5-15)
- "The fiscal year 1985 Department of Defense budget for [RDT&E] totaled $33,985,037,000. The accompanying Senate [Committee] bill contains $31,881,467,000. This is a reduction of $2,103,570,000 from the fiscal year 1985 budget... The recommended allowance is $5,142,198,000 above the fiscal year 1984 appropriation for RDT&E." (S. Rpt. 98-636, September 26, 1984, p. 137)
- "The real growth in the [R&D] budget request is primarily directed at improvements for U.S. strategic nuclear forces, intelligence and communications programs, space activities, and new program starts. Much of this real growth is required to correct near-term deficiencies in our defense posture, provide for adequate force modernization and establish a stable base from which to make long-range planning in the acquisition area. As such, the [Senate Appropriations] Committee is supportive of increased investment in defense-wide [R&D]..." (Ibid, p. 138)
- "The [Senate Appropriations] Committee strongly supports the President's Strategic Defense Initiative and recommends fully funding SDI at the level proposed by the authorization committee... virtually the entire U.S. scientific and technical communities strongly endorse the need for a vigorous research and technology demonstration effort such as the strategic defense initiative, both as a hedge against potential Soviet moves in this area and to fully explore the possibilities and merits of an effective U.S. ballistic missile defense" (Ibid, pp. 201-203)
- "The [Senate Appropriations] Committee notes its continuing support for the technology base modernization effort of the military services and DARPA. Increased investment in basic research and innovative technologies is a high RDT&E priority. The Committee has supported this objective by providing a high level of funding for all technology-based budget activities, and by fully funding the Triservice University Research Instrumentation Program and the Supercomputers Program." (Ibid, p. 139)
- "Within DARPA's Strategic Technology program, $72,000,000 was requested for the Strategic Computing program. The [House Appropriations] Committee recommends the full amount. Last year, the Committee stated its strong support for the pursuit of a supercomputer that is capable of both numerical and symbolic computing, and encouraged the Department to fund such a project as part of the Strategic Computing program. It appears to the Committee that primary emphasis continues to be placed on artificial intelligence, which is focused on symbolic computing." (H. Rpt. 98-1086, September 26, 1984, p. 246)
- "The Republican-controlled Senate panel's bill, as usual, was the higher of the two, appropriating $278 billion out of an overall defense budget of $297 billion... The $268 billion bill reported to the House would have brought the overall defense budget to about $290 billion. By a vote of 24-21, the House committee cut to $1.09 billion the budget for developing space-based anti-missile weapons, a program that arms control activists criticized as "Star Wars"... which would amount to a real increase for the

program of 5 percent over the fiscal 1984 budget, the same increase as was allowed for the overall defense budget." ("For Defense, $274.4 Billion in Fiscal 1985," *CQ Almanac 1984*, 40th ed., 399-407. Washington, DC: Congressional Quarterly, 1985)

Department of Defense R&D Appropriations for FY1986

Bill: Department of Defense Appropriations Act, 1986

Public Law: 99-190 **Enacted:** December 19, 1985 **Effective:** December 19, 1985

Nominal change		Real change		Classification
Millions ($)	YOY%	Millions ($2012)	YOY%	
$2,226.2	7.1%	$2,875.6	5.5%	Exogenous

Congress appropriated a significant increase in real defense R&D appropriations for FY1985, largely motivated by the "Evil Empire" threat posed by the Soviet Union and President Reagan's emphasis on a continued military buildup. Fiscal restraint across the rest of the federal budget, codified by the Gramm–Rudman–Hollings Balanced Budget Act of 1985, finally caught up with DOD, and total defense appropriations decreased in real terms for the first time in a decade, but the administration and congress continued to increase real funding for defense R&D activities; priorities included modernizing ICBMs, developing new long-range bombers and submarine-launched ballistic missiles, and developing missile defense systems as part of Reagan's SDI program. Congress refused to fund the Reagan administration's desired anti-satellite weapons systems and chemical weapons programs, but all other major strategic weapons and RDT&E budget requests were largely funded. The increase in defense R&D funding appears to have been motivated by long-run national security concerns and appears unrelated to any concerns about unemployment or other short-run macroeconomic prerogatives. As such, we classify this policy event as exogenous. Most pertinent narrative evidence:

- "Since 1981 we've been committed to seeking fair and verifiable arms agreements that would lower the risk of war and reduce the size of nuclear arsenals. Now our determination to maintain a strong defense has influenced the Soviet Union to return to the bargaining table... Each Member of Congress has a role to play in modernizing our defenses, thus supporting our chances for a meaningful arms agreement. Your vote this spring on the Peacekeeper missile will be a critical test of our resolve to maintain the strength we need and move toward mutual and verifiable arms reductions." Ronald Reagan, State of the Union Address, February 6, 1985 (*The American Presidency Project*, by Gerhard Peters and John T. Woolley, https://www.presidency.ucsb.edu/node/258923)
- "For the past 20 years we've believed that no war will be launched as long as each side knows it can retaliate with a deadly counterstrike. Well, I believe there's a better way of eliminating the threat of nuclear war. It is a Strategic Defense Initiative aimed ultimately at finding a nonnuclear defense against ballistic missiles... Now, some say the research would be expensive. Perhaps, but it could save millions of lives, indeed humanity itself. And some say if we build such a system, the Soviets will build a defense system of their own. Well, they already have strategic defenses that surpass ours; a civil defense system, where we have almost none; and a research program covering roughly the same areas of technology that we're now exploring. And finally, some say the research will take a long time... Let's get started." (Ibid)

- "Since 1981, the administration has vigorously pursued a program of strategic modernization consistent with a policy of deterrence. The budget continues efforts to modernize our nuclear forces. Only by establishing modern, capable U.S. forces do we create the necessary incentives for the Soviet Union to negotiate genuine arms reductions... Real growth of about 20% in budget authority for [R&D] is proposed for 1986, with a continuing emphasis on strategic programs. Major strategic efforts include the Peacekeeper and Trident II missiles. The budget provides funds for a high-priority development program for a small land-based missile, which will carry a single warhead and weigh less than 30,000 pounds. Also included in the budget is an expanded effort on the administration's strategic defense initiative, a research program to explore the possibility of eliminating the ballistic missile threat to the United States and its allies. This initiative includes research on space surveillance and target acquisition; directed energy weapons; kinetic energy weapons; battle management systems; and system survivability." (Budget of the United States, p. 5-6)
- "[DOD] requested $3,722,184,000 to continue [SDI] research in fiscal year 1986... In authorization action, the requested program funding was reduced to $2,750,000,000. The Committee recommends a total of $2,509,222,000 including $2,500,000,000 in program funding and $9,222,000 for headquarters management. This represents an increase of 79 percent over the fiscal year 1985 level... The Committee is also concerned about the fact that U.S. policy is not consistent with what Administration officials have stated are legal obligations under the ABM Treaty... If the United States and the Soviet Union are to proceed in parallel efforts to research the role of strategic defensive systems, we should ensure that there is a clear understanding of the fundamental rules governing these efforts. Otherwise, suspicions and accusations from both sides will undermine these efforts and erode the Treaty, directly counter to the Administration's stated intentions." (H. Rpt. 99-332, October 24, 1985, pp. 345-346)
- "Faced with mounting pressures to reduce the Federal budget deficit, Congress has moved to restrain Government spending across the board. The military budget, containing the largest single block of controllable appropriations, has been targeted for the biggest cutbacks and the accompanying bill reflects this shift in congressional policy. Although recommended appropriations in the bill approach the $285,500,000,000 target allocated to the Defense Subcommittee, they represent an increase of little more than $7,000,000,000 over appropriations enacted for fiscal year 1985. This is an increase of less than 3 percent, or an actual decline in defense purchasing power at current inflation projections... any further reduction, in the Committee's view, would seriously undermine the readiness and modernization initiatives that Congress has supported so strongly in recent years." (S. Rpt. 99-176, November 6, 1985, p. 6)
- "Carefully developed reductions, designed to restrain but not halt program growth, have been recommended for [R&D]. This is an activity the Committee regards as a critical investment in future national security, and spending reductions have been allocated to minimize program impact. Some $3,300,000,000 in budget authority reductions will develop $1,600,000,000 in outlay savings while preserving 11 percent real growth in the RDT&E program. Key programs have been funded at the full authorization levels. The President's Strategic Defense Initiative is fully funded at the Senate-authorized level, $2,962,962,000. Continued development and flight testing of the MX Peacekeeper missile are approved, together with full funding for other key strategic programs such as the Trident II missile and the small ICBM. The Committee has fully funded the Navy's

new design SSN and SUBACS programs at authorized levels and added $40,000,000 to continue competition in the contract design phase of this new attack submarine... Within the Army programs, the Committee has initiated a medical research fund to help combat [AIDS]." (Ibid, p. 7)

- "The [FY]1986 Department of Defense budget for [RDT&E] totaled $39,280,100,000. The accompanying Senate bill contains $35,984,121,000, a reduction of $3,295,979,000 from the budget estimates. The recommended allowance is $495,367,000 above the authorization, $2,831,300,000 above the House allowance, and $4,797,050,000 above the fiscal year 1985 appropriation for RDT&E... The real growth in the [R&D] budget request is primarily directed at improvements for U.S. strategic nuclear forces, intelligence and communications programs, space activities, new program starts, and the Strategic Defense Initiative... Much of this real growth is proposed to correct near-term deficiencies in our defense posture, provide for adequate force modernization and establish a stable base from which to make long-range planning in the acquisition area. The Committee is generally supportive of the DOD emphasis on increased investment in defensewide [R&D]." (Ibid, pp. 224-225)
- "For the first time in a decade, Congress voted on a defense budget that would result in a significant decline in the Pentagon's purchasing power. The continuing appropriations resolution (H J Res 465—PL 99-190) cleared and signed by President Reagan on Dec. 19 contained $281.2 billion in new Defense Department budget authority for fiscal 1986, bringing overall defense appropriations for fiscal 1986 to $297.6 billion. According to Ted Stevens, R-Alaska, chairman of the Senate Appropriations Subcommittee on Defense, that would amount to a 2 percent decrease in Pentagon purchasing power compared with the fiscal 1985 budget, once the cost of inflation was taken into account. The defense appropriation faced further cuts under the Gramm-Rudman-Hollings budget-balancing law (PL 99-177)..." ("Pentagon's Purchasing Power Drops with Reduced Defense Funds," *CQ Almanac 1985*, 41st ed., 377-92. Washington, DC: Congressional Quarterly, 1986)
- "Once again, House-Senate conferees—like the members of the Appropriations panels who drafted earlier versions of the bill—made hefty trims at the margins of specific programs. But they neither killed any major programs nor reshaped the basic priorities of Reagan's February budget request. The only clear challenge Congress posed to an important Reagan policy was a ban on tests of the anti-satellite (ASAT) missile against a space target... To continue Reagan's program of research on anti-missile defenses—the [SDI] or "star wars"—conferees approved $2.75 billion, the ceiling set by the defense authorization bill. Reagan had requested $3.7 billion... " (Ibid)

Department of Defense R&D Appropriations for FY1990

Bill: Department of Defense Appropriations Act, 1990

Public Law: 101-165 **Enacted:** November 21, 1989 **Effective:** November 21, 1989

Nominal change		Real change		Classification
Millions ($)	YOY%	Millions ($2012)	YOY%	
-$1,042.1	-2.8%	-$2,787.9	-4.9%	Exogenous

Congress appropriated a decrease in nominal defense R&D funding for FY1990, resulting in a significant, larger decrease in real appropriations, one largely motivated by the end of

the Cold War (the "peace dividend") and long-term deficit reduction efforts. The House Appropriations Committee was particularly intent on paring back defense R&D appropriations, notably in cutting requested funding for the SDI, Advanced Tactical Fighter program, and space-based weapons and surveillance technologies; budget cuts to the SDI program—the first since it was launched in 1983—particularly frustrated President George H.W. Bush, who threatened to veto the appropriations bill. But President Bush had proposed freezing total defense spending as part of a broader effort to reduce budget deficits, and, with the Soviet Union collapsing, the pendulum was swinging the other direction after years of defense funding rising in real terms under President Reagan. The decrease in defense R&D funding appears to have been driven by the end of the Cold War, and does not appear to have been motivated by concerns about inflation or any other short-run macroeconomic prerogatives. As such, we classify this policy event as exogenous. Most pertinent narrative evidence:

- "Most people don't realize that after the successful restoration of our strength, the Pentagon budget has actually been reduced in real terms for each of the last four years. We cannot tolerate continued real reduction in defense. In light of the compelling need to reduce the deficit, however, I support a 1-year freeze in the military budget, something I proposed last fall in my flexible freeze plan. And this freeze will apply for only one year, and after that, increases above inflation will be required. I will not sacrifice American preparedness, and I will not compromise American strength." George H.W. Bush, State of the Union Address, February 9, 1989 (*The American Presidency Project*, by Gerhard Peters and John T. Woolley, https://www.presidency.ucsb.edu/node/247737)
- "This defense freeze must be a part of a comprehensive budget agreement which meets the targets spelled out in Gramm-Rudman-Hollings law without raising taxes and which incorporates reforms in the budget process. I've directed the National Security Council to review our national security and defense policies and report back to me within 90 days to ensure that our capabilities and resources meet our commitments and strategies." (Ibid)
- "And it's a time of great change in the world, and especially in the Soviet Union... We will not miss any opportunity to work for peace. The fundamental facts remain that the Soviets retain a very powerful military machine in the service of objectives which are still too often in conflict with ours. So, let us take the new openness seriously, but let's also be realistic... I will vigorously pursue the Strategic Defense Initiative. The spread, and even use, of sophisticated weaponry threatens global security as never before. Chemical weapons must be banned from the face of the Earth, never to be used again... And the spread of nuclear weapons must be stopped." (Ibid)
- "The fiscal year 1990 budget, my last, represents a continuation of my efforts to reduce the Federal budget deficit through restraint in domestic spending. The budget I am submitting today complies with the deficit targets set in the Gramm-Rudman-Hollings (G-R-H) Act, by proposing measures that meet the 1990 deficit target of $100 billion and assure a steady reduction in the deficit leading to a balanced budget in 1993... We have an opportunity this year to put the worst of the deficit problem behind us and enable the next Administration to begin its term of office with a clean slate and with the promise of continuing prosperity." (Budget Message of the President, FY1990, January 29, 1989, p. 1-6)
- "Research and technology development programs will grow by $1.5 billion to $11.0 billion (an increase of 15 percent) and will emphasize both research in the physical sciences, particularly materials and electronics, and the development of technologies, such

as those in the Strategic Defense Initiative. DOD funding for R&D for the Strategic Defense Initiative increases by $1.9 billion, to a level of $5.6 billion in 1990." (Special Analyses Budget of the US Government FY1990, p. 393)

- "The [House Appropriations] Committee recommends $35,550,277,000 for the RDT&E title, a reduction of 4,095,023,000 from the budget request. As mentioned earlier, the Committee has recommended the termination of several RDT&E programs which have poor prospects for completing development and being produced at economic rates due to the current limitations on overall defense spending. The Committee has added funding for a few high-priority RDT&E programs that offer significant military utility. These programs include... V-22 Aircraft... Antisubmarine Warfare... Light Helicopter Experimental (LHX) program... National Aerospace Plane (a"high risk-high payoff" revolutionary technology which also leverages significant industry investment)... High Definition Television (given its potential for both military and commercial sectors)" (H. Rpt. 101-208, August 1, 1989, p. 12)
- "The Committee has added $198 million to provide 2 percent real growth for the DOD technology base, which is the foundation upon which new developments occur, and which did not receive the rapid weapon system RDT&E increases which occurred between 1981 and 1985." (Ibid, p. 12)
- "The budget requests $1.1 billion in fiscal year 1990 for the Air Force Advanced Tactical Fighter and about $65 million for the Navy's version. Due to deep concerns over the acquisition strategy, costs, and technical risks associated with the current ATF program the Committee recommends that no funds be provided in fiscal year 1990. In particular, the Committee believes that the ATF program combines both an unacceptable degree of concurrency between development and production with a highly unrealistic assumption of substantial out-year funding levels." (Ibid, p. 202)
- "SDI, [DOD's] program to develop defenses against strategic and tactical ballistic missiles, remains its largest RDT&E program. The Committee notes that the program faces a major decision in the near future whether to abandon its current phase 1 strategic defense system architecture in favor of the brilliant pebbles concept... The Committee believes that a stable and balanced research program at the recommended level is the best way to protect the most prudent options for developing technologically advanced and effective missile defenses." (S. Rpt. 101-132, September 14, 1989, pp. 295-296)
- "President Bush on Nov. 21 signed a $286 billion fiscal 1990 defense spending bill (HR 3072—PL 101-165) that reduced Pentagon purchasing power for the fifth straight year. Combined with funds in other spending legislation, the total for defense-related appropriations was $302.9 billion. That was in essence the amount Bush and the bipartisan congressional leadership had agreed to in April, but it was not enough of a boost over the $299 billion appropriated for fiscal 1989 to cover the cost of inflation... Bush, while maintaining that the bill would meet most of his major priorities, said he was disappointed that Congress had sharply reduced his request for the strategic defense initiative (SDI). The bill earmarked $3.8 billion for SDI, a reduction of $234 million from the fiscal 1989 appropriation. It was the first time that spending for the space-oriented program had been cut since President Ronald Reagan launched it in 1983." ("Lawmakers Drag Feet On Cutting Weapons," *CQ Almanac 1989*, 45th ed., 760-76. Washington, DC: Congressional Quarterly, 1990)

- "The [House Appropriations] bill cut nearly $3 billion from the amounts requested for major strategic weapons. HR 3072 incorporated the controversial reductions in fiscal 1990 funding for the B-2 "stealth" bomber, the SDI anti-missile research program, and other strategic weapons projects the House had imposed as part of the companion defense authorization bill (HR 2461), passed July 27... The administration's veto threat also cited appropriations cuts in strategic programs" (Ibid)
- "The [defense appropriations] conference has agreed to cut funds from the amount requested by Mr. Bush for the Stealth, or B-2, bomber, which is designed to evade detection by radar, but to go forward with the program at a slower pace. Some members of Congress have said the bomber is too expensive... The Air Force has said the bomber is intended to penetrate Soviet defenses and is vital to deterring a Soviet nuclear attack." ("Conferees Near Accord on '90 Arms Program," by Richard Halloran, *New York Times*, October 27, 1989)
- "Today I signed into law H.R. 3072, the Department of Defense Appropriations Act, 1990. The Defense Appropriations Act for fiscal year 1990 is within the funding levels of the Bipartisan Budget Agreement. The Act provides funds for our critical national defense operations and satisfactorily accommodates most of the Administration's major concerns. I am disappointed in the deep reductions made to our budget request for the Strategic Defense Initiative. I am hopeful that, in the future, the Congress will support the Administration's request for this program." George H.W. Bush, Statement on Signing the Department of Defense Appropriations Act, 1990, November 21, 1989 (*The American Presidency Project*, by Gerhard Peters and John T. Woolley, https://www.presidency.ucsb.edu/node/263763)

Department of Defense R&D Appropriations for FY1991

Bill: Department of Defense Appropriations Act, 1991

Public Law: 101-511 **Enacted:** November 5, 1990 **Effective:** November 5, 1990

Nominal change		Real change		Classification
Millions ($)	YOY%	Millions ($2012)	YOY%	
-$325.5	-0.9%	-$1,914.4	-3.6%	Exogenous

Congress appropriated a decrease in nominal defense R&D funding for FY1991, resulting in a significant, larger decrease in real appropriations, one largely motivated by the end of the Cold War (the "peace dividend") and continued long-term deficit reduction efforts. The appetite for cutting defense spending was, however, somewhat diminished by Iraq's invasion of Kuwait in August 1990. The appropriations committees continued to cut back funding for the SDI program aimed at intercepting ICBMs and began pivoting interest toward R&D for "tactical missile defense" programs aimed at countering post-Cold War emerging threats from "third world countries," such as missiles armed with chemical or biological weapons. Concerns about chemical weapons were amplified by the Iraq war, and appropriators also prioritized funding increases for infectious disease research and protecting U.S. forces deployed in Iraq from potential chemical or biological attacks. The decrease in defense R&D funding again appears to have been driven by the end of the Cold War, and does not appear to have been motivated by concerns about inflation or any other short-run macroeconomic prerogatives. As such, we classify this policy event as exogenous. Most pertinent narrative evidence:

- "We recognize that the Soviet military threat in Europe is diminishing, but we see little change in Soviet strategic modernization. Therefore, we must sustain our own strategic offense modernization and the Strategic Defense Initiative. But the time is right to move forward on a conventional arms control agreement to move us to more appropriate levels of military forces in Europe... tonight I am announcing a major new step for a further reduction in U.S. and Soviet manpower in Central and Eastern Europe to 195,000 on each side... A swift conclusion to our arms control talks—conventional, chemical, and strategic—must now be our goal." George H.W. Bush, State of the Union Address, January 31, 1990 (*The American Presidency Project*, by Gerhard Peters and John T. Woolley, https://www.presidency.ucsb.edu/node/263819)
- "The budget request for National Defense is significantly less ($14.3 billion in budget authority and $5.5 billion in outlays) than the amounts included in the President's February 1989 budget. Planning levels for the future now assume only slight nominal increases, less than would be required to offset projected inflation." (Budget of the United States, FY1991, p. 152)
- "The steadfastness and rightness of America's foreign policy and defense posture since the end of World War II have paid dramatic and stunning results in the past year: The collapse of the Berlin Wall; The beginning of the Soviet withdrawal from eastern Europe; The beginning of democratization in eastern Europe and the Soviet Union itself; The bright outlook for the successful implementation of both a strategic and conventional arms agreement... However, the euphoria of a few months ago regarding the rapidly improving global outlook has rapidly dissipated with Iraq's invasion of Kuwait. In this bill, the Committee believes it has funded a mix of programs which will provide continued peace through continued strength." (H. Rpt. 101-822, October 9, 1990, pp. 4-5)
- "In a declining defense budget environment in which funding for the Strategic Defense Initiative is also likely to continue to be lower than current Administration out-year forecasts, the very serious issue of the tactical ballistic missile threat must be afforded a higher priority. The Committee therefore recommends the establishment of a new program "Tactical Ballistic Missile Defense" to be initiated at $250,000,000 in fiscal year 1991 separate from the Strategic Defense Initiative. The goal of this program is to field an integrated, ground-launched Tactical Ballistic Missile Defense system by 1995. The proliferation of tactical ballistic missiles in third world countries, especially those that might one day have chemical or biological agent warheads, has become a serious problem as evidenced by recent events in the Middle East." (Ibid, p. 178)
- "The Committee also is concerned about the increased threat posed by surface-to-surface ballistic missiles, some with chemical warheads, in the Middle East and Persian Gulf regions. The SDI joint program between the United States and Israel to develop the Arrow theater ballistic missile defense system can contribute to advancing the technologies to defeat this threat..." (S. Rpt. 101-521, October 11, 1990, p. 228)
- "The conferees note that the recent crisis in the Middle East increases concern over the possible requirement for nuclear biological chemical (NBC) protection and environmental control for existing and future armored systems. The conferees believe that there may be off-the-shelf NBC protection systems, or NBC protection systems under development for other weapons systems, which should be reviewed for use on the Bradley Fighting Vehicle (BFV) and other armored systems... The conferees agree to the Senate proposed funding for infectious disease research: $109,402,000, an increase

of $12,500,000, of which $7,500,000 is only for chemical/biological defense [R&D]." (H. Rpt. 101-938, October 24, 1990, pp. 99-100)

- "The president's fiscal 1991 budget request for defense amounted to a 2 percent decline in purchasing power, after allowing for inflation. But the reduced threat of the Soviet conventional military threat to Western Europe initially fueled congressional demands for larger cuts. When Congress began its August recess, the prevailing wisdom was that the deeper cuts in defense spending sought by the House would prevail. But the political dynamics changed when Iraq marched into Kuwait on Aug. 2, and the administration deployed more than 200,000 U.S. troops to the Persian Gulf. The prospect that U.S. military personnel could wind up engaged in a large-scale combat operation made members more cautious of cutting the defense budget too dramatically" ("Defense Spending Held to $288 Billion," *CQ Almanac 1990*, 46th ed., 812-26. Washington, DC: Congressional Quarterly, 1991)
- "Aside from the B-2, the major strategic weapons programs engendered little controversy in 1990 on Capitol Hill, and, in most cases, the appropriations conferees had to settle only relatively minor differences in funding. Similarly, the appropriations conferees' action on mobile intercontinental ballistic missiles (ICBMs) fell squarely within the congressional consensus that was apparent for months. The bill provided $688 million to be allocated by the Pentagon between two programs: One to develop a version of the existing MX missile that could move by rail, and another to develop the much smaller Midgetman ICBM" (Ibid)

Department of Defense R&D Appropriations for FY1994

Bill: Department of Defense Appropriations Act, 1994

Public Law: 103-139 **Enacted:** November 11, 1993 **Effective:** November 11, 1993

Nominal change		Real change		Classification
Millions ($)	YOY%	Millions ($2012)	YOY%	
-$3,379.1	-9.0%	-$5,566.7	-10.6%	Exogenous

Congress appropriated a decrease in nominal defense R&D funding for FY1994, resulting in a significant, larger decrease in real appropriations, one largely motivated by the end of the Cold War (the "peace dividend") and long-term deficit reduction efforts. The fall of the Berlin Wall, collapse of the Warsaw Pact, and dissolution of the Soviet Union were cited by the House Appropriations Committee as justification for continued reductions in the U.S. defense posture, but the committee also noted that the FY1994 budget would be the ninth consecutive cut in real defense spending, and there was not much scope for further reductions given new post-Cold War emerging threats and recent U.S. military interventions in Panama, Iraq, and Somalia. The Clinton administration also sought more "balance" between civilian and defense R&D and aimed to transition defense R&D toward more dual-use technologies (i.e., with both civilian and military applications). That said, defense R&D bore the brunt of defense spending cuts for FY1994, with the biggest cuts coming to Clinton's request for the development of ground-based missile interceptors under the Ballistic Missile Defense program, which was created in 1993 to replace the Strategic Defense Initiative Organization. While the Clinton administration had proposed modest economic stimulus to accelerate job growth, the continued post-Cold War budget cuts to defense spending were intended to reduce budget deficits, not to stimulate short-run economic activity; as Clinton noted in

the Budget Message of the President, falling government spending and a downsizing of the defense industry were contributing to the weak labor market. The decrease in defense R&D funding appears to have been driven by the end of the Cold War and long-term deficit reduction efforts, and does not appear to have been motivated by concerns about unemployment or any other short-run macroeconomic prerogatives. As such, we classify this policy event as exogenous. Most pertinent narrative evidence:

- "The heart of this plan deals with the long term. It is an investment program designed to increase public and private investment in areas critical to our economic future. And it has a deficit reduction program that will increase the savings available for the private sector to invest, will lower interest rates, will decrease the percentage of the Federal budget claimed by interest payments, and decrease the risk of financial market disruptions that could adversely affect our economy... About the defense budget, I raise a hope and a caution. As we restructure our military forces to meet the new threats of the post-cold-war world, it is true that we can responsibly reduce our defense budget." William J. Clinton, State of the Union Address, February 17, 1993 (*The American Presidency Project*, by Gerhard Peters and John T. Woolley, https://www.presidency.ucsb.edu/node/218852)
- "The plan has three key elements: economic stimulus to create jobs now and lay the foundation for long-term economic growth; long-term public investments to increase the productivity of American workers and businesses; and fair, balanced, and equitable deficit reduction measures to stop government deficits from preempting the private investments needed to create jobs and raise living standards." (Budget Message of the President, FY1994, April 8, 1993)
- "The economy experienced a recession during the latter half of 1990 and the first quarter of 1991. The recovery from that recession has been anemic by past cyclical standards... The result has been an abnormally weak labor market. Inflation has remained mild, and interest rates have declined to their lowest levels in many years. The slow recovery reflects several structural adjustments: the massive layoffs in key American industries as firms seek to become leaner and more competitive; the downsizing of the defense sector to meet the new realities of the post-Cold War world; the weakness of financial institutions, and the failures of shaky business ventures to which they had made loans; and the spending reductions and tax increases imposed by governments at all levels." (Budget of the United States, FY1994, p. 5)
- "Public and private investments in [R&D] remain an important contribution to achieving these goals. Since World War II, Federal technology policy has been to support basic science and mission-oriented R&D (i.e., defense, space, etc.) and to rely on these investments to trickle down to civilian industry. While this approach may have made sense in earlier eras, when U.S. firms dominated world markets, it is no longer adequate. Our Nation needs improved cooperative strategies for satisfying Federal and industrial technology requirements... This reorientation toward more commercially relevant R&D should have a high payoff for [DOD], which accounted for 59 percent of all Federal R&D in 1993. It is expected that a growing number of defense needs can be met effectively through commercial technologies without compromising national security requirements (i.e., dual use). The increased support for civilian R&D has already permitted progress toward balancing the civilian and defense R&D investment levels. DOD's dual-use strategy will contribute to this transition" (Ibid, p. 43)

- "Throughout the Cold War, the committee and the Congress steadfastly supported a strong US military defense posture. That strong defense posture has been a large factor in the dramatic geo-political events of the past five years including: The tearing down of the Berlin Wall; [t]he demise of the Warsaw Pact; [t]he dissolution of the former Soviet Union; and [t]he emergence of democratic forces in Eastern Europe and the former Soviet Union... In light of these geopolitical events, the Committee supports the downsizing of the force structure and the need to reduce spending on defense. However, the Committee notes the scope of the reductions in defense that have already occurred in recent years and the projections for the out-years is extremely large... The fiscal year 1994 budget represents the ninth consecutive year of reductions in budget authority for defense when measured in constant dollars." (H. Rpt. 103-254, September 22, 1993, p. 3)
- "There are those who would argue that because of the demise of the Soviet Union, reductions in defense spending should be made even deeper than the dramatic reductions outlined above. Unfortunately, the demise of the Cold War has not brought a tranquil era in the world. Interestingly, the major engagements and deployments of U.S. forces in the past decade or so have had nothing to do with communism: The attack on Libya; the invasion of Panama; the Persian Gulf War; and the deployment to Somalia... the post-Cold War era is a volatile and dangerous time in which America, as the world's only superpower, must maintain an adequate and robust national defense posture" (Ibid, p. 4)
- "The $261 billion defense authorization bill for fiscal 1994 (HR 2401) backed the essentials of President Clinton's budget request, from his efforts to revamp research into anti-missile defenses to his proposals to continue work on a new generation of combat planes... Lawmakers sliced about $2.6 billion from the Clinton request, which in turn was $12 billion less than former President George Bush had projected in a skeletal budget request for the year that he had prepared before leaving office... Although liberal lawmakers argued for deeper defense cuts to reflect the end of the Cold War arms race, other members in both chambers expressed concern that Clinton's long-range defense plans would cut too fast and too deep and would risk the nation's military capabilities. Those warnings were conveyed by leaders of the Armed Services committees and the Defense Appropriations subcommittees in both chambers... Accounts for operations and maintenance (cut $2 billion) and for [R&D] (cut $4 billion) took the heaviest hits." ('$261 Billion Authorized for Defense," *CQ Almanac 1993*, 49th ed., 433-42. Washington, DC: Congressional Quarterly, 1994)
- "The $240.5 billion fiscal [1994] defense spending bill, cleared by Congress on Nov. 10, represented the first installment of President Clinton's plan for a relatively modest long-term defense retrenchment. The bill (HR 3116), which generally followed the outlines of Clinton's budget request, only slightly accelerated the cuts in Pentagon spending that had been planned by President George Bush following the collapse of the Soviet military threat... Congress ended up cutting $12.6 billion from the amount provided for defense in fiscal 1993—just $323 million more in cuts than Clinton had requested... The appropriators achieved the spending cuts and paid for the members' add-ons in part by outright cuts from programs requested by the Pentagon. There were a handful of large slashes from individual programs, such as $1 billion from Clinton's request for anti-missile defense research. But most of the cuts were relatively modest reductions made to hundreds of programs, mostly in [R&D]" ("Defense Funding Drops

by $12.6 Billion," *CQ Almanac 1993*, 49th ed., 569-78. Washington, DC: Congressional Quarterly, 1994)

Department of Defense R&D Appropriations for FY1995

Bill: Department of Defense Appropriations Act, 1995

Public Law: 103-335 **Enacted:** September 30, 1994 **Effective:** October 1, 1994

Nominal change		Real change		Classification
Millions ($)	YOY%	Millions ($2012)	YOY%	
-$59.4	-0.2%	-$1,760.0	-3.7%	Exogenous

Congress appropriated a slight decrease in nominal defense R&D funding for FY1995, resulting in a significant decrease in real appropriations, again largely motivated by the end of the Cold War (the "peace dividend") and continued long-term deficit reduction efforts. President Clinton had pledged to significantly reduce the five-year defense budget inherited from President George H.W. Bush as part of a broader deficit reduction effort, while realigning the military's posture for the new post-Cold War geopolitical landscape, in keeping with DOD's "bottom-up" review. But after nearly a decade of reducing DOD appropriations since the height of the Reagan military buildup, President Clinton started pushing to ease up on defense budget cuts, while more liberal lawmakers, particularly in the House of Representatives, continued to push for decreased defense funding relative to the budget request. The appropriations conference committee approved significantly less funding for Clinton's Ballistic Missile Defense program and DOD grants for research at universities, among other programs, but much of Clinton's defense budget—which requested a real spending cut of just under 1% from FY1994 levels—was approved at nearly the requested funding level. The decrease in defense R&D funding again appears to have been largely driven by the end of the Cold War and long-term deficit reduction efforts, and does not appear to have been motivated by concerns about inflation or any other short-run macroeconomic prerogatives. As such, we classify this policy event as exogenous. Most pertinent narrative evidence:

- "After drafting an ambitious post-cold-war strategy, the Pentagon finds itself $50 billion short of what it needs to carry out the plan and in a skirmish with the White House budget director over the money... Leon E. Panetta, the director of [OMB], confirmed that [DOD] would be short $40 billion to $50 billion over the next five years. With President Clinton trying to cut the Federal budget, Mr. Panetta said he did not expect a change would be made in next year's Pentagon spending request... That puts the President exactly where he least wants to be: in a dispute between his budget director and the Pentagon and potentially in a standoff with Senator Sam Nunn, the Georgia Democrat who heads the Senate Armed Services Committee and supports the Pentagon's push for additional money... This year's debate is especially heated, however, because Mr. Clinton is trying to protect the United States role as a military power while honoring his promise to shift the nation's priorities more to domestic programs." ("Pentagon Fights Budget Officials Over $50 Billion," by Michael R. Gordon, *New York Times*, December 10, 1993)
- "Last year I proposed a defense plan that maintains our post-cold-war security at a lower cost. This year many people urged me to cut our defense spending further to pay for other Government programs. I said no. The budget I send to Congress draws the

line against further defense cuts. It protects the readiness and quality of our forces... We must not cut defense further." William J. Clinton, State of the Union Address, January 25, 1994 (*The American Presidency Project*, by Gerhard Peters and John T. Woolley, https://www.presidency.ucsb.edu/node/219941)

- "Profound shifts are taking place in America's foreign relations and defense requirements. When we came into office, we faced dramatically changed international conditions and problems, but we inherited foreign and defense policies and institutions still geared, in many ways, to the conditions and needs of the Cold War... We remain committed to maintaining the best trained, best equipped and best prepared fighting force in the world... but we must hold the line against further defense cuts, in order to protect fully the readiness and quality of our forces." (Budget Message of the President FY1995, pp. 8-9)
- "For 1995, $9.3 billion is proposed for defense [Science and Technology] programs. This includes $4.2 billion for basic and applied research, as well as $5.1 billion for advanced technologies. These efforts form the foundation for advanced military capabilities—such as stealth aircraft and precision weapons convincingly demonstrated during Operation Desert Storm. In addition, in the post-Cold War era defense technology investments can provide for national security requirements and contribute to economic growth..." (Budget of the United States, FY1995, pp. 121-122)
- "In light of these geopolitical events, the Committee supports the downsizing of the U.S. force structure and the ensuing reductions in defense spending on the order of those proposed by the President. The Committee notes that the scope of these reductions combined with planned reductions in the years ahead will result in a very lean force. It is imperative that this force remain the best equipped and best trained force in the world. This presents a significant challenge in the years ahead under the tight budget constraints for overall discretionary spending embodied in the statutory discretionary spending caps" (H. Rpt. 103-562, June 27, 1994, p. 4)
- "The [House Appropriations] Committee recommends $34,467,940,000 for the RDT&E title, a reduction of $1,757,073,000 from the budget request. Specific recommendations for selected programs are as follows: ... a general reduction of $900,000,000 to university research due to fiscal constraints... The Committee denied all funds to continue development of the Tri-Service Standoff Attack Missile, a reduction of $230,183,000 to the budget request... The Committee provided $408,659,000, a decrease of $100,000,000 to the budget request for the development of the New Attack Submarine... The Committee provided $105,154,000 for continued development and testing of the C-17 airlift aircraft, a reduction of $116,300,000 to the budget request... The Committee provided $2,491,762,000 for Ballistic Missile Defense, a reduction of $488,093,000 to the budget request" (Ibid, pp. 19-20)
- "The fiscal year 1995 [DOD] budget request for [RDT&E] totaled $36,225,013,000. Title IV of the accompanying Senate bill contains $35,405,174,000, a reduction of $819,839,000, or about 2.3 percent from the budget estimate. The recommended allowance is $213,683,000 above the fiscal year 1994 appropriation for RDT&E in Title IV. An additional $134,339,000 for RDT&E is reduced from the bill through a recommended general provision, section 8054, governing funding for defense federally funded research and development centers [FFRDCs], university-affiliated research centers, and non-FFRDC consultants... For the past two years, the [Senate Appropriations] Committee has expressed serious reservations about the magnitude, scope, pace, direction,

and cost of the science and technology advanced technology demonstrations requested in the "RDT&E" accounts." (S. Rpt. 103-321, July 29, 1994, p. 224)

- "By the second year of his administration, Clinton had put his stamp on the Pentagon—setting its funding, choosing its key personnel and approving its new strategy. He built his defense policy around the conclusions of [DOD's] 1993 "bottom-up review," which sought to determine how large, combat-ready, and modern the military needed to be for the post-Cold War world. The plan called for the United States to be capable of fighting two nearly simultaneous "major regional conflicts." Daunted in part by concern about the federal deficit, moderates and conservatives shied away from trying to force Clinton to restore any significant portion of the $123 billion he had pledged to cut over five years from the long-term Pentagon spending plan he inherited from President George Bush." ("Congress Backs Clinton's Plans To Hold the Line on Defense," *CQ Almanac 1994*, 50th ed., 421-28. Washington, DC: Congressional Quarterly, 1995)
- "President Clinton's defense spending request for fiscal 1995 proved remarkably resistant to attacks from both the left and the right. Liberals wanted bigger cuts in Pentagon spending, and conservatives wanted less retrenchment. But Congress on Sept. 29 cleared a $243.7 billion defense appropriations bill (HR 4650) that represented a reduction of less than 1 percent in the president's request of $244.7 billion... The bill generally supported the force size, tempo of operations and weapons procurement plans in Clinton's budget... [including] continued development of new generations of combat helicopters for the Army and jet fighters for the Navy and Air Force." ("Defense Bill Mirrors Request," *CQ Almanac 1994*, 50th ed., 488-97. Washington, DC: Congressional Quarterly, 1995)
- "Conferees approved $2.8 billion of the $3.25 billion requested to develop and buy anti-ballistic missile defenses... The conferees cut $200 million from Pentagon-sponsored university research, a much smaller cut than the $900 million the House had voted for." ("Defense Appropriations Provisions," *CQ Almanac 1994*, 50th ed., 495-96. Washington, DC: Congressional Quarterly, 1995)

Department of Defense R&D Appropriations for FY2001

Bill: Department of Defense Appropriations Act, 2001

Public Law: 106-259 **Enacted:** August 9, 2000 **Effective:** October 1, 2000

Nominal change		Real change		Classification
Millions ($)	YOY%	Millions ($2012)	YOY%	
$3,099.0	8.1%	$3,109.8	6.7%	Exogenous

Congress appropriated a significant increase in real defense R&D appropriations for FY2001, largely motivated by the political preferences of Republicans in Congress and easing long-term deficit reduction efforts. The federal budget was projected to be running in surplus for the fourth consecutive year, and Republican majorities in both the House and Senate pushed for an increase in defense funding, R&D included. The House and Senate Armed Services Committees authorized nearly 4% more for defense R&D than was requested in the administration's FY2001 budget, and the appropriations conference bill brought that up to a 9% increase; the appropriators even turned to a budget gimmick—designating nearly a third of the increase as "emergency spending" not subject to budget caps—to facilitate the increase in appropriations for DOD. The Clinton administration pushed back against the

unrequested increases in procurement and R&D funding but did not threaten to veto the bill. President Clinton and defense policymakers were increasingly concerned about chemical, biological, or nuclear weapons attacks from terrorist groups and rogue states (e.g., North Korea, Iran), and continued to significantly increase appropriations for Ballistic Missile Defense Organization R&D programs intended to counter related missile threats. Other defense R&D spending priorities included modernization of conventional forces, notably the development of the F-22 fighter, Joint Strike Fighter, B-2 bomber, Comanche helicopter, and Space Based Infrared System, among other programs. The increase in defense R&D funding does not appear to have been motivated by concerns about unemployment or any other short-run macroeconomic prerogatives. As such, we classify this policy event as exogenous. Most pertinent narrative evidence:

- "A third challenge we have is to keep this inexorable march of technology from giving terrorists and potentially hostile nations the means to undermine our defenses. Keep in mind, the same technological advances that have shrunk cell phones to fit in the palms of our hands can also make weapons of terror easier to conceal and easier to use. We must meet this threat by making effective agreements to restrain nuclear and missile programs in North Korea, curbing the flow of lethal technology to Iran, preventing Iraq from threatening its neighbors, increasing our preparedness against chemical and biological attacks, protecting our vital computer systems from hackers and criminals, and developing a system to defend against new missile threats, while working to preserve our ABM missile treaty with Russia... sometime in the next 10 to 20 years, the major security threat this country will face will come from the enemies of the nation-state, the narcotraffickers and the terrorists and the organized criminals who will be organized together, working together, with increasing access to ever more sophisticated chemical and biological weapons." William J. Clinton, State of the Union Address, January 27, 2000 (*The American Presidency Project*, by Gerhard Peters and John T. Woolley, https://www.presidency.ucsb.edu/node/227524)
- "I ask you to pass a national security budget that keeps our military the best trained and best equipped in the world, with heightened readiness and 21st-century weapons, which raises salaries for our service men and women, which protects our veterans, which fully funds the diplomacy that keeps our soldiers out of war, which makes good on our commitment to our U.N. dues and arrears." (Ibid)
- "The 2001 Budget, which I am submitting to you with this message, is the fourth balanced budget of my Administration... Our success in reversing what once seemed to be uncontrollable growth in the Federal budget deficit has created more than prosperity... By continuing to maintain discipline, we can provide for the aging of America and for the investments of the future—including education, the environment, [R&D], and defense—which are central to our economic growth, health, and national security. (Budget Message of the President, February 7, 2000, pp. 1, 9)
- "this budget provides resources for [DOD] and other agencies to combat emerging threats, including terrorism and weapons of mass destruction, and to provide for critical infrastructure protection... it also provides additional funding for contingency operations in Southwest Asia, Bosnia, and Kosovo." (Ibid, p. 8)
- "Defense hawks of both parties contend that Clinton has undermined combat readiness with defense budgets that are too small and a military workload that is too ambitious. However, as it had in the five previous years of Republican control on Capitol Hill, Congress exceeded Clinton's defense budget request only modestly—about 1.5

percent, much of it spread over dozens of smaller programs. The [FY2001 defense authorization] bill allocated about $2.6 billion of the additional funds to procurement and development, including nearly $800 million more for the Army's effort to transform itself into a lighter force, able to move overseas more quickly... Conferees added $349 million to the $4.9 billion Clinton requested to develop anti-missile defenses, including $135 million more than the $1.8 billion requested to develop a limited national missile defense system." ("Congress Adds Little To Defense Request Despite Criticism of Clinton Policies," *CQ Almanac 2000*, 56th ed., 8-3-8-30. Washington, DC: Congressional Quarterly, 2001)

- "In light of the growing threat posed to deployed U.S. military forces, the citizens and territory of the United States, and our allies, the [House Appropriations] Committee recommends a total of $4,555,370,000 for programs under the [BMDO]. This is a net increase of $168,245,000 over the budget request, and $738,824,000 above the amounts provided for fiscal year 2000." (H. Rpt. 106-644, June 1, 2000, p. 6)
- "Congress cleared a $289.6 billion defense spending bill for fiscal 2001, $5.1 billion more than President Clinton requested. To avoid breaking spending limits set by the annual budget resolution, conferees designated $1.8 billion of the increase as fiscal 2000 emergency spending. Though projected budget surpluses were ballooning by the time Congress got down to drafting the annual defense funding bill, Republican defense hawks found themselves in a political bind. Both Clinton and GOP congressional leaders had ruled out using the growing Social Security surplus for discretionary spending. That left the defense appropriations subcommittees competing with other domestic priorities for a more limited supply of extra funds. A relatively small but deeply committed band of fiscal conservatives threatened to torpedo any proposal that sacrificed tax cuts to fund defense increases." ("Lawmakers Camouflage Some Defense Funds As "Emergency" Spending," *CQ Almanac 2000*, 56th ed., 2-40-2-53. Washington, DC: Congressional Quarterly, 2001)
- "OMB said in a June 8 statement that "much of the additional funding in the committee bill is for unrequested procurement and [R&D] programs, funding that comes at the expense of more urgent needs." But the agency did not threaten to recommend a veto." (Ibid)

Department of Defense R&D Appropriations for FY2002

Bill: Department of Defense And Emergency Supplemental Appropriations for Recovery from and Response to Terrorist Attacks on the United States Act, 2002

Public Law: 107-117 **Enacted:** January 10, 2002 **Effective:** January 10, 2002

Nominal change		Real change		Classification
Millions ($)	YOY%	Millions ($2012)	YOY%	
$6,973.0	16.8%	$8,389.9	17.0%	Exogenous

Congress appropriated a very large, significant increase in real defense R&D appropriations for FY2002, largely motivated by the 9/11 terrorist attacks, concerns about chemical, biological, or nuclear terrorist attacks, and the newly launched Global War on Terror and invasion of Afghanistan. President George W. Bush had campaigned on increasing defense spending, particularly for missile defense, and then the 9/11 attacks galvanized a new urgency and bipartisan support for defense spending, R&D included; according to *CQ*

Almanac, Congress "funded nearly everything on the Pentagon's wish" after the terrorist attack. The final bill appropriated $7.8 billion for missile defense system development, an unusually large increase of roughly 50% over FY2001 funding levels, reflecting both campaign promises and new perceived threats. In addition to development funding for force modernization, research for vaccines and defenses against biological and chemical warfare attacks were also a high priority. Accelerated development of reconnaissance drones was also prioritized as DOD adapted to new realities of asymmetric warfare and the Global War on Terror. The increase in defense R&D funding appears to have been largely motivated by new post-9/11 national security concerns and appears unrelated to any concerns about unemployment or other short-run macroeconomic prerogatives. As such, we classify this policy event as exogenous. Most pertinent narrative evidence:

- "I've asked the Secretary of Defense to review America's Armed Forces and prepare to transform them to meet emerging threats. My budget makes a downpayment on the [R&D] that will be required... Our Nation also needs a clear strategy to confront the threats of the 21st century, threats that are more widespread and less certain. They range from terrorists who threaten with bombs to tyrants in rogue nations intent upon developing weapons of mass destruction. To protect our own people, our allies, and friends, we must develop, and we must deploy effective missile defenses." George W. Bush, State of the Union Address, February 27, 2001 (*The American Presidency Project*, by Gerhard Peters and John T. Woolley, https://www.presidency.ucsb.edu/node/211834)
- "I have today signed into law S. 1438, the "National Defense Authorization Act for Fiscal Year 2002." The Act authorizes the funding necessary to defend the United States and its interests around the globe. In particular, it provides the resources needed to continue the war against global terrorism, accelerate programs for defense against biological or chemical attacks, pursue effective missile defense, properly support members of the Armed Forces and their families, and begin to transform our Armed Forces to meet the military requirements of the 21st century" George W. Bush, Statement on Signing the National Defense Authorization Act for Fiscal Year 2002, December 28, 2001 (*The American Presidency Project*, by Gerhard Peters and John T. Woolley, https://www.presidency.ucsb.edu/node/212461)
- "The recent attacks on September 11, 2001, vividly demonstrate the need to greatly expand governmental efforts to develop and field systems that can defend against threats posed by weapons of mass destruction. One of the most unsettling and dangerous threats to the homeland is the possibility of nuclear terrorism using unconventional delivery methods, e.g., delivery other than by missile or military aircraft." (H. Rpt. 107-298, November 19, 2001, p. 255)
- "In his foreword to the Quadrennial Defense Review, the Secretary of Defense described this as "a crucial time of transition to a new era." Even before the events of September 11th, the outlines of that "new era" were clear. The future security environment would be marked by the existence of lingering, largely conventional military threats—such as in the Persian Gulf region, and Northeast Asia—and the growing threat posed by other regional powers such as China. The future security environment would be increasingly marked by the reality of new threats such as terrorism; weapons of mass destruction (nuclear, radiological, chemical, and biological weapons); ballistic missiles; information operations (computer network exploitation and attack); and other unconventional, "asymmetric" threats to the United States." (Ibid, p. 5)

- "The budget contained a significant increase in funding for intelligence and intelligence-related activities, including the accelerated development and fielding of unmanned aerial vehicles (UAVs) and so-called "ISR" assets (intelligence, surveillance, and reconnaissance). It also proposed sizable increases in support of certain key mission areas and new technologies such as Ballistic Missile Defense." (Ibid, p. 6)
- "Of the additional funds provided over the budget request, $213,500,000 is for additional research to find vaccines, antidotes, and antibiotics to treat a broad spectrum of threats, as well as funding for the next generation of detectors and protective equipment. The largest increase is to accelerate promising research into finding post-exposure treatment for diseases for which there is currently no known cure." (H. Rpt. 107-298, p. 241)
- "The Committee's recommendations in this [Counter-Terrorism and Defense against Weapons of Mass Destruction] appropriation fully support [DOD's] efforts to transform the military and counter asymmetric threats. The President's request for basic research, advanced concept technology demonstrations, chemical and biological warfare programs, robotics, and counter-proliferation activities all are fully funded. The Committee also provides increases for programs in areas such as composite materials research, nanotechnology, and explosives demilitarization." (S. Rpt. 107-109, December 5, 2001, p. 140)
- "Today I have signed into law H.R. 3338, the "Department of Defense and Emergency Supplemental Appropriations for Recovery from and Response to Terrorist Attacks on the United States Act, 2002," which provides $317.2 billion for national security programs administered by [DOD]... In particular, the Act provides the resources needed to continue the war against global terrorism, pursue effective missile defense, properly support members of the Armed Forces and their families, and begin to transform our Armed Forces to meet the military requirements of the 21st century." George W. Bush, Statement on Signing the Department of Defense and Emergency Supplemental Appropriations for Recovery from and Response to Terrorist Attacks on the United States Act, 2002, January 10, 2002 (*The American Presidency Project*, by Gerhard Peters and John T. Woolley, https://www.presidency.ucsb.edu/node/215283)
- "Congress cleared a $317.5 billion Defense Department spending bill for fiscal 2002 that postponed tough choices about the future shape of the military and funded nearly everything on the Pentagon's wish list—from Cold War-style weapons to equipment for unconventional battles... The final bill was $1.9 billion less than Bush requested, but about the same amount as was approved by both the House and Senate. The total was almost $19 billion more than the fiscal 2001 level, including fiscal 2001 supplemental spending... When the full House Appropriations Committee met on Oct. 24 to consider the defense measure, the terrorist attacks and the subsequent U.S. and allied war in Afghanistan loomed large. "We have before us a defense bill that is a peacetime defense bill," complained David R. Obey of Wisconsin, the committee's ranking Democrat. "We ain't at peace no more." ("Anti-Terror Funds Slow Defense Bill," *CQ Almanac 2001*, 57th ed., 2-13-2-17. Washington, DC: Congressional Quarterly, 2002)
- "The fiscal 2002 budget that Bush submitted to Congress in April included a $310.5 billion placeholder for defense, contingent on a comprehensive review of military needs undertaken by Defense Secretary Donald H. Rumsfeld. During the presidential campaign, candidate Bush had promised to increase defense spending, arguing that the Clinton administration had underfunded the military and stretched the services with

too many missions... The Sept. 11 attacks, the campaign against terrorism, and the sudden war footing significantly altered the budget dynamic, postponing the hard choices on where to spend money." (Ibid)

Department of Defense R&D Appropriations for FY2003

Bill: Department of Defense Appropriations Act, 2003

Public Law: 107-248 **Enacted:** October 23, 2002 **Effective:** October 23, 2002

Nominal change		Real change		Classification
Millions ($)	YOY%	Millions ($2012)	YOY%	
$9,381.0	19.3%	$10,652.1	18.4%	Exogenous

Congress appropriated another very large, significant increase in real defense R&D appropriations for FY2003, again largely motivated by the 9/11 terrorist attacks, concerns about chemical, biological, or nuclear terrorist attacks, the Global War on Terror, and invasion of Afghanistan as well as looming concerns about a possible invasion of Iraq. In his second State of the Union address, President Bush declared Iraq, Iran, and North Korea to be an "axis of evil," a threat meriting increased spending on missile defense systems. Congress continued to appropriate funds for nearly any defense prerogatives of the administration in the aftermath of the 9/11 attacks, and defense R&D funds were prioritized for ballistic missile defense, force modernization, counter-terrorism, and bioterrorism concerns. The increase in defense R&D funding again appears to have been largely motivated by new post-9/11 national security concerns and appears unrelated to any concerns about unemployment or other short-run macroeconomic prerogatives. As such, we classify this policy event as exogenous. Most pertinent narrative evidence:

- "Our military has put the terror training camps of Afghanistan out of business, yet camps still exist in at least a dozen countries. A terrorist underworld, including groups like Hamas, Hizballah, Islamic Jihad, Jaish-e-Mohammed, operates in remote jungles and deserts and hides in the centers of large cities. While the most visible military action is in Afghanistan, America is acting elsewhere. We now have troops in the Philippines, helping to train that country's armed forces to go after terrorist cells that have executed an American and still hold hostages. Our soldiers, working with the Bosnian Government, seized terrorists who were plotting to bomb our Embassy. Our Navy is patrolling the coast of Africa to block the shipment of weapons and the establishment of terrorist camps in Somalia... We will work closely with our coalition to deny terrorists and their state sponsors the materials, technology, and expertise to make and deliver weapons of mass destruction. We will develop and deploy effective missile defenses to protect America and our allies from sudden attack. And all nations should know: America will do what is necessary to ensure our Nation's security" George W. Bush, State of the Union Address, January 29, 2002 (*The American Presidency Project*, by Gerhard Peters and John T. Woolley, https://www.presidency.ucsb.edu/node/211864)
- "My budget supports three great goals for America: We will win this war; we will protect our homeland; and we will revive our economy... Afghanistan proved that expensive precision weapons defeat the enemy and spare innocent lives, and we need more of them. We need to replace aging aircraft and make our military more agile to put our troops anywhere in the world quickly and safely. Our men and women in uniform deserve the best weapons, the best equipment, the best training, and they also

deserve another pay raise. My budget includes the largest increase in defense spending in two decades because, while the price of freedom and security is high, it is never too high. Whatever it costs to defend our country, we will pay." (Ibid)

- "North Korea is a regime arming with missiles and weapons of mass destruction while starving its citizens. Iran aggressively pursues these weapons and exports terror, while an unelected few repress the Iranian people's hope for freedom. Iraq continues to flaunt its hostility toward America and to support terror. The Iraqi regime has plotted to develop anthrax and nerve gas and nuclear weapons for over a decade. States like these and their terrorist allies constitute an axis of evil, arming to threaten the peace of the world" (Ibid)
- "The war against terrorism is a war unlike any other in American history. It is a war that must be fought at home as well as abroad, a war waged on the financial, diplomatic, and intelligence fronts as much as on the battlefield. We did not choose this war, but we will not shrink from it. And we will mobilize all the necessary resources of our society to fight and to win... Government, too, will have new bills to pay. Since the end of the Cold War, defense has been a dwindling priority in our national budget. By the end of the 1990s, the United States was spending less of its national income on defense than at any time since the attack on Pearl Harbor. That will have to change—and the 2003 Budget reflects the new reality. Future budgets will need to do likewise. We have new duties, and we will be judged by how we meet them. We are at war, and we must pay the price to fight a war." (Budget of the United States, FY2003, p. 13)
- "[This budget] counters the threat of bioterrorism with enhancements in hospitals and other public health systems ($1.2 billion), [R&D] ($2.4 billion), pharmaceutical and vaccine stockpile ($400 million), and a national information network for better detection of biological attacks, as well as natural disease outbreaks ($392 million)." (Ibid, p. 7)
- "House and Senate negotiations reached an agreement late yesterday on a $355.1 billion defense bill for 2003 that would boost military spending by $35 billion and finance the purchase of dozens of new high-tech weapons, warships, fighter planes, and helicopters as the nation grids for war. Final passage of the measure, which could come as early as today, would greatly strengthen President Bush's hand if he strengthens President Bush's hand if he decides to use force to bring about his goal of toppling the regime of Iraqi President Saddam Hussein, congressional sources said... the major portion of the increase goes to weapons procurement and research. The Defense Advanced Projects Agency (DARPA), the Pentagon's research arm, gets a 17% increase above its fiscal 2002 budget." ("Hill Conferees Agree on 2003 Defense Bill," by Dan Morgan, *The Washington Post*, October 10, 2002)
- "Congress cleared a fiscal 2003 Defense Department spending bill that reflected wide agreement among lawmakers after the Sept. 11, 2001, attacks that no dollars should be spared in the war on terrorism and on a looming showdown with Iraq. The $355.1 billion bill provided $37.5 billion more than Congress appropriated for fiscal 2002, $20.7 billion more if supplemental spending was included... [the bill] largely tracked administration plans to transform the military into a lighter, more agile force." ("No Expense Spared on Defense Bill," *CQ Almanac 2002*, 58th ed., 2-9-2-13. Washington, DC: Congressional Quarterly, 2003)
- "With the war on terrorism, the growing possibility of an attack on Iraq, and political delays to legislation creating a new Department of Homeland Security, members were

eager to show their commitment to defense. The significant increase in spending also reduced conflicts over priorities. Even Bush's request to spend $7.8 billion on a missile defense system, a highly contentious issue in previous years, drew little criticism." (Ibid)

Department of Defense R&D Appropriations for FY2004

Bill: Department of Defense Appropriations Act, 2004

Public Law: 108-87 **Enacted:** September 30, 2003 **Effective:** October 1, 2003

Nominal change		Real change		Classification
Millions ($)	YOY%	Millions ($2012)	YOY%	
$6,477.0	11.2%	$6,117.7	8.9%	Exogenous

Congress appropriated another significant increase in real defense R&D appropriations for FY2004, largely motivated by the wars in Afghanistan and Iraq, the broader Global War on Terror, and perceived emerging threats from the "axis of evil" and non-state terrorist groups. Bipartisan support for increased defense funding persisted, partly due to the "deteriorating security situation in Iraq," and Congress continued to appropriate funds for nearly any defense prerogatives of the administration in the aftermath of the 9/11 attacks; defense R&D funds were again prioritized for ballistic missile defense, force modernization, military drone development, counter-terrorism, and bioterrorism concerns. The increase in defense R&D funding again appears to have been motivated by post-9/11 national security concerns and ongoing wars, and appears unrelated to concerns about unemployment or any other short-run macroeconomic prerogatives. As such, we classify this policy event as exogenous. Most pertinent narrative evidence:

- "Today, the gravest danger in the war on terror, the gravest danger facing America and the world, is outlaw regimes that seek and possess nuclear, chemical, and biological weapons. These regimes could use such weapons for blackmail, terror, and mass murder. They could also give or sell those weapons to terrorist allies, who would use them without the least hesitation... this year, for the first time, we are beginning to field a defense to protect this Nation against ballistic missiles." George W. Bush, State of the Union Address, January 28, 2003 (*The American Presidency Project*, by Gerhard Peters and John T. Woolley, https://www.presidency.ucsb.edu/node/211931)
- "I ask you tonight to add to our future security with a major research and production effort to guard our people against bioterrorism, called Project Bioshield. The budget I send you will propose almost $6 billion to quickly make available effective vaccines and treatments against agents like anthrax, botulinum toxin, Ebola, and plague. We must assume that our enemies would use these diseases as weapons, and we must act before the dangers are upon us." (Ibid)
- "The budget for 2004 meets the challenges posed by three national priorities: winning the war against terrorism, securing the homeland, and generating long-term economic growth. Working with our allies and partners, we will face down regimes that govern by fear and deception, and we will devote the necessary resources to protect ourselves and our friends against the use of weapons of mass destruction." (Budget Message of the President, FY2004, February 3, 2003, p. 1)

- "The [House Appropriations] Committee recommends over $1.3 billion for procurement and continued development of unmanned aerial vehicles, nearly a $200 million increase from fiscal year 2003 levels... The Committee believes that unmanned combat aerial vehicles [UCAVs] can provide a unique niche capability, especially in extreme threat environments and suppression of enemy air defenses. The Committee believes that for the UCAV to be viable in an era of stressed budgetary resources, it must be a system that provides a significant increase in capability for a reasonable cost." (H. Rpt. 108-187, July 2, 2003, pp. 3, 209)
- "Driven by the grim reality of soldiers serving and dying on two fronts in south-central Asia, lawmakers dropped virtually all of their disagreements and approved the most expensive defense spending package in history... Partisan politics played almost no part in deliberation on the defense bill... [which provided] $65.2 billion for [R&D], a $7 billion increase over fiscal 2003... Most of the main programs for the Air Force, Navy, and Army were funded at or near the administration requests" ("Record Defense Bill Clears Congress," *CQ Almanac 2003*, 59th ed., 2-42-2-45. Washington, DC: Congressional Quarterly, 2004)
- "[Congress appropriated] $9.1 billion for ballistic missile defense programs, roughly equal to Bush's request but $1.4 billion above the fiscal 2003 level. Democrats remained concerned that work on the program could destabilize efforts to control the spread of nuclear weapons, but they largely chose to ignore the issue, focusing their effort on nuclear research initiatives in other bills." (Ibid)
- "[Congress appropriated] $1.4 billion for procurement and continued development of unmanned vehicles, or drones, an increase of more than $225 million over the fiscal 2003 level. The vehicles had proven particularly useful in identifying and tracking enemy targets in Afghanistan and Iraq and conducting missions considered too dangerous for manned aircraft."
- "With a speed born of the deteriorating security situation in Iraq, House and Senate negotiators pushed the defense bill through conference in just 25 minutes" (Ibid)

Department of Defense R&D Appropriations for FY2011

Bill: Department of Defense and Full-Year Continuing Appropriations Act, 2011

Public Law: 112-10 **Enacted:** April 15, 2011 **Effective:** April 15, 2011

Nominal change		Real change		Classification
Millions ($)	YOY%	Millions ($2012)	YOY%	
-$3,257.0	-4.1%	-$5,606.7	-6.7%	Exogenous

Congress appropriated a decrease in nominal defense R&D funding for FY2011, resulting in a significant, larger decrease in real appropriations, one largely motivated by long-term deficit reduction objectives and partisan budget fights between the Obama administration and House Republicans. The Obama administration had pivoted from prioritizing economic stimulus to negotiating a bipartisan "grand bargain" over long-term deficit reduction—and House Republicans were fixated on cutting government spending after retaking the majority in the 2010 midterms, and unwilling to negotiate on tax increases. With the two parties at loggerheads about budget priorities, the regular order appropriations process broke down for FY2011, and three continuing resolutions avoided a government shutdown and cut spending

slightly below FY2010 funding levels. The Department of Defense and Full-Year Continuing Appropriations Act, 2011 was eventually enacted nearly halfway into the fiscal year, and reduced appropriations by significantly more than the CRs had. The defense appropriations bill was the only one of the twelve bills to see funding levels increased in nominal terms, but appropriations for DOD were well below President Obama's budget request and fell in real terms. Defense R&D took a particular hit as Defense Secretary Robert Gates axed the development of the controversial alternative engine for the F-35 Joint Strike Fighters, cutting $2.2 billion from the program. The Senate Appropriations Committee had proposed a slight increase for DOD RDT&E programs relative to the budget request (S. Rpt. 111-295, p. 128), but the final continuing resolution appropriated $1.2 billion (1.5%) less than the budget request for those programs. The decrease in defense R&D funding appears to have been largely motivated by long-term deficit reduction efforts and appears unrelated to any concerns about unemployment or other short-run macroeconomic objectives. As such, we classify this policy event as exogenous. Most pertinent narrative evidence:

- "By the time I took office, we had a 1-year deficit of over $1 trillion and projected deficits of $8 trillion over the next decade. Most of this was the result of not paying for two wars, two tax cuts, and an expensive prescription drug program. On top of that, the effects of the recession put a $3 trillion hole in our budget... families across the country are tightening their belts and making tough decisions. The Federal Government should do the same. So tonight I'm proposing specific steps to pay for the trillion dollars that it took to rescue the economy last year" Barack Obama, State of the Union Address, January 25, 2011 (*The American Presidency Project*, by Gerhard Peters and John T. Woolley, https://www.presidency.ucsb.edu/node/287936)
- "The Administration is committed to a robust defense against emerging missile threats by deploying technology that is proven, cost-effective, and adaptable for countering an evolving security environment. Starting in 2011, the new Phased Adaptive Approach will guide missile defense architecture. It will feature incremental deployments of increasingly capable sea- and land-based missile interceptors and a range of sensors in Europe to defend against growing ballistic missile dangers. This phased approach will offer more effective defenses against near-term ballistic missile threats and augment the current defense of the U.S. homeland against long-range ballistic missile threats." (Budget of the United States, FY2011, p. 57)
- "A major goal of the Administration is to provide the troops with the most effective and modern equipment possible. To accomplish this, the 2011 Budget continues to develop and procure many advanced weapons systems that support both today's wars and future conflicts. These include: the F-35 Joint Strike Fighter, a new family of ground vehicles, new ships such as the next-generation ballistic missile submarine, and the P-8 aircraft. The Budget also bolsters capabilities in Unmanned Aerial Vehicles, helicopters, and cyber capabilities and electronic warfare, which are key components in the ongoing task of rebalancing the military to focus on current and emerging threats." (Ibid, FY2011, p. 58)
- "With the Nation at war, the Congress has generally supported [DOD] leadership's funding requests to guarantee that the men and women who volunteer to serve this Nation in harm's way are provided everything they need to accomplish their mission. Today, however, the economic situation facing the Nation is also a matter of national security and requires [DOD], like all Government agencies, to improve its stewardship of its resources... The Secretary of Defense should be applauded for trying to gain

greater control over runaway costs, schedule delays, and requirements creep. However, the Committee remains frustrated by the lack of proper control in the Defense budget process as exemplified by the examples listed below... Most disturbing perhaps is the Joint Strike Fighter" (S. Rpt. 111-295, September 16, 2010, pp. 6-7)

- "Deep differences over federal spending priorities and deficit reduction kept the two parties from completing the 2011 appropriations process until the fiscal year was more than halfway over... Few big departments or agencies were spared in the legislation (HR 1473) that trimmed nearly $40 billion in discretionary spending for fiscal 2011... The bill provided $1.05 trillion in discretionary budget authority, a $39.9 billion reduction from existing law, including $12 billion in cuts that had been made in three earlier stopgap measures... The conservative House Republican Study Committee (RSC), buttressed by a sizable class of freshmen swept into office on promises to slash spending, demanded deep cuts. That set up a conflict with the Senate and the White House, both of which had initially balked at any trimming... The Pentagon was the only department to get an increase, although some Defense Department programs got less money than originally planned." ("Parties Face Off Over Fiscal 2011 Bills," *CQ Almanac 2011*, 67th ed., edited by Jan Austin, 2-5-2-7. Washington, DC: CQ-Roll Call Group, 2012)
- "Defense was the only department to receive a funding increase under the spending package (PL 112-10). The bill provided $513 billion in base Defense spending, $5 billion more than enacted in fiscal 2010, although it was roughly $18.1 billion less than the president requested for fiscal 2011... The bill did not include funds for the controversial F-35 Joint Strike Fighter alternative-engine program, which the president and Defense Secretary Robert M. Gates had ordered terminated." ("Appropriations Bills for Fiscal 2011," *CQ Almanac 2011*, 67th ed., edited by Jan Austin, 2-8-2-12. Washington, DC: CQ-Roll Call Group, 2012)

Department of Defense R&D Appropriations for FY2012

Bill: Consolidated Appropriations Act, 2012; Department of Defense Appropriations Act, 2012

Public Law: 112-74 **Enacted:** December 23, 2011 **Effective:** December 23, 2011

Nominal change		Real change		Classification
Millions ($)	YOY%	Millions ($2012)	YOY%	
-$4,651.0	-6.1%	-$5,915.8	-7.6%	Exogenous

Congress appropriated a decrease in nominal defense R&D funding for FY2012, resulting in a significant, larger decrease in real appropriations, one largely motivated by long-term deficit reduction objectives, partisan budget fights between the Obama administration and House Republicans, and newly imposed discretionary spending caps. In 2011, the new Republican majority in the House of Representatives refused to raise the statutory debt ceiling unless met dollar-for-dollar with spending cuts; this tense debt ceiling crisis was resolved by the negotiation of the Budget Control Act of 2011 (BCA). The bill matched an initial $900 billion increase in the debt ceiling with discretionary spending cuts of roughly the same magnitude, to be enforced with caps to both defense and nondefense discretionary spending for the next decade. The BCA also created a Joint Select Committee on Deficit Reduction, tasked with achieving another $1.2-1.5 trillion in deficit reduction, which would be met with an equivalent second increase in the debt ceiling; to compel action, the bill set in

place automatic sequestration mechanism to bluntly cut further into defense and nondefense discretionary spending starting in FY2013, intended to be unappealing to both conservative defense hawks and more liberal representatives. In the aftermath of the Great Recession, the Obama administration remained focused on negotiating a bipartisan "grand bargain" over long-term deficit reduction, and hoped that the Joint Select Committee would produce such a legislative compromise (it did not). The contours of the Global War on Terror had also changed, particularly with the U.S. having killed Osama bin Laden in May 2011, facilitating reductions in defense spending following a decade of hefty defense expenditures since the 9/11 attacks. The Obama administration was also seeking to end the wars in Iraq and Afghanistan, and in October 2011 announced that all remaining U.S. troops would be withdrawn from Iraq by the end of the year. The decrease in defense R&D funding appears to have been largely motivated by long-term deficit reduction efforts and appears unrelated to any concerns about unemployment or other short-run macroeconomic objectives. As such, we classify this policy event as exogenous. Most pertinent narrative evidence:

- "We are living with a legacy of deficit spending that began almost a decade ago... But now that the worst of the recession is over, we have to confront the fact that our Government spends more than it takes in. That is not sustainable... So tonight I am proposing that starting this year, we freeze annual domestic spending for the next five years. Now, this would reduce the deficit by more than $400 billion over the next decade and will bring discretionary spending to the lowest share of our economy since Dwight Eisenhower was President. This freeze will require painful cuts... The Secretary of Defense has also agreed to cut tens of billions of dollars in spending that he and his generals believe our military can do without." Barack Obama, State of the Union Address, January 25, 2011 (*The American Presidency Project*, by Gerhard Peters and John T. Woolley, https://www.presidency.ucsb.edu/node/289120)
- "Now that the threat of a depression has passed, and economic growth is beginning to take hold, taking further steps toward reducing our long-term deficit has to be a priority, and it is in this Budget. The reason is simple: in the long run, we will not be able to compete with countries like China if we keep borrowing more and more from countries like China... Even in areas outside the freeze, we are looking for ways to save money and cut unnecessary costs. At [DOD], for instance, we are reducing its funding by $78 billion over the next 5 years on a course for zero real growth in funding." (Budget Message of the President, FY2012, February 14, 2011, pp. 3-4)
- "The [Senate Appropriations] Committee recommends [RDT&E] appropriations totaling $71,033,956,000 for fiscal year 2012. This is $4,291,126,000 below the budget estimate... These adjustments reflect the following Committee actions: elimination of funds requested for programs that are lower priority, duplicative, or not supported by firm requirements in out-year development or procurement appropriations; deletion of excess funds based on program delays or slow execution; addition of funds to reflect congressional priorities and to rectify shortfalls in the budget estimate; and implementation of recommendations in S. 1253, the National Defense Authorization Act for FY2012" (S. Rpt. 112-77, September 15, 2011, p. 161)
- "Congress cleared the fiscal 2012 Defense spending bill as part of a year-end omnibus appropriations package that President Obama signed into law Dec. 23 (HR 2055—PL 112-74). The bill provided $518.1 billion for the base Pentagon budget—which excluded war funding—an increase of $5 billion from fiscal 2011 but $20.8 billion less than Obama requested... The base Pentagon spending level was driven largely by the

August debt limit law (PL 112-25), which put a $684 billion cap on security spending for fiscal 2012, excluding war-related funding... War fatigue was mounting after years of U.S. involvement in Iraq and Afghanistan, and congressional questions about the war in Afghanistan had grown louder since the May 1 killing of al Qaeda leader Osama bin Laden" ("Defense Accounts Grow Despite Cap," *CQ Almanac 2011*, 67th ed., edited by Jan Austin, 2-20-2-23. Washington, DC: CQ-Roll Call Group, 2012)

Department of Defense R&D Appropriations for FY2013

Bill: Consolidated and Further Continuing Appropriations Act, 2013; Department of Defense Appropriations Act, 2013

Public Law: 113-6 **Enacted:** March 26, 2013 **Effective:** March 26, 2013

Nominal change		Real change		Classification
Millions ($)	YOY%	Millions ($2012)	YOY%	
-$8,707.0	-12.1%	-$9,114.6	-12.7%	Exogenous

Congress significantly decreased both nominal and real defense R&D appropriations for FY2013, largely motivated by long-term deficit reduction, partisan budget fights, and the Budget Control Act of 2011. Democrats and Republicans on the Joint Select Committee on Deficit Reduction failed to reach any semblance of a bipartisan agreement over deficit reduction, and the intentionally bad sequestration policy kicked in for FY2013, albeit with a two-month delay negotiated late in 2012. The sequestration spending cuts came on top of tighter discretionary spending caps set by the same law, again constraining nominal defense and nondefense discretionary spending. Military personnel and funding for ongoing "overseas contingency operations" were exempt from the sequestration spending cuts, but appropriations for defense R&D and procurement took a sizable hit. While deeply unpopular with defense hawks, these cuts to military spending were more politically palatable given the accompanying deep cuts to nondefense discretionary spending, the recent killing of Osama bin Laden, the ongoing draw-down of U.S. combat operations in Afghanistan, and the recent end of U.S. combat operations in Iraq. The decrease in defense R&D funding appears to have been largely motivated by long-term deficit reduction efforts and appears unrelated to any concerns about unemployment or other short-run macroeconomic objectives. As such, we classify this policy event as exogenous. Most pertinent narrative evidence:

- "For the first time in 9 years, there are no Americans fighting in Iraq. For the first time in two decades, Osama bin Laden is not a threat to this country. Most of Al Qaida's top lieutenants have been defeated. The Taliban's momentum has been broken, and some troops in Afghanistan have begun to come home... From this position of strength, we've begun to wind down the war in Afghanistan. Ten thousand of our troops have come home. Twenty-three thousand more will leave by the end of this summer." Barack Obama, State of the Union Address, January 24, 2012 (*The American Presidency Project*, by Gerhard Peters and John T. Woolley, https://www.presidency.ucsb.edu/node/299426)
- "I've proposed a new defense strategy that ensures we maintain the finest military in the world while saving nearly half a trillion dollars in our budget." (Ibid)
- "This budget begins the process of implementing my new defense strategy that reconfigures our force to meet the challenges of the coming decade. Over the past 3 years, we

have made historic investments in our troops and their capabilities, military families, and veterans. After a decade of war, we are at an inflection point: American troops have left Iraq; we are undergoing a transition in Afghanistan so Afghans can assume more responsibility; and we have debilitated al Qaeda's leadership, putting that terrorist network on the path to defeat. At the same time, we have to renew our economic strength here at home, which is the foundation of our strength in the world, and that includes putting our fiscal house in order. To ensure that our defense budget is driven by a clear strategy that reflects our national interests, I directed the Secretary of Defense and military leadership to undertake a comprehensive strategic review... [DOD] will focus modernization on emerging threats and sustaining efforts to get rid of outdated Cold War-era systems so that we can invest in the capabilities we need for the future, including intelligence, surveillance and reconnaissance capabilities." (Budget Message of the President, FY2013, February 13, 2012, p. 3)

- "First, this Budget implements the tight discretionary spending caps that I signed into law in the Budget Control Act of 2011. These caps will generate approximately $1 trillion in deficit reduction over the next decade... Every department will feel the impact of these reductions as they cut programs or tighten their belts to free up more resources for areas critical to economic growth." (Ibid, p. 3)
- "In order to force Congress to act and enact at least $1.2 trillion in deficit reduction, the BCA included an automatic sequester that would cut that same amount beginning in calendar year 2013 if the Joint Select Committee on Deficit Reduction failed. By design, the sequester is not good policy and is meant to force Congress to take action: it would lead to significant cuts to critical domestic programs such as education and research and cuts to defense programs that could undermine our national security. Yet even this strong incentive to action was not enough for Republicans in Congress to agree to ask the wealthiest Americans to pay their fair share in revenue or to close special tax loopholes for large companies; thus, no action was taken, and the sequester was triggered and will take effect in January 2013 if no action is taken... There is time for Congress to pass a balanced, sensible plan to meet the deficit reduction goals of the BCA. And they should act to do so since cuts of this magnitude and done in an across-the-board fashion would be devastating both to defense and non-defense programs. Already, we have reduced spending on these programs, and further cuts would lead to an erosion of services that Americans would not want and undermine our national security in a way that we cannot allow. That is why in this Budget, the President again has put forward a plan that will, together with the deficit reduction enacted last year, cut the deficit by more than $4 trillion over the next decade" (Budget of the United States, FY2013, p. 24)
- "With a sequester poised to take effect in January 2013 that would inflict great damage on critical domestic priorities as well as the country's national security, it is especially important that the Congress come together and pass a balanced deficit reduction plan to replace this sequester and, also, go beyond its required deficit reduction." (Ibid, p. 28)
- "The Budget reflects continued reevaluation of the magnitude and timing of planned modernization efforts to maintain the finest military in the world... For example, expensive programs such as the Joint Strike Fighter, which are designed to counter the potential threat from a sophisticated adversary, will continue but at a reduced level." (Ibid, p. 83)

- "The budget request included $2.8 billion for the research and management activities of [DARPA]. While DARPA's fiscal performance has notably improved, the committee is still concerned about the timeliness of sustained funding execution. The [Senate Armed Services] committee recommends a reduction of $100.0 million from DARPA's overall budget to reflect continuing concerns about timely and effective execution of funds by the agency, as well as concerns about specific programs." (S. Rpt. 112-173, June 4, 2012, pp. 56-57)
- "Due to budget reductions mandated by the Budget Control Act, [DOD] was required to reduce its planned spending over the next decade. The [Senate Appropriations] Committee fully supports efforts to bring down the Nation's deficit but is concerned about the Department's approach to meet the targets set in the Budget Control Act. The Committee believes that instead of correcting years of poor fiscal discipline, the Department chose to make substantial reductions in force structure and take risks in meeting U.S. military commitments around the globe. Over the past several years, Congress has sustained the current force structure while finding tens of billions of dollars in annual savings by scrutinizing the budget request and removing funds from troubled programs, duplicative requests, and overstatement of certain funding requirements." (S. Rpt. 112-196, August 2, 2012, p. 6)
- "Even more, as President Obama—who has placed some of the military's long-favored weapons programs in his sights—continues to negotiate with Congress over a spending and revenue deal, Pentagon officials acknowledge they are bracing for a protracted period in which they may have to manage even larger budget reductions than anticipated... The message is that while the leadership hopes to dampen the impact of across-the-board spending cuts, there is a new Pentagon reality, and everyone must deal with it." ("Hagel Warns of Big Squeeze at the Pentagon," by Thom Shanker, *New York Times*, March 31, 2013)
- "The House passed a fiscal 2013 Republican-sponsored Defense spending bill that would have boosted Pentagon funds beyond limits set in the 2011 Budget Control Act (PL 112-25). Senate Democratic appropriators stuck with the spending caps, but did so partly by shifting money from the base Pentagon budget to the Overseas Contingency Operations account, which funded operations in Afghanistan and Iraq and did not count under the statutory caps..." ("Annual Spending Bills Languish," *CQ Almanac 2012*, 68th ed., 2-6-2-15. Washington, DC: CQ-Roll Call Group, 2013)
- "Defense Secretary Leon E. Panetta criticized House lawmakers for exceeding the funding limits laid out in the budget control law. That prompted Armed Services Chairman Howard "Buck" McKeon, R-Calif., to write a letter to Panetta saying that "those caps take [DOD] right to the razor's edge. They cut through any fat that may have existed and right into the muscle." ("More Money, More Weapons OK'd After Debates on Detainees, Biofuels," *CQ Almanac 2012*, 68th ed., 6-3-6-6. Washington, DC: CQ-Roll Call Group, 2013)
- "Congress in March cleared a broad appropriations measure to finance government activities for the balance of fiscal 2013, after having completed work on none of the 12 regular appropriations bills for the year... For the Defense title, which includes nuclear weapons programs run by the Energy Department, the omnibus provided an aggregate of $605.3 billion before the sequester is taken into account, including $518.1 billion in base appropriations for the Pentagon, roughly equal to fiscal 2012 spending. The bill provided an additional $87.2 billion for overseas contingency operations, most of which

was associated with the war in Afghanistan. [OMB] estimated that the sequester would cut most defense accounts by 7.8 percent in fiscal 2013, while spending on military personnel and most war operations was exempt ("Bipartisan Hybrid Bill Finances 2013," *CQ Almanac 2013*, 69th ed., 2-34-2-35, 2014)

Department of Defense R&D Appropriations for FY2016

Bill: Consolidation Appropriations Act, 2016; Department of Defense Appropriations Act, 2016

Public Law: 114-113 **Enacted:** December 18, 2015 **Effective:** December 18, 2015

Nominal change		Real change		Classification
Millions ($)	YOY%	Millions ($2012)	YOY%	
$5,327.0	8.4%	$5,594.2	9.1%	Exogenous

Congress significantly increased both nominal and real defense R&D appropriations for FY2016, largely motivated by growing frustration with the across-the-board sequestration spending cuts imposed by the Budget Control Act of 2011, now outweighing earlier concerns about long-term deficit reduction. The Bipartisan Budget Act of 2013 (Pub. L. 113-67) had eased sequestration spending cuts for FY2014-2015, but they were slated to take full effect again in FY2016. The discretionary spending caps and automatic sequester, which was designed to be politically painful for both parties and thus compel compromise over a long-term deficit reduction deal, was proving deeply unpopular. Defense hawks in the House of Representatives tried to skirt the defense sequestration spending limits using a budget gimmick (using a sequestration-exempt emergency war designation for general operations and maintenance funding) in the National Defense Authorization Act for FY2016, leading President Obama to veto that first version brought to his desk; the president then negotiated a two-year budget deal—the Bipartisan Budget Act of 2015 (Pub. L. 114-74)—that again provided "relief" from sequestration for both defense and nondefense discretionary spending. New emerging threats and national security concerns were also brewing, notably the U.S.-led fight against the Islamic State of Iraq and the Levant (ISIL) terrorist group, Russia's recent annexation of Crimea and involvement in the ongoing Syrian civil war, and concerns about Iran's nuclear weapons program. The increase in defense R&D funding appears to have been motivated by new national security concerns and bipartisan agreement to ease long-term deficit reduction plans, and does not appear to have been influenced by any concerns about unemployment or other short-run macroeconomic prerogatives. As such, we classify this policy event as exogenous. Most pertinent narrative evidence:

- "In Iraq and Syria, American leadership—including our military power—is stopping ISIL's advance. Instead of getting dragged into another ground war in the Middle East, we are leading a broad coalition, including Arab nations, to degrade and ultimately destroy this terrorist group. We're also supporting a moderate opposition in Syria that can help us in this effort and assist people everywhere who stand up to the bankrupt ideology of violent extremism..." Barack Obama, State of the Union Address, January 20, 2015 (*The American Presidency Project*, by Gerhard Peters and John T. Woolley, https://www.presidency.ucsb.edu/node/308225)
- "The Budget supports our efforts to degrade and ultimately destroy ISIL. We are leading over 60 partners in a global effort that will take time and steady resolve. As I made clear in my State of the Union address, I am calling on Congress to show

the world that we are united in this mission by passing a bill to authorize the use of force against ISIL. The Budget supports our efforts to counter Russian pressure and aggressive actions in concert with our European allies, by funding support for Ukraine's democracy and efforts to reassure our NATO allies." (Budget Message of the President, FY2016, February 2, 2015, p. 3)

- "When Congress failed to enact the balanced long-term deficit reduction required by the Budget Control Act of 2011, a series of automatic cuts known as sequestration went into effect, canceling more than $80 billion in budgetary resources across the Federal Government in 2013. Beyond the economic impacts, these cuts also had severe programmatic impacts, shortchanging investments that contribute to future growth, reducing economic opportunity, and harming vulnerable populations... While the Bipartisan Budget Act of 2013 replaced a portion of the damaging and short-sighted sequestration cuts in 2014 and 2015 with long-term reforms, they did not go far enough. Without further congressional action, sequestration will return in full in 2016, bringing discretionary funding—or, spending that is approved through the appropriations process—to its lowest level in a decade, adjusted for inflation. In fact, assuming roughly the current allocation of resources across programs, a return to sequestration levels in 2016 would mean the lowest real funding level for research since 2002—other than when sequestration was in full effect in 2013..." (Budget of the United States, FY2016, p. 9)
- "Today I have signed into law S. 1356, the "National Defense Authorization Act for Fiscal Year 2016." I vetoed an earlier version of this legislation that failed to authorize funding for our national defense in a fiscally responsible manner. As I noted at the time, my first and most important responsibility, as President and Commander in Chief, is keeping the American people safe. The bill that Congress originally presented to me was not acceptable. In addition to authorizing inadequate funding for our military, it would have prevented a range of necessary military reforms... Following my veto of the previous bill, Congress approved—and I have signed into law—the "Bipartisan Budget Act of 2015," which revises discretionary spending caps for fiscal years 2016 and 2017 by providing significant relief from sequestration for both defense and non-defense priorities. The agreement in place helps ensure that relief from sequestration is paid for in a balanced way. The Congress has now revised the National Defense Authorization Act to incorporate these new funding changes and has altered the funding authorization provisions to which I objected." Barack Obama, Statement on Signing the National Defense Authorization Act for Fiscal Year 2016, November 25, 2015 (*The American Presidency Project*, by Gerhard Peters and John T. Woolley, https://www.presidency.ucsb.edu/node/311598)
- "Congress completed a $607 billion, fiscal 2016 defense authorization bill (S 1356) on Nov. 10, the eve of Veterans Day, but only after reaching a two-year budget agreement with President Barack Obama to raise overall spending levels. Obama had vetoed an earlier version of the legislation (HR 1735) over the inclusion of $38 billion in additional war funds to evade defense spending limits, with no guarantee that domestic spending would get the same relief... During the rare, but brief, public veto ceremony, Obama said the bill "falls woefully short" in abiding by sequestration spending caps, rejecting cost savings measures requested by the Pentagon" ("Defense Authorization Agreement Helped by Increases in Budget Deal," *CQ Almanac 2015*, 71st ed., edited by CQ-Roll Call, 5-3-5-14. Washington, DC: CQ-Roll Call, Inc., 2016)
- "House and Senate appropriators agreed in December to a fiscal 2016 defense spend-

ing measure with $572.7 billion for the Pentagon, including $514.1 for its base budget and another $58.6 billion for operations overseas in Afghanistan, Iraq, and the general war or terrorism. The measure's total was $18.5 billion more than the fiscal 2015 level, including $23.9 billion more for the department's base budget... than in Fiscal 2015... The bill provided approximately $10 billion for missile defense programs, including $488 million for cooperative missile defense programs with Israel, $330 million more than requested. It also appropriated $228 million to develop a next-generation rocket propulsion system that is made in the United States ($144 million more than requested)..." ("DOD Spending Is Half of the Omnibus," *CQ Almanac 2015*, 71st ed., edited by CQ-Roll Call, 2-12-2-13. Washington, DC: CQ-Roll Call, Inc., 2016)

Department of Defense R&D Appropriations for FY2018

Bill: Consolidated Appropriations Act, 2018; Department of Defense Appropriations Act, 2018

Public Law: 115-141 **Enacted:** March 23, 2018 **Effective:** March 23, 2018

Nominal change		Real change		Classification
Millions ($)	YOY%	Millions ($2012)	YOY%	
$18,016.0	24.5%	$15,291.5	21.7%	Exogenous

Congress significantly increased both nominal and real defense R&D appropriations for FY2018, largely motivated by President Trump's desired "great rebuilding of the Armed Forces" and mounting frustration with the discretionary spending caps and automatic sequestration budget cuts that had been imposed since FY2011 and FY2013, respectively, by the Budget Control Act of 2011. The Bipartisan Budget Act of 2015 had provided "relief" from sequestration for FY2016 and FY2017, but the automatic cuts were slated to take full effect again in FY2018, which neither party was keen on. In his State of the Union address, President Trump promised to eliminate the defense sequester so his budget could fund "one of the largest increases in national defense spending in American history." Compromise on reversing sequestration again proved easier than bipartisan agreement on long-term deficit reduction; the Bipartisan Budget Act of 2018 (Pub. L. 115–123), enacted on February 9, 2018, increased the defense and nondefense discretionary spending caps, paving the way for a sizable increase in defense R&D appropriations, among other areas of discretionary spending. The war against Islamic State, concerns about Iran's nuclear weapons and ballistic missile programs, and geopolitical competition with China weighed on defense policy. Missile defense R&D and development of the F-35 Joint Strike Fighter remained top defense priorities, as well as countering emerging and asymmetric threats more broadly. The increase in defense R&D funding appears to have been motivated by national security concerns and bipartisan agreement to ease long-term deficit reduction plans, and does not appear to have been motivated by concerns about unemployment or other short-run macroeconomic prerogatives. As such, we classify this policy event as exogenous. Most pertinent narrative evidence:

- "President Trump signed an executive order Friday to launch what he called a "great rebuilding of the Armed Forces" that is expected to include new ships, planes, and weapons and the modernization of the U.S. nuclear arsenal... The order calls for new Defense Secretary Jim Mattis to carry out a 30-day "readiness review" that is expected to examine needs for the war against the Islamic State, along with training,

equipment maintenance, munitions, modernization, and infrastructure. A draft of the order obtained by *The Washington Post* on Thursday also said it would examine how to carry out operations against unnamed "near-peer competitors," a term that U.S. officials typically use to mean China and Russia, but that language is not in the final version." ("Trump promises 'great rebuilding of the Armed Forces' while signing executive order at the Pentagon," by Dan Lamothe, *The Washington Post*, January 27, 2017)

- "Finally, to keep America safe, we must provide the men and women of the United States military with the tools they need to prevent war. If they must, they have to fight, and they only have to win. I am sending Congress a budget that rebuilds the military, eliminates the defense sequester, and calls for one of the largest increases in national defense spending in American history" Donald J. Trump, State of the Union Address, February 28, 2017 (*The American Presidency Project*, by Gerhard Peters and John T. Woolley, https://www.presidency.ucsb.edu/node/323680)
- "The budget proposal that will be unveiled by Mr. Trump's White House on Thursday represents the most dramatic shift in how national resources are divided up of any presidential spending plan since Ronald Reagan... Mr. Trump wants to slash deeply into domestic and international programs to pay for a large military buildup and protect Social Security and Medicare without increasing the deficit or raising major taxes." ("In Trump Budget, More for Military, as His Supporters May Lose Out," by Peter Baker, *New York Times*, March 15, 2017)
- "As promised, I directed [DOD] to develop a plan to demolish and destroy ISIS, a network of lawless savages that have slaughtered Muslims and Christians, and men and women and children of all faiths and all beliefs... I have also imposed new sanctions on entities and individuals who support Iran's ballistic missile program and reaffirmed our unbreakable alliance with the State of Israel." (Ibid)
- "To unleash the power of American work and creativity—and drive opportunity and faster economic growth—we must reprioritize Federal spending so that it advances the safety and security of the American people. This Budget, therefore, includes $639 billion for [DOD]—a $52 billion increase from the 2017 annualized continuing resolution level... This defense funding is vital to rebuilding, modernizing, and preparing our Armed Forces for the future so that our military remains the world's preeminent fighting force..." (Budget Message of the President, FY2018, May 23, 2017, p. 2)
- "The Budget fully reverses the defense sequestration by increasing funding for national defense by $54 billion above the cap in current law, and fully offsets this increase. This includes a $52 billion increase for the DOD, as well as $2 billion of increases for other national defense programs. Since defense sequestration was first triggered in 2013, the world has grown more dangerous due to rising terrorism, destabilizing technology, and increasingly aggressive potential adversaries. Over the same period, our military has become smaller, and deferred training, maintenance, and modernization have degraded its ability to prepare for future war while sustaining current operations. The President's Budget ends this depletion and begins to rebuild the U.S. Armed Forces, laying the groundwork for a larger, more capable, and more lethal joint force consistent with a new National Defense Strategy." (Budget of the United States, FY2018, p. 17)
- "The Committee is increasingly concerned with the deterioration of military readiness for the full spectrum of conflict as well as the dire need for modernization to maintain

the United States technological advantage, including a credible strategic deterrent... Just as a national defense-oriented toward a Cold War, a garrison-based posture left the military somewhat ill-prepared for the expeditionary and counterinsurgency-focused nature of recent conflicts, the recent emphasis on dangerous but highly asymmetrical adversaries has required the military to delay or trade away the capabilities that will be needed to counter peer and near-peer competitors that have been aggressively investing in military technology to counter or reverse United States dominance in all domains. This factor has compounded a growing deficit of modernization that can be traced back to the "procurement holiday" of the 1990s." " (H. Rpt. 115-219, July 13, 2017, p. 3)

- "The [National Defense Authorization for FY2018] legislation authorized $692.1 billion for the Pentagon, $26.4 billion more than the president's request... Because the measure had $77.3 billion more than permitted for fiscal year 2018 under the 2011 Budget Control Act (PL 112-25), appropriators would be unable to spend the total authorized in the defense bill unless Congress raised the budget caps to unprecedented levels, or eliminated them completely." ("$692.1 Billion Defense Authorization Increases 'End Strength,' Adds Warships." In CQ Almanac 2017, 73rd ed., edited by CQ-Roll Call, 6-3-6-11. Washington, DC: CQ-Roll Call, Inc., 2018)
- "The FY2018 defense appropriations bill, Division C of the Consolidated Appropriations Act of 2018 (H.R. 1625; P.L. 115-141), appropriates $647 billion for [DOD]. This amounts to an increase of $61 billion (about 10%) over the enacted FY2017 level and an increase of $24 billion over the President's FY2018 budget request for such activities... Lawmakers funded all titles in the defense bill at amounts higher than enacted FY2017 levels... (RDT&E) increased 22% to $88 billion... discretionary base defense funding provided by Division C of H.R. 1625... would bring total FY2018 discretionary appropriations for national defense (budget function 050) to $629 billion—the amount allowed by the revised discretionary spending cap enacted in February under the Bipartisan Budget Act of 2018." ("FY2018 Defense Appropriations Act: An Overview," by Congressional Research Service, April 5, 2018)

4.2 Narrative Analysis of Energy R&D Appropriations

The Department of Energy of present day evolved from the wartime Manhattan Project that researched, developed, and tested the first atomic weapons during WWII. Shortly after the war, the Atomic Energy Act of 1946 (PL 79-595) established the U.S. Atomic Energy Commission and transferred the work of the Manhattan Project to the new agency, and with it nuclear energy research was deliberately shifted from military to civilian oversight. But the newly created AEC had dual military and civilian objectives in building upon recent wartime breakthroughs in nuclear fission. As WWII quickly morphed into the Cold War, the AEC raced to develop more powerful hydrogen bombs and thermonuclear weapons harnessing the power of nuclear fusion reactions, and a new naval nuclear reactor R&D program sought to vastly extend the range and deployment of U.S. warships, particularly submarines and aircraft carriers. The AEC also led the development of the U.S. civilian nuclear energy industry, which was a top priority of President Eisenhower, who was keen on channeling the wartime nuclear weapons programs into "Atoms for Peace."

The OPEC embargo and 1973 oil crisis spurred major changes in U.S. energy policy and reorganizations of related federal agencies. The Energy Reorganization Act of 1974 (PL

93-438) abolished the AEC and split its activities into two new agencies: ERDA, charged with developing and maintaining nuclear weapons, advancing civilian nuclear power, and researching other energy sources, and the Nuclear Regulatory Commission (NRC), tasked with regulating the civilian nuclear power industry. President Nixon created a Federal Energy Office in December 1973 to oversee the U.S. response to the energy crisis, and the following year the Federal Energy Administration Act of 1974 created the Federal Energy Administration, superseding and replacing the Federal Energy Office. The Federal Energy Administration was originally tasked with regulating fuel pricing and supply and collecting data on and energy use and production. Shortly thereafter, the Department of Energy Organization Act of 1977 (PL 95–91) merged ERDA and Federal Energy Administration into DOE, a single cabinet level agency. In 2000, following the Wen Ho Lee spy scandal and heightened concerns about the nuclear security secrets, Congress created the National Nuclear Security Administration (NNSA) as a semi-autonomous agency within DOE; NNSA took over research, development, testing, and maintenance of U.S. nuclear weapons as well as naval nuclear reactor programs, in addition to nuclear nonproliferation work and maintaining the security of the U.S. nuclear arsenal and classified weapons technology.

DOE oversees the system of National Laboratories, which also largely evolved out of scientific efforts during WWII, particularly the Manhattan Project's network of research sites (DOE 2020). There are currently 17 National Labs, all but one of which are structured as FFRDCs, public-private partnerships operated by universities, firms, or nonprofits but owned and funded by the federal government. While other federal agencies also oversee FFRDCs, DOE is unique in the scale at which provides funding through the national labs; as of FY2019, DOE accounted for 57% of all federal obligations for FFRDCs and 58% of its R&D budget was for FFRDCs (CRS 2020).[21] DOE's Office of Science oversees the Lawrence Berkeley National Laboratory (Berkeley, California), Oak Ridge National Laboratory (Oak Ridge, Tennessee), Argonne National Laboratory (DuPage County, Illinois), Ames National Laboratory (Ames, Iowa), Brookhaven National Laboratory (Upton, New York), Princeton Plasma Physics Laboratory (Princeton, New Jersey), SLAC National Accelerator Laboratory (Menlo Park, California), Pacific Northwest National Laboratory (Richland, Washington), Fermi National Accelerator Laboratory (Batavia, Illinois), and the Thomas Jefferson National Accelerator Facility (Newport News, Virginia). The NNSA oversees the Los Alamos National Laboratory (Los Alamos, New Mexico), Sandia National Laboratories (Albuquerque, New Mexico), and the Lawrence Livermore National Laboratory (Livermore, California). DOE's Office of Energy Efficiency and Renewable Energy oversees the National Renewable Energy Laboratory (Golden, Colorado), the Office of Environmental Management oversees the Savannah River National Laboratory (Aiken, South Carolina), the Office of Nuclear Energy oversees the Idaho National Laboratory (Idaho Falls, Idaho), and the Office of Fossil Energy & Carbon Management oversees the National Energy Technology Laboratory (with three sites in Albany, Oregon; Morgantown, West Virginia; and Pittsburgh, Pennsylvania).

The Lawrence Berkeley National Laboratory and the precursors of the National Energy Technology Laboratory were the only of these national labs predating WWII, and many present-day national labs were established as part of the Manhattan Project, notably the Oak Ridge National Laboratory, Argonne National Laboratory, Ames National Laboratory, Pacific Northwest National Laboratory, Los Alamos National Laboratory, and the Lawrence Livermore National Laboratory; Brookhaven National Laboratory and Sandia National Lab-

[21] For comparison, NASA and DOD provided 20.9% and 14.1% of funding for FFRDCs, respectively; 20.3% of NASA's R&D budget goes to FFRDCs, whereas only 3.7% of DOD's R&D budget is for FFRDCs.

oratories were also established shortly after the war's end to continue related work. Other national labs were established to tackle new post-war challenges. For instance, the National Renewable Energy Laboratory (originally the Solar Energy Research Institute) was established in 1977 in response to the OPEC oil shock.

Today, DOE's R&D activities remain split between national security functions and civilian energy and scientific research functions, the former still overwhelmingly for nuclear weapons activities and naval reactor programs. Nondefense science and technology functions span advancing research in the "physical, chemical, biological, materials, and computational and information sciences" as well as R&D efforts for the safe production of nuclear energy, other renewable energy sources, cleaner uses of nonrenewable energy, environmental remediation, energy safety, and promoting energy security and independence more broadly (DOE 2020). NNSA's national security R&D activities are classified as federal "national defense" gross investment in R&D and DOE's other civilian R&D activities are classified as federal "nondefense" R&D investment in the NIPAs. For a better mapping to NIPA R&D data and firm- or industry-level data, we bifurcate DOE's R&D appropriations into defense (or "national security") functions and nondefense functions; see Appendix Section A.2 for details about classification and quantification. However, because both functions have been governed by the same appropriations subcommittees and bills, and budgetary trade-offs often arise within those appropriation bills, we analyze both functions simultaneously in this subsection.

Energy R&D Appropriations for FY1949

Bill: The Supplemental Independent Offices Appropriation Act, 1949

Public Law: 80-862 **Enacted:** June 30, 1948 **Effective:** July 1, 1948

Function	Nominal change		Real change		Classification
	Millions ($)	YOY%	Millions ($2012)	YOY%	
Defense	-$16.2	-9.5%	-$120.3	-11.4%	Exogenous
Nondefense	-$39.2	-31.3%	-$245.1	-32.7%	Exogenous

Congress appropriated a decrease in nominal energy R&D funding for both defense and nondefense functions in FY1949, resulting in significant, larger decreases in real appropriations for the AEC. The reduction in funding was in part driven by frustration amongst members of the House Appropriations Committee, which viewed the AEC as uncooperative and operating on a "lavish" budget, but also fit into a broader deficit reduction program; the House approved considerably less funding for the AEC than had been requested by the Truman administration, which viewed developing atomic energy as key for long-term economic growth as well as for national security objectives. The budget cuts do not appear to have been motivated by concerns about inflation or other short-run macroeconomic prerogatives. As such, we classify this policy event as exogenous. Most pertinent narrative evidence:

- "We are today far short of the industrial capacity we need for a growing future... The industrial application of atomic energy and other scientific advances will constantly open up further opportunities for expansion." Harry S. Truman, State of the Union Address, January 7, 1948 (*The American Presidency Project*, by Gerhard Peters and John T. Woolley, https://www.presidency.ucsb.edu/node/232897)
- "The key objectives of the natural resources program in the fiscal year 1949 are to find new reserves, to reduce destruction and waste, to discover new applications of resources,

to promote greater reliance on resources known to be abundant, and particularly to develop the use of atomic energy" (Budget Message of the President, FY1949, January 6, 1948, pp. M39-39)

- "Our responsibilities for safeguarding the national defense and developing peacetime applications of atomic energy require new laboratories, new production plants, and training of an increasing number of scientists and technicians. Increased expenditures in the fiscal year 1949 are required." (Ibid, p. M40)
- "The [AEC], established pursuant to the Atomic Energy Act of 1946, received its first independent appropriation in fiscal year 1948. The functions of the Commission are a continuation and expansion of the [R&D] inaugurated under the Manhattan Engineer District of the Department of the Army... The Commission is charged with the development and production of fissionable materials and atomic weapons, with research leading to beneficent uses of atomic energy to improve the public welfare, with control of scientific and technical information to safeguard national security, and with dissemination of nonrestricted data to encourage scientific progress... The increase in obligational authority requested both in 1948 and 1949 arises from the necessity for improving technical processes, expanding both basic and applied research programs, advancing research in radiobiology and medicine, replacing obsolete production and community facilities, and expanding essential plant facilities" (Budget of the United States, FY1949, p. 48)
- "The [House Appropriations] committee is not satisfied with its relations to date with the [AEC]. The committee is fully aware of the vital importance, particularly under present world conditions, of the work of the commission and of the technical aspects associate with it and is desirous of making every provision for its adequate support... There is some feeling among the membership of the committee that the Commission has taken advantage of its strategic position in modern military defense to avoid facing the practical realities of less important and subsidiary elements of their budget... The reductions imposed by the committee are to be absorbed in other items without affecting the military phases" (H. Rpt. 80-2245, June 8, 1948, pp. 2-4)
- "Sharp differences of opinion as to the type and quantity of information that should be made available to the [House Appropriations] committee by the [AEC] created heated discussion between committee members and David E. Lilienthal, AEC Chairman... The brief debate on the floor centered around amounts the AEC was reported to have spent for various items" ("Supplemental Appropriations–Independent Offices," *CQ Almanac 1948*, 4th ed., 114-16. Washington, DC: Congressional Quarterly, 1949)
- "Pushing its economy drive, the house today voted to cut 504 million dollars from appropriations for six agencies, including the Atomic Energy Commission... The house also supported the committee's attack on the Atomic Energy Commission for engaging in "general extravagance" and cut its appropriation by $48,150,000 to $501,850,000. The cut is applicable to the Commission's 10 percent nonmilitary activities and not the development and production of new atomic weapons... Chairman Wigglesworty (R., Mass.), of the appropriations subcommittee which prepared the bill, told the house that the AEC has not co-operated with the committee in supplying essential information on its budget and is operating "on a basis of lavish expenditures." ("504 Million Cut From Funds of 6 Agencies: House Also Votes to Abolish WAA," by Chicago Tribune Press Service, *Chicago Tribune*, June 10, 1948)

Energy R&D Appropriations for FY1950

Bill: Independent Offices Appropriation Act, 1950

Public Law: 81-266 **Enacted:** August 24, 1949 **Effective:** August 24, 1949

Function	Nominal change		Real change		Classification
	Millions ($)	YOY%	Millions ($2012)	YOY%	
Defense	$38.9	25.0%	$230.5	24.5%	Exogenous
Nondefense	$5.3	6.2%	$29.0	5.8%	Exogenous

Congress appropriated a significant increase in nominal and real energy R&D funding for both the defense and nondefense functions of the AEC in FY1950. The increase in scientific funding was largely motivated by national security concerns as the Cold War escalated; any semblance of budgetary restraint was lifted for atomic weapons programs and reactor development, and the development of more advanced nuclear weapons was a top national priority. More broadly, the Truman administration was keen to keep the U.S. ahead of the Soviet Union in the field of atomic science, and relatedly, to continue expanding the training of atomic scientists and engineers; the FY1950 budget request reflected these priorities. The House Appropriations concurred that AEC's weapons and naval reactor programs were "of the utmost importance to our national security" and funded both requests fully, as did their Senate counterparts; both committees prioritized these defense functions over everything unrelated to national security. The policy changes do not appear to have been motivated by concerns about unemployment or other short-run macroeconomic prerogatives. As such, we classify these policy events as exogenous. Most pertinent narrative evidence:

- "To an increasing extent our national welfare and security are linked to our atomic energy program. We must continue to add to our knowledge of this resource and move ahead with practical development. Special emphasis is given to the development of nuclear reactors as an eventual means for converting atomic energy into electricity and into power for the propulsion of ships and airplanes. The 1950 Budget provides increased funds for the production of fissionable materials and the development of the science and technology of atomic energy. The present high costs of rapidly accomplishing these purposes must be balanced against the ultimate and far greater costs of failure to move ahead vigorously in this field." (Budget Message of the President, FY1950, January 3, 1949, p. M53)
- "The development of electrical and propulsive power from atomic energy is a major objective. Before the technical feasibility of power applications can be demonstrated, more [R&D] will be required in the field of nuclear reactors. Problems of nuclear propulsion of ships and aircraft are a part of this research. The Commission is intensifying its work in this important field." (Budget of the United States, FY1950, p. 45)
- "The Commission has expanded the distribution of radioisotopes produced by the Commission for research in medicine, biology, and the physical sciences, and for agricultural and industrial research. These isotopes constitute the first great contribution of atomic energy to peacetime welfare... Research in basic physical science, together with research in medicine and biology, is fundamental to progress in atomic energy. Expenditures for research by the Commission, including commitments for the training of atomic scientists and technicians, have been growing... In terms of obligational authority, the budget would provide $792 million for 1950 as compared to $661.8 million for 1949." (Ibid, p. 45)

- "These two programs, dealing with projects that might be described as our first line of defense are regarded as of the utmost importance to our national security and the committee does not feel justified in effecting economies in this field of atomic development... Referring to the reductions made by the committee in other programs it is believed that sufficient funds and authorizations have been allowed to permit continuation and obtain satisfactory progress in the several fields in which the commission is operating. However, there is no intention to cripple any activity of this important agency..". (H. Rpt. 81-425, April 11, 1949, p. 7)
- "The [Senate Appropriations] committee was unanimous in its wish to maintain the level of the programs procuring and processing source and fissionable materials and the weapons production, as well as that portion of the reactor program dealing with military needs... Curtailment of activity is thus recommended to be made in other fields of commission operations such as administration, community programs, biology and medicine, physical research, and to such aspects of reactor development as are not immediately necessary for national security" (S. Rpt. 81-639, June 2, 1949, p. 3)
- "The [House Appropriations] Committee said that it had pruned down requests for funds to operate a number of programs as a means of putting the agencies involved "on a basis more nearly comparable to their present requirements." Some agencies had expanded greatly during the war, it pointed out, and had to scale down their operations to a peace-time economy. Two programs left untouched by the Committee knife were the weapons and reactor development of the AEC. They were "of the utmost importance to our national security," it stated in refusing to touch this third of the AEC budget" ("Independent Offices," *CQ Almanac 1949*, 5th ed., 03-202-03-208. Washington, DC: Congressional Quarterly, 1950)
- "[The Senate Appropriations Committee] did not change House figures for the [AEC]. It said it was 'unanimous in its wish to maintain the level of the programs of procuring and processing source and fissionable materials and of weapons production, as well as that portion of the reactor program dealing with military needs.' It directed the Commission not to make any change in this program. On the other hand, it recommended curtailment of activity in other fields of AEC operations, such as administration, community programs, biology, medicine, physical research, and such aspects of reactor development as are not immediately necessary for national security. It also recommended that the Commission present improved budget estimates next fiscal year and recommended an amendment to provide closer supervision by the Budget Bureau and the Appropriations Committees over the cash and contract authority expended in construction by AEC" (Ibid)
- "President Truman declared today that Americans and all who rely upon the strength of the United States "have reason for reassurance and faith" in the progress the nation has made in the development of atomic energy... He stressed that it was important that the program "continue to go forward with undiminished momentum and effectiveness." The AEC report stated that "new and more effective atomic weapons"—tested at Eniwetok in 1948—were in production and told of other "changes and advances in all phases of the atomic energy program" ("Wide Atomic Gain Hailed by Truman; Bomb Output Rises: President Says," by Clayton Knowles, *New York Times*, August 2, 1949)

Energy R&D Appropriations for FY1951

Primary Bill: General Appropriations Act, 1951

Public Law: 81-759 **Enacted:** September 6, 1950 **Effective:** September 6, 1950

Secondary: Supplemental Appropriation Act, 1951

Public Law: 81-843 **Enacted:** September 27, 1950 **Effective:** September 27, 1950

Tertiary: Second Supplemental Appropriation Act, 1951

Public Law: 81-911 **Enacted:** January 6, 1951 **Effective:** January 6, 1951

Quaternary: Fourth Supplemental Appropriation Act, 1951

Public Law: 82-43 **Enacted:** May 31, 1951 **Effective:** May 31, 1951

Function	Nominal change		Real change		Classification
	Millions ($)	YOY%	Millions ($2012)	YOY%	
Defense	$93.5	48.1%	$460.0	39.3%	Exogenous
Nondefense	-$6.9	-7.6%	-$69.7	-13.1%	Exogenous

Congress appropriated a significant increase in funding for defense R&D functions of the AEC in FY1951, overwhelmingly motivated by national security concerns following the Soviet Union's first atomic weapons test and then the start of the Korean War. The Soviet Union was known to be developing its own atomic weapons, and detonated its first nuclear device on August 29, 1949, just days after the FY1950 appropriations bill was enacted and much earlier than expected; as it turned out, Soviet spies had stolen blueprints from the Manhattan Project, significantly accelerating their progress with nuclear weapons development and testing. North Korea's invasion of South Korea—backed by China and the Soviet Union—in June 1950 compounded the heightened sense of urgency about accelerating U.S. nuclear weapons programs after losing a monopoly on the technology; following a significant increase in AEC funding through the regular order FY1951 appropriations bill, three of the wartime emergency supplemental appropriations bills provided additional funding for atomic weapons programs and reactor development shortly after the outbreak of the war. Civilian atomic energy and other scientific research programs saw a decrease in funding as military purposes were prioritized. The policy changes do not appear to have been motivated by concerns about unemployment or other short-run macroeconomic prerogatives. As such, we classify these policy events as exogenous. The General Appropriations Act, 1951 and Supplemental Appropriation Act, 1951 resulted in a relatively muted change in real appropriations for the defense R&D functions of the AEC for FY1951, so this policy event is instead dated to 1951Q1, when the Second Supplemental Appropriation Act, 1951 took effect, resulting in a significant increase. The decrease in real funding for nondefense R&D functions of the AEC are, however, dated to 1950Q3, based on the former two laws. Most pertinent narrative evidence:

- "The value of our natural resources is constantly being increased by the progress of science. Research is finding new ways of using such natural assets as minerals, seawater, and plant life. In the peaceful development of atomic energy, particularly, we stand on the threshold of new wonders. The first experimental machines for producing useful power from atomic energy are now under construction. We have made only the first beginnings in this field, but in the perspective of history they may loom larger than the first airplane, or even the first tools that started man on the road to civilization." Harry S. Truman, State of the Union Address, January 4, 1950 (*The American Presidency Project*, by Gerhard Peters and John T. Woolley, https://www.presidency.ucsb.edu/node/231027)

- "The United States is seeking both to develop atomic energy for national defense purposes and to realize the great promise in its use for industrial and other peacetime purposes. Our atomic energy development program is a large venture in diverse fields—scientific research, medicine, engineering, and industry—and will continue to require substantial outlays in the next few years. The 1951 expenditures include increased amounts for the production of fissionable materials and weapons, and for the advancement of the science and technology of atomic energy, including accelerated construction of new facilities and development of new types of nuclear reactors. It is principally through the development of new reactors to produce fissionable materials and radioisotopes, generate power, and propel ships and aircraft, that the [AEC] expects to evolve means of utilizing for peaceful purposes the energy released by nuclear fission." (Budget Message of the President, FY1951, January 3, 1950, p. M64)
- "The [House Appropriations Committee] bill contained $647,820,000 for the [AEC in] 1951 fiscal program and $300,150,000 in contract authorization. This represented a $61,980,000 cut in cash and $33,350,000 contract reduction." ("Omnibus Funds Bill," *CQ Almanac 1950*, 6th ed., 113-28. Washington, DC: Congressional Quarterly, 1951)
- "North Korean Communist troops invaded the American-backed South Korean Republic and the United States, with the sanction of the United Nations, decided to back up the South Koreans with combat forces. To finance this operation, to speed general rearmament of the United States and its Western European allies, and to implement domestic programs having a military potential, the President in mid-July sent Congress a request for funds ultimately totaling $17,302,658,634... Another $260 million was written in for the [AEC] to build new plants for making hydrogen and atomic bombs" ("Supplemental Appropriations," *CQ Almanac 1950*, 6th ed., 130-38. Washington, DC: Congressional Quarterly, 1951)
- "I am today transmitting to Congress a request for additional funds to strengthen our defenses. The gravity of the world situation requires that these funds be made available with the utmost speed... I am also recommending a supplemental appropriation for the [AEC] in the amount of $1,050,000,000. These funds will enable the commission to enlarge its production capacity substantially... The further expansion of our military forces and of our atomic energy enterprise is directed towards strengthening the defense of the United States and of the entire free world. This expansion is a matter of great urgency, with can be understood and evaluated only against the background of present critical world conditions" Harry S. Truman, Special Message to the Congress Requesting Additional Appropriations for Defense, December 1, 1950 (*The American Presidency Project*, by Gerhard Peters and John T. Woolley, https://www.presidency.ucsb.edu/node/230487)
- "The throttle of government spending, opened wide by rapidly mounting costs of the Korean war and American and Western European rearmament, was stretched even further with the enactment into law Jan. 6, 1951, of HR 9920, the Second Supplemental Appropriation Act... The $20 billion measure carried $16,795,181,000 for the Army, Navy, Air Force and Marines, $1,065,000,000 for the expanding atomic energy program, and $1,834,911,000 for the stockpiling of copper, rubber, zinc, nickel, tin, and other critical materials." ("Second Supplemental Appropriations Bill," *CQ Almanac 1950*, 6th ed., 139-43. Washington, DC: Congressional Quarterly, 1951)
- "Congress completed work May 28 on the Fourth Supplemental Appropriation bill for 1951 (HR 3842), carrying $6,442,668,000 in additional funds for national defense in

the fiscal year ending June 30... Except for $59,323,000 for the [AEC] and $3,672,000 for the Interior Department, all the money went to the Army, Navy, and Air Force for immediate procurement of military "hardware" such as tanks and planes... The AEC funds were earmarked for construction work, including a Project X, a top-secret development which the Committee reviewed off the record." ("Fourth Supplemental," *CQ Almanac 1951*, 7th ed., 03-158-03-159. Washington, DC: Congressional Quarterly, 1952)

Energy R&D Appropriations for FY1952

Primary Bill: Independent Offices Appropriation Act, 1952

Public Law: 82-137 **Enacted:** August 31, 1951 **Effective:** August 31, 1951

Secondary: Supplemental Appropriation Act, 1952

Public Law: 82-253 **Enacted:** November 1, 1951 **Effective:** November 1, 1951

Tertiary: Second Supplemental Appropriations Act, 1952

Public Law: 82-254 **Enacted:** November 1, 1951 **Effective:** November 1, 1951

Function	Nominal change		Real change		Classification
	Millions ($)	YOY%	Millions ($2012)	YOY%	
Defense	$83.6	29.0%	$361.9	22.2%	Exogenous
Nondefense	$19.5	23.1%	$77.5	16.7%	Exogenous

Congress appropriated a significant increase in funding for both defense and nondefense R&D functions of the AEC in FY1952, largely motivated by national security and the ongoing Korean War. The Truman administration had again pushed for significant increases in base funding for salaries and expenses of the AEC; the request for FY1952 appropriations was, however, considerably below total enacted appropriations from the prior year because of the FY1951 supplemental appropriations for the AEC. The House Appropriations Committee continued trying to exert budget economy and pared back the administration's base request for the AEC, but the Senate successfully restored most of the cuts approved by the House. Following the regular order appropriations bill, two supplemental appropriations bills predominantly for the war effort provided additional funding for atomic energy programs; the first emergency supplemental provided the AEC with an additional $266 million, and the second supplemental another $200 million for construction and development of the AEC's new atomic energy reactor plant in Savannah, SC. The policy changes do not appear to have been motivated by any concerns about unemployment or other short-run macroeconomic prerogatives. As such, we classify these policy events as exogenous. The Supplemental Appropriation Act, 1952 and Second Supplemental Appropriation Act, 1952 resulted in more of a significant increase in both the defense and nondefense R&D functions of the AEC for FY1952, so these policy events are instead dated to 1951Q4, when those bills took effect, instead of when the Independent Offices Appropriation Act, 1952 took effect one quarter earlier. Most pertinent narrative evidence:

- "We are going to produce all the weapons and equipment that such an armed force will need. Furthermore, we will make weapons for our allies, and weapons for our own reserve supplies. On top of this, we will build the capacity to turn out on short notice arms and supplies that may be needed for a full-scale war... In the months ahead the Government must give priority to activities that are urgent–like military

procurement and atomic energy and power development. It must practice rigid economy in its nondefense activities. Many of the things we would normally do must be curtailed or postponed." Harry S. Truman, State of the Union Address, January 8, 1951 (*The American Presidency Project*, by Gerhard Peters and John T. Woolley, https://www.presidency.ucsb.edu/node/231403)

- "At the same time that we are actively pursuing industrial and other peacetime applications of atomic energy, present world developments demand intensification of the national security aspects of the program. The very substantial increases appropriated for the atomic energy program in fiscal year 1951 will provide for the enlargement of production capacity for atomic materials and weapons. A portion of the funds recommended for 1952 provides for certain construction projects under this expansion program. The Budget recommends increases also for the procurement and processing of raw materials, the production in existing plants of fissionable materials and weapons, and the investigation and development of new and improved weapons. The 1952 funds also allow for the continuing development of new designs of nuclear reactors, including those for the production of fissionable material, the generation of power, and the propulsion of ships and aircraft. The [AEC] will continue its vigorous program in basic and applied research in the physical sciences and in biology and medicine." (Budget Message of the President, FY1952, January 15, 1951, pp. M37-38)
- "The [House Appropriations] Committee considered a budget estimate of $1.21 billion... While funds for operations under the biology and medicine programs have been reduced $2,362,000 by the committee, it should be emphasized that the amount allowed, $20,049,500, is $2,362,084 in excess of expenditures for the fiscal 1950" (H. Rpt. 82-384, April 27, 1951, pp. 4-5)
- "The House of Representatives went on an economic rampage today and despite repeated efforts of Administration leaders trimmed $23,000,000 from the Independent Offices Appropriations Bill. This was in addition to the Appropriation Committee's cut of $665,900,025 from the President's budget estimate of $6,837677,465... the other heavy losers in the day's action were the [AEC] and the President's Emergency Fund. The committee's recommendation for the former was $1,140,917,750. It was trimmed today to $1,139,932,750 on an amendment" ("Agency Funds Cut 23 Millions More: House Economy Drive Hits Atomic Board, Emergency Outlay and Housing," *New York Times*, May 5, 1951)
- "The changes recommended by the committee in the amounts of the House bill are as follows:... [$29 million for the AEC] The increase recommended by the [Senate Appropriations] committee is to restore the full amount of the House reduction below the estimate for program direction and administration, for purchase of automobiles and for biology and medicine operations, as well as to partially restore the reduction by the House for construction and equipment. The total amount provided is $1,168,932,750, which is $41,067,250 below the budget estimate." (S. Rpt. 82-418, May 17, 1951, p. 5)
- "While the [Senate Appropriations Committee's] reduction in personnel funds cut about $28 million from the bill, enough additions were made to the House total to offset this several times over. The biggest additions were in defense-related activities of the [AEC], the National Advisory Committee for Aeronautics, and the Tennessee Valley Authority. The AEC got an additional $29 million, mostly for construction and equipment" ("Independent Offices," *CQ Almanac 1951*, 7th ed., 03-115-03-119. Washington, DC: Congressional Quarterly, 1952)

- "The first Supplemental Appropriation bill for fiscal 1952 (HR 5215) carried a total of $1,676,246,976 in additional appropriations. The measure was designed to take care of fund needs which developed after Congress began consideration of the regular appropriation bills and to provide funds for the emergency agencies to carry out provisions of the Defense Production Act and the Civil Defense Act... the [AEC] received $265,965,000." ("First 1952 Supplemental," *CQ Almanac 1951*, 7th ed., 03-159-03-162. Washington, DC: Congressional Quarterly, 1952)
- "Funds for the big construction program which Congress authorized in the Military and Naval Construction Bill were appropriated in a $4,146,407,108 Second Supplemental Appropriation for fiscal 1952... Most of the money—$3,890,296,392—in the supplemental appropriation was earmarked for [DOD], to be used by the Army, Navy, and Air Force for the construction of barracks, depots, and bases in this country and abroad. The measure also provided funds for continuing construction of the atomic energy plant at Savannah River, S.C." ("Second 1952 Supplemental," *CQ Almanac*, 1951, 7th ed., 03-162-03-163. Washington, DC: Congressional Quarterly, 1952)

Energy R&D Appropriations for FY1953

Bill: Independent Offices Appropriation Act, 1953

Public Law: 82-455 **Enacted:** July 5, 1952 **Effective:** July 5, 1952

Function	Nominal change		Real change		Classification
	Millions ($)	YOY%	Millions ($2012)	YOY%	
Defense	-$43.5	-11.7%	-$255.6	-12.8%	Exogenous
Nondefense	$13.0	12.4%	$59.4	11.0%	Exogenous

Congress appropriated a significant decrease in funding for defense R&D functions of the AEC in FY1953, while nondefense functions saw a significant increase. The House Appropriations Committee continued trying to exert budget economy and again substantially pared back the administration's request, and, in a change from recent years, the Senate acquiesced to the reduced level of funding passed by the House; federal expenditures and the budget deficit had been driven substantially higher by wartime mobilization, and Congress was increasingly eager to economize on budget programs deemed unessential to the war effort. Unlike the previous two years, there were no wartime supplemental appropriations bills further increasing AEC funding after the regular order Independent Agencies appropriation bill was passed. Recent increases in research funding for atomic weapons were perceived to have paid off, resulting in the recent successful tests of newer, more powerful weapons, opening the door to decreased real funding for atomic weapons RDT&E. The policy changes do not appear to have been motivated by any concerns about unemployment, inflation, or any other short-run macroeconomic prerogatives. As such, we classify these policy events as exogenous. Most pertinent narrative evidence:

- "We have made rapid progress in the field of atomic weapons... Nevertheless, the grim fact remains that the Soviet Union is increasing its armed might. It is still producing more warplanes than the free nations. It has set off two more atomic explosions. The world still walks in the shadow of another world war." Harry S. Truman, State of the Union Address, January 9, 1952 (*The American Presidency Project*, by Gerhard Peters and John T. Woolley, https://www.presidency.ucsb.edu/node/231465)

- "This Budget lays the groundwork for further progress by providing for additional increases in the strength of our armed forces, additional deliveries of arms to our allies overseas, continued requirements of our atomic energy program, and further development of our economic strength... More than three-fourths of the total expenditures included in this Budget are for major national security programs—military services, international security, and foreign relations, the development of atomic energy, the promotion of defense production and economic stabilization, civil defense, and merchant marine activities. Major national security programs not only dominate this Budget but also account for practically all of the increase in total Budget expenditures since the attack on Korea." (Budget Message of the President, FY1953, January 21, 1952, p. M6)
- "Although the past year has brought considerable progress in the industrial and other peacetime applications of atomic energy—including more widespread participation by private industry— the principal emphasis of this program continues of necessity to be placed on national security. The major program initiated in October 1950 for expanding the productive capacity of our atomic energy plants is well under way, and major production facilities now under construction will begin to contribute to output in the fiscal year 1953. This program is under constant study in order to make the adjustments necessary to continue our leadership in this field. Funds recommended for the [AEC] include increased amounts for the procurement of uranium ores and concentrates, the production of fissionable materials and atomic weapons, and the development of improved and more effective weapons. The several tests of atomic weapons and devices carried out during the past 12 months demonstrate the effectiveness of recent research. Increases are also provided for an expanded effort to develop improved nuclear reactors for the production of fissionable material as well as reactors for the propulsion of submarines and aircraft. The development of propulsion reactors complements other studies underway in contributing to the ultimate goal of the economical production of electricity for civilian use. The Commission will also continue its vigorous programs in basic and applied research in the physical sciences and in biology and medicine." (Ibid, p. M38)
- "Substantially higher costs will be incurred in 1953 in the production of greater numbers of [atomic] weapons; the development, design, and testing of new weapon types; and the storage, maintenance, and custody of stockpiled weapons. A further increase in technical personnel is anticipated at the principal weapon development centers, the Los Alamos Scientific Laboratory and the Sandia Laboratory in New Mexico. New production installations and expanded facilities at existing installations will be in operation, and activity will continue at the test sites in Nevada and at Eniwetok." (Budget of the United States, FY1953, p. 112)
- "The [House Appropriations] committee believes that under no circumstances should the Commission, with its present experience in the field of atomic plant construction, submit an estimate so far out of line that an additional 35 percent will not permit completion of such project... In recommending $1,137,727,500, the committee has effected a reduction of $174,272,500 in the total [budget] estimate... The committee believes [operating] funds should be limited to prevent overstaffing both in Washington and in the field and it has provided specific limitations as to the amount of money which may be expended for such personnel in the District of Columbia and in the field... In general, the committee has provided for the continuation of construction of projects

in progress, with some reductions, and it has deferred initiation of new construction where it believes such postponement will not hamper the preparedness program" (H. Rpt. 82-1517, March 14, 1952, pp. 5-6)

- "In failing to recommend the restoration of any part of the House reduction of $174,272,500 below the budget estimate, the committee does not intend in any way to prejudice the considerations of the entire needs of the program of the Commission in connection with the anticipated supplemental estimate for a large expansion in the program of which the committee was advised" (S. Rpt. 82-1603, May 28, 1952, p. 6)
- "When the House Appropriations Committee reported the bill March 14, it recommended chopping about $700 million... Largest cuts were handed to funds for the Veterans' Administration, reduced $243 million; the [AEC], cut about $174 million..." ("Independent Offices," *CQ Almanac 1952*, 8th ed., 102-6. Washington, DC: Congressional Quarterly, 1953)

Energy R&D Appropriations for FY1954

Bill: Second Independent Offices Appropriation Act, 1954

Public Law: 83-149 **Enacted:** July 27, 1953 **Effective:** July 27, 1953

Function	Nominal change		Real change		Classification
	Millions ($)	YOY%	Millions ($2012)	YOY%	
Defense	-$14.2	-4.3%	-$83.9	-4.8%	Exogenous

Congress appropriated a significant decrease in funding for defense R&D functions of the AEC in FY1954. The House Appropriations Committee continued trying to exert budget economy and again substantially pared back the administration's request for the AEC, and the Senate largely agreed to the reduced level of funding passed by the House; federal expenditures and the budget deficit had been driven substantially higher by the Korean War, and Congress was intent to reduce expenditures now that the pendulum had swung to demobilization from the conflict. Recent increases in research funding for atomic weapons were perceived to have paid off; the U.S. successfully tested its first thermonuclear warhead (or hydrogen bomb) on November 1, 1952, which was vastly more powerful than earlier atomic bombs. While the AEC soon began work on developing and testing smaller thermonuclear warheads that could be launched by ballistic missiles, this technological breakthrough temporarily eased pressure to sustain rapid growth in funding for atomic weapons RDT&E; moreover, appropriations for FY1953 had financed considerable construction of new scientific facilities for the AEC, work which was recently completed, further facilitating decreased funding levels for FY1954. The policy changes do not appear to have been motivated by concerns about unemployment, inflation, or any other short-run macroeconomic prerogatives. As such, we classify this policy change as exogenous. Most pertinent narrative evidence:

- "Ten years ago, scientists working at the University of Chicago under Federal sponsorship brought about the world's first nuclear chain reaction. Since then, our efforts in the development of atomic energy have of necessity been devoted primarily to meeting the needs of national security. Two major expansions of facilities for the production of fissionable materials and atomic weapons have been authorized by Congress since the attack on Korea. The first was authorized in the fiscal year 1951 and the second early in the fiscal year 1953. The rise in atomic energy expenditures results largely

from construction work on the new facilities. As a result of this expansion, our ability to meet the threat of aggression will be significantly increased. The new obligational authority which I am recommending for 1954 is substantially less than the amount enacted for the current fiscal year because the bulk of the construction funds needed to finance the expansion programs has already been provided. However, I am recommending an increase in funds for operations. These funds will provide for increases in our reserve of atomic weapons and for the development and testing of improved weapons. I am also recommending an increase in funds for the development of atomic power for naval ships. The keel of the first nuclear-powered submarine was laid last summer. The funds recommended for aircraft reactor research will enable this program to proceed at an effective pace. Research in the peacetime uses of atomic energy shows steady progress. We have developed new techniques in medical research, and substantial progress has been made in the fields of physics, chemistry, and biology. This research will continue in 1954. This Budget also provides for continuing research in the development of atomic reactors for the production of electric power..." (Budget Message of the President, FY1954, January 19, 1953, pp. M28-29)

- "The [House Appropriations] committee approved $26,565,000 for the AEC's biology and medicine program, and urged coordination with other federal agencies in the field of cancer research. The agency was taken to task for "a very large waste of public funds" in the administration of its security program." ("House Unite Cuts Funds of 4 Agencies," by Sam Stavisky, *The Washington Post*, June 12, 1953)
- "The [AEC] is appearing before your committee today in connection with the appropriations required for the atomic energy program for fiscal year 1954... The appropriation approved by the House provides for a further reduction to a total of $1,057,781,000, which is $38,219,000 below our revised estimates and $535,008,000 below the original estimates... The reduction of roughly one-third in total financial requirements in fiscal year 1954 is the product of successive program reviews by the Commission, the Bureau of the Budget, the National Security Council, and the President. Among the key factors accounting for the sharply reduced level of financial support for the atomic energy program in fiscal year 1954 are these: First, this budget has been pared to the bone, the primary consideration being a minimum request for funds consistent with the Commission's overriding responsibility for fulfilling military requirements and for furthering the development of atomic energy for man's peacetime welfare. Second, savings from 1953 appropriations have been made, wherever possible, and carried forward to reduce the need for new funds in 1954... Finally, no funds have been provided for certain developments which might clearly call for financial support... Certain reactor work will not be pushed as rapidly toward actual construction as might well be warranted by the technical data now at hand" Gordon Dean, Chairman, U.S. Atomic Energy Commission, June 22, 1953 (Hearings before the Senate Appropriations Subcommittee on the Second Independent Offices Appropriations, 1954, pp. 12-13)
- "The results of the weapon tests last fall at Eniwetok in the Pacific and this spring in Nevada are undoubtedly the most important events of recent months... substantial advances have been made in new weapon designs; these have been and are being converted promptly into weapon production and introduced into the stockpile as improved weapons." (Ibid, p. 14)
- "Technical advances in atomic energy represent long, lead-time accomplishments. What is being accomplished now, for example, in the field of new weapons is based on re-

search undertaken some years ago. This situation is certain to continue. The technical advances we hope to make in the next few years are dependent on investigations being conducted now and on our accumulated knowledge to this time. It is for this reason that we feel the present budget estimates involve a clear risk. The funds being requested permit no increase whatsoever in the physical research level over that in fiscal year 1953; in fact, there may be some decrease because added costs for operating major research equipment now under construction will mean that other types of promising research will have to be cut back" (Ibid, pp. 15-16)

- "Congress July 20, 1953, approved $5,253,177,664 in funds for four major federal agencies for use in fiscal 1954... The final total was $1,202,581,000 less than former President Truman had requested, $358,611,000 less than the revised estimates of the Eisenhower Administration, and $3,388,946,796 below the amount appropriated by Congress in 1953 for the four independent units... The [House Appropriations Committee] said the "substantial savings in original budget estimates" of $1,171,389,000 was "the maximum" which could be deducted "safely" from the Truman requests. The Committee also reported that the recommended reduction of $3,357,754,796 as compared with fiscal 1953 appropriations for the four agencies was "accounted for almost entirely by the decrease in funds for the [AEC]." ("Independent Offices (Second Bill)," *CQ Almanac 1953*, 9th ed., 03-145-03-148. Washington, DC: Congressional Quarterly, 1954)

Energy R&D Appropriations for FY1955

Bill: Independent Offices Appropriation Act, 1955

Public Law: 83-428 **Enacted:** June 24, 1954 **Effective:** July 1, 1954

Function	Nominal change		Real change		Classification
	Millions ($)	YOY%	Millions ($2012)	YOY%	
Defense	$24.2	7.7%	$116.0	7.0%	Exogenous
Nondefense	$49.8	41.8%	$247.9	40.7%	Exogenous

Congress appropriated a significant increase in funding for both defense and nondefense R&D functions of the AEC for FY1955. The newfound U.S. monopoly on thermonuclear weapons was quite short-lived, with the Soviet Union conducting its first thermonuclear test on August 12, 1953, just weeks after the FY1954 appropriations bill was enacted. Funding for the development, testing, and production of more advanced thermonuclear weapons was a high priority in FY1955, as was naval nuclear reactor development for a new class of nuclear submarine; the USS Nautilus, the first-ever nuclear-powered submarine, was launched in January 1954 and development of a second generation was underway. The House Appropriations Committee broke with the recent prioritization of budget frugality and approved the administration's entire request for increased AEC funding for weapons development, testing, and production. The development of civilian nuclear power was also a major policy priority of President Dwight D. Eisenhower, epitomized by his famous "Atoms for Peace" speech given before the United Nations General Assembly on December 8, 1953. President Eisenhower was keen for the U.S. to remain the global leader in atomic energy science and to use such technological advances as a diplomatic tool to strengthen the Western alliance. The policy changes appear to have been motivated by geopolitical and national security concerns, and do not seem to have been influenced by any concerns about unemployment, inflation, or other short-run macroeconomic prerogatives. As such, we classify these policy events as exogenous. Most pertinent narrative evidence:

- "The United States knows that if the fearful trend of atomic military buildup can be reversed, this greatest of destructive forces can be developed into a great boon, for the benefit of all mankind. The United States knows that peaceful power from atomic energy is no dream of the future. That capability, already proved, is here—now—today. Who can doubt, if the entire body of the world's scientists and engineers had adequate amounts of fissionable material with which to test and develop their ideas, that this capability would rapidly be transformed into universal, efficient, and economic usage." Dwight D. Eisenhower, Address Before the General Assembly of the United Nations on Peaceful Uses of Atomic Energy, December 8, 1953 (*The American Presidency Project*, by Gerhard Peters and John T. Woolley, https://www.presidency.ucsb.edu/node/232498)
- "As we maintain our military strength during the coming year and draw closer the bonds with our allies, we shall be in an improved position to discuss outstanding issues with the Soviet Union. Indeed we shall be glad to do so whenever there is a reasonable prospect of constructive results. In this spirit, the atomic energy proposals of the United States were recently presented to the United Nations General Assembly." Dwight D. Eisenhower, State of the Union Address, January 7, 1954 (*The American Presidency Project*, https://www.presidency.ucsb.edu/node/232936)
- "Authority is recommended for new and advanced work on the peacetime uses of atomic energy in the earnest hope that present international relations can be improved and the wonders of nuclear power can be turned gradually to the development of a more abundant life for ourselves and all mankind." (Budget Message of the President, FY1955, January 24, 1954, p. M5)
- "Proposed reductions in major national security expenditures in 1955 represent the largest single element of reduction from the current year's level of expenditures. I emphasize, however, that these savings result from revisions in programs, from shifts in emphasis, from better-balanced procurement, and from improved management and operations... expenditures for some programs in this category will be reduced, and others will be increased. Of the four major national security programs, proposed 1955 expenditures for the [AEC] and for the mutual military program will be at the highest levels since the initiation of the two programs." (Ibid, pp. M10-11)
- "In my speech before the United Nations on December 8, 1953, I made proposals looking toward a resolution of the atomic danger that threatens the world. My budgetary recommendations for the program of the [AEC] for the fiscal year 1955 contemplate both new efforts to advance peacetime applications of atomic energy and also additional production of fissionable materials... Under the recommendations in this budget, expenditures of the [AEC] will rise in the fiscal year 1955 to the highest point in our history... Atomic reactor development will be focused particularly on the development of industrial atomic power for peacetime uses. The Commission will move forward on the construction of a large atomic power reactor to be initiated in the fiscal year 1954, marking a significant advance in the technology of peacetime atomic power. Research and development, including the construction of experimental facilities, will also continue on several other types of reactors which show promise of ultimately producing power at economic rates. The launching—this month—of the first atomic submarine, the U.S.S. Nautilus, will be followed in the fiscal year 1955 by the launching of the U.S.S. Seawolf, a second atomic submarine of a different design. Research on the more difficult problems of aircraft propulsion by atomic energy will continue." (Ibid, pp.

M48-49)

- "For several years the amounts allocated for physical research and biology and medicine have been increasing steadily. The committee does not intend to hamper any productive research project as research is one of the most important facets of the atomic energy program. There are, however, always fringe items that research scientists would like to investigate which have a comparatively slight possibility of providing useful results. This is the type of project that should be eliminated to accomplish the budget objective" (H. Rpt. 83-1428, March 26, 1954, p. 6)
- "Chairman Lewis L. Strauss of the [AEC], yesterday urged a Senate Appropriations subcommittee to approve the Commission's request for $1,342,000,000 for fiscal year 1955... The House has approved a $1,061,000,000 figure, including every cent asked by the AEC for weapons development and production. This sum includes money for the greatest production of atomic and hydrogen weapons and materials to go into them, in the Nation's history. It includes money for the stepped-up H-bomb program. Strauss said the AEC's original budget for fiscal 1955, submitted in January, as revised in February after President Eisenhower approved 'recommendations to bring about greatly increased production of thermonuclear weapons'... Strauss also appealed to the Senate to restore $3,100,000 eliminated by the House from funds for atomic research. He said the money is needed for 'urgently required work'" ("Strauss Asks 1.3 Billion for AEC Program," *The Washington Post*, April 8, 1954)

Energy R&D Appropriations for FY1956

Primary Bill: Public Works Appropriation Act, 1956

Public Law: 84-163 **Enacted:** July 15, 1955 **Effective:** July 15, 1955

Secondary: Supplemental Appropriation Act, 1956

Public Law: 84-219 **Enacted:** August 4, 1955 **Effective:** August 4, 1955

Function	Nominal change		Real change		Classification
	Millions ($)	YOY%	Millions ($2012)	YOY%	
Defense	$85.6	25.3%	$382.9	21.7%	Exogenous
Nondefense	$29.0	17.1%	$119.3	13.9%	Exogenous

Congress again appropriated a significant increase in funding for both defense and nondefense R&D functions of the AEC for FY1956. The development of more advanced thermonuclear weapons, naval nuclear reactors, nuclear airplane engines, and civilian nuclear power plants all remained very high priorities of the Eisenhower administration. The House Appropriations Committee was again frustrated that the AEC was requesting more funds than it was spending, leaving large unobligated balances, and cut deeply into the budget request, which their Senate counterparts—who had proposed a higher level of AEC funding, closer to the budget request—acquiesced to in conference. President Eisenhower was frustrated that Congress did not fully fund his requested increases in AEC's "crucial programs" for FY1956, as made clear by his terse statement on signing the appropriations bill, but did not veto the legislation. Shortly after the enactment of the regular order Public Works Appropriation Act for FY1956, a requested supplemental appropriations act instead provided the AEC with an additional $256 million for AEC plant and equipment expenditures in early August, as well as authorizing the use of unspent construction funds for operating

expenses, effectively reversing budget cuts in the earlier legislation. The policy changes appear to have been motivated by geopolitical and national security concerns, and do not seem to have been influenced by any concerns about unemployment, inflation, or other short-run macroeconomic prerogatives. As such, we classify these policy events as exogenous. Most pertinent narrative evidence:

- "Our many efforts to build a better world include the maintenance of our military strength... pending a world agreement on armament limitation, we must continue to improve and expand our supplies of nuclear weapons for our land, naval and air forces, while, at the same time, continuing our encouraging progress in the peaceful use of atomic power" Dwight D. Eisenhower, State of the Union Address, January 6, 1955 (*The American Presidency Project*, by Gerhard Peters and John T. Woolley, https://www.presidency.ucsb.edu/node/233954)
- "New atomic energy plants will be placed in operation and more than in any previous year will be spent for peaceful applications of atomic energy." (Budget Message of the President, FY1956, January 17, 1955, p. M8)
- "It is our purpose, working in concert with other nations, to banish the threat of atomic warfare which now confronts the world. Progress is being made toward establishing an international agency for cooperation in developing the peaceful uses of atomic energy, as I proposed to the United Nations on December 8, 1953. The budget of the [AEC] for the fiscal year 1956 provides for greater expenditures than ever before on projects to develop peaceful applications of atomic energy. We shall continue unabated our efforts to assure that this great force will be used, not for war, but for the well-being of all mankind. Until such assurance can be achieved, however, we have no alternative but to strengthen further our most effective deterrent to armed aggression— the power of our nuclear weapons stockpile" (Ibid, p. M35)
- "The national effort to develop industrial atomic power for peacetime uses will go forward with increased vigor. The Atomic Energy Act of 1954 makes possible substantial private activity and investment in the constructive applications of atomic energy. Construction of one large atomic powerplant jointly financed by the Government and industry is already underway. As I stated in my message of February 17, 1954, to Congress, "It is essential that this program so proceed that this new industry will develop self-reliance and self-sufficiency." Accordingly, it is expected that industry will finance an increasingly larger share of the total national effort in developing power reactor technology. However, to speed progress in getting the new technology established, the [AEC] in 1956 will expand substantially its program to develop industrial power reactors. Construction of several experimental reactors will be started in 1955 and 1956. Of these, one of the most significant is a power breeder, designed to produce more fissionable material than it consumes. Nearly 15 million dollars is included in the budget for this project." (Ibid, p. M36)
- "Effective progress in military propulsion reactors will continue. The launching in 1954 of the first atomic submarine, the U. S. S. Nautilus, will be followed by the launching in 1955 of the U. S. S. Sea Wolf, an atomic submarine of different design. In addition, two atomic-powered attack-type submarines have been financed by Department of Defense appropriations in the fiscal year 1955. My recommendations for the Department for 1956 include additional submarines of this type. In 1956, development work will proceed on improved types of submarine reactors, and on a reactor to power larger naval vessels. The [AEC] and [DOD] will expand and accelerate research on atomic

powered aircraft, and will continue development work on small transportable power reactors for military use." (Ibid, p. M36)

- "The basic—as distinct from applied—research which is fundamental to progress in all aspects of nuclear energy will be pursued energetically and will entail somewhat higher expenditures in 1956, both in the Commission's own laboratories and through support of research in universities and other institutions." (Ibid, p. M36)
- "The [AEC] signaled a sharp increase in its program to develop a nuclear aircraft engine... The commission said the boost planned in the reactor program will provide for 'increased emphasis and the [R&D] program, the fabrication of major experiments, the initiation of operations of the ground test facilities at the National Reactor Testing Station'... All told, the commission expects to pay out $136.6 million for reactor development projects next fiscal year including civilian as well as military work. Its second largest reactor program is the civilian power reactor development project which calls for the construction of five different atomic power plants over the next five years for the purpose of obtaining vital technical knowledge needed to design economically competitive power plants. A total of $35.4 million will be spent for this work in fiscal 1956, compared with $25.8 million during the present year." ("Atom Power: AEC Plans Sharp Rise in Program To Develop a Nuclear Plane Engine," by a Wall Street Journal Staff Reporter, *Wall Street Journal*, June 9, 1955)
- "The reduction of $166,404,000 [for the AEC] represents an amount estimated by the [House Appropriations] Committee as being excessive to the obligations that will be incurred during the fiscal year. On the basis of past experience, this is a conservative estimate of unobligated funds which can be expected. The Commission estimated that $260,596,000 of the unobligated balance in the Plant and Equipment account would be required for Plant and Equipment obligations. However, this is only a tentative estimate as legislation, required under Section 261 of the Atomic Energy Act of 1954, authorizing appropriations for such purposes has not been enacted. The Committee feels that this sum can be made available for operating expenses at this time and that when authority for plant and equipment expenditures has been obtained a request for the necessary funds can be considered." (H. Rpt. 84-747, June 10, 1955, p. 2)
- "I have approved this bill with great reluctance. There are two matters which are of deep concern to me. The first is the reduction made in the funds available to the [AEC]. The amount provided in the bill, together with the estimated amount carried over from 1955, would provide the Commission with total obligational authority of $1,380,847,000 for operating expenses in 1956. This amount is $144,404,000 less than was requested. A reduction of this magnitude could seriously interfere with the Commission's plans to produce atomic weapons, to develop propulsion reactors for the Navy and the Air Force, and to develop peaceful applications of atomic energy, including the production of electric power. These are most crucial programs in maintaining a strong national defense and in maintaining this Nation's leadership in bringing the benefits of atomic energy to the service of mankind both here and abroad. For these reasons, I would hope that the Congress would reconsider its action and make supplementary amounts available so as to avoid serious disruptions in this most vital program." Dwight D. Eisenhower, Statement by the President Upon Signing the Public Works Appropriation Act, July 15, 1955 (*The American Presidency Project*, by Gerhard Peters and John T. Woolley, https://www.presidency.ucsb.edu/node/233256)
- "The Senate inserted a provision in [the Supplemental Appropriation Act, 1956] au-

thorizing the [AEC] to use $101 million of left-over construction funds for operating expenses. A conference committee had chopped this amount out of a similar Senate provision in the Public Works Appropriation Act (HR 6766–PL 163). Conferees on HR 7278 agreed on AEC's use of $90 million for operating expenses... Joint Atomic Energy Committee chairman, and AEC Chairman Lewis L.Strauss, [had] urged the restoration of $101 million in AEC operating funds cut out of the final version of the Public Works Appropriation bill." ("Supplemental, 1956," *CQ Almanac 1955*, 11th ed., 242-46. Washington, DC: Congressional Quarterly, 1956)

Energy R&D Appropriations for FY1957

Bill: Second Supplemental Appropriation Act, 1957

Public Law: 84-855 **Enacted:** July 31, 1956 **Effective:** July 31, 1956

Function	Nominal change		Real change		Classification
	Millions ($)	YOY%	Millions ($2012)	YOY%	
Defense	$175.3	41.4%	$804.5	37.4%	Exogenous
Nondefense	$71.4	36.1%	$316.8	32.5%	Exogenous

Congress again appropriated a significant increase in funding for both the defense and nondefense R&D functions of the AEC for FY1957. Development of more advanced thermonuclear weapons, naval nuclear reactors, nuclear airplane engines, and civilian nuclear power plants all remained very high priorities of the Eisenhower administration; the FY1957 budget request again reflected as much. President Eisenhower was keen to use U.S. technological advances in atomic energy as a diplomatic tool to strengthen the Western alliance. The administration also requested another increase in funding for the AEC's basic research and physical and life sciences research programs. The House Appropriations Committee, which had been the principal skeptic regarding AEC funding in recent years, was increasingly concerned that nuclear power generation was a top national security imperative, and approved additional 'crash" funding to accelerate civilian atomic power development. Some Republican members of Congress were concerned that such involvement would lead to "federal domination and control of atomic power," impeding a more appropriate role of the private sector, and only the administration's requested increase was funded at the end of the day. These policy changes appear to have been motivated by national security and geopolitical concerns, and appear unrelated to any concerns about unemployment, inflation, or other short-run macroeconomic prerogatives. As such, we classify these policy events as exogenous. Most pertinent narrative evidence:

- "The successful Atomic Energy Conference held in Geneva under United Nations auspices and our Atoms for Peace program have been practical steps toward the worldwide use of this new energy source. Our sponsorship of such use has benefited our relations with other countries. Active negotiations are now in progress to create an International Agency to foster peaceful uses of atomic energy... While maintaining our military deterrent, we must intensify our efforts to achieve a just peace. In Asia, we shall continue to give help to nations struggling to maintain their freedom against the threat of Communist coercion or subversion. In Europe, we shall endeavor to increase not only the military strength of the North Atlantic Alliance but also its political cohesion and unity of purpose. We shall give such assistance as is feasible to the recently renewed effort of Western European nations to achieve a greater measure of integration, such as in

the field of peaceful uses of atomic energy... We have improved the effectiveness and combat readiness of our forces by developing and making operational new weapons and by integrating the latest scientific developments, including new atomic weapons, into our military plans... We are moving as rapidly as practicable toward nuclear-powered aircraft and ships" Dwight D. Eisenhower, State of the Union Address, January 5, 1956 (*The American Presidency Project*, by Gerhard Peters and John T. Woolley, https://www.presidency.ucsb.edu/node/233132)

- "We have long sought and we continue to seek, jointly with other nations, means to banish the threat of nuclear warfare which still confronts the world. Pending a trustworthy agreement, however, we must continue to increase our nuclear weapons stockpile which, together with the means of delivery, is the principal deterrent to armed aggression in the world. At the same time, we shall speed the development of the peaceful uses of atomic energy and make the resulting benefits, under appropriate controls, available to other nations for the well-being of all mankind." (Budget Message of the President, FY1957, January 16, 1956, p. M28)
- "The civilian applications of nuclear energy will receive even greater attention, not only in terms of government expenditures but also through the Commission's efforts to stimulate more participation and investment by private and public groups, particularly in the development of atomic power... The [AEC] will also step up research on controlled thermonuclear reactions as new discoveries may justify. This program, while long-range, gives promise of yet greater dimensions to the potential peaceful uses of nuclear energy... Continuing progress in basic research is fundamental to further advances in nuclear energy. The Commission will increase in the fiscal year 1957 its support of basic research in the physical and life sciences, including development and design studies of high-energy particle accelerators. The 1957 construction program will include new buildings at three of the Commission's laboratories" (Ibid, p. M29)
- "The House Rules Committee sent to the floor today a bill to begin a $400,000,000 Federal program for peaceful atomic power... The bill, approved by the Senate last week would authorize a program to build domestic atomic power plants... Republicans contend the measure might slow the military atomic program and curb private industry's interest in atomic power development. Democrats assert the program is needed to keep the United States ahead in the atomic power race..." ("House Group Backs Atomic Power Bill," *New York Times*, July 19, 1956)
- "The Committee recommends an appropriation of $1,780,400,000 [for operating expenses], an increase of $40,000,000 over the budget estimate of $1,740,400,000 and an increase of $1,205,400,000 over the 1956 appropriation. Funds for the reactor development program have been increased by $40,000,000. This $40,000,000 and the $10,000,000 in the budget estimate for 'increase for power reactors demonstration program' together with the $15,000,000 in the budget estimate for Power Reactor Acceleration will make a total of $65,000,000 available for acceleration of the power reactor program... The committee recommends an appropriation of $558,300,000 [for plant acquisition and construction], an increase of $400,000,000 over the budget estimate of $153,300,000 and an increase of $279,073,000 over the 1956 appropriation. This increase is for the purpose of implementing the provisions of H.R. 12061 for a civilian atomic power acceleration program" (H. Rpt. 84-2849, July 20, 1956, p. 3)
- "Intertwined with this increasing use of our fossil fuels is the necessity of producing energy. The atom provides the answer to unlimited, efficient energy supply... In the

event of another major war, the use of A-bombs and H-bombs by the participants would undoubtedly result in the deaths of millions upon millions of people and could render the entire earth, or a large portion of it, uninhabitable... It follows that an international agreement to outlaw A-bombs and H-bombs as weapons of warfare is a logical prospect. In that situation, the likely victor in a war fought with conventional weapons will be the nation or group of nations possessing the greatest energy potential. In other words, the earliest possible development of atomic electric power by the United States is immediately required" (Ibid, p. 6)

- "The Second Supplemental Appropriations Act for fiscal 1957, covering funds for the emergency needs of a dozen federal agencies, allotted the bulk of the money to the [AEC], which received $1,898,700,000. Because budget requests for the agency were delayed, AEC had received no funds in the regular appropriation bills for fiscal 1957... Included [in the House Appropriations Committee bill] was $440 million to speed up, on a "crash" basis, the civilian atomic power program, which the Administration had not requested. The report sharply criticized the AEC and its chairman, Lewis L. Strauss, for "misleading" the public on the progress toward a civilian atomic program and for becoming "immersed in partisan politics as evidenced by unyielding insistence that the federal government should not go vigorously forward with the construction of these needed atomic power plants"... A minority report signed by 15 GOP members of the Committee said the proposed "crash" program would "open the door for federal domination and control of atomic power" and lead toward "complete socialization of the electric utility industry... Following House rejection July 24 of a Democratic-sponsored bill (HR 12061) to accelerate the civilian atomic power program, provision of $400 million for the projected program was stricken from the supplemental bill [on the House floor]." ("Second Supplemental, 1957," *CQ Almanac 1956*, 12th ed., 03-639-03-641. Washington, DC: Congressional Quarterly, 1957)

Energy R&D Appropriations for FY1958

Bill: Atomic Energy Commission Appropriation Act, 1958

Public Law: 85-175 **Enacted:** August 28, 1957 **Effective:** August 28, 1957

Function	Nominal change		Real change		Classification
	Millions ($)	YOY%	Millions ($2012)	YOY%	
Defense	$112.6	18.8%	$477.5	16.2%	Exogenous
Nondefense	$52.6	19.5%	$213.0	16.5%	Exogenous

Congress again appropriated a significant increase in funding for both the defense and nondefense R&D functions of the AEC for FY1958. Development of more advanced thermonuclear weapons, naval nuclear reactors, nuclear airplane engines, and civilian nuclear power plants all remained very high priorities of the Eisenhower administration, and the FY1958 budget request again reflected as much. President Eisenhower remained keen to remain the global leader in atomic energy science and to use U.S. technological advances in this field as a diplomatic tool strengthening the Western alliance through his atoms-for-peace program. The House Appropriations Committee was increasingly concerned that nuclear power generation was a top national security imperative, and Congressional democrats on the committee succeeded in pushing through extra funding to develop three controversial first-stage civilian reactors; the Eisenhower administration was skeptical of too much government involvement in the civilian atomic energy industry and was against the "crash"

reactor program. These policy changes appear to have been motivated by national security and geopolitical concerns and do not appear to have been influenced by concerns about unemployment, inflation, or any other short-run macroeconomic prerogatives. As such, we classify these policy events as exogenous. Most pertinent narrative evidence:

- "To demonstrate once again our unalterable purpose to make of the atom a peaceful servant of humanity, I shortly shall ask the Congress to authorize full United States participation in the International Atomic Energy Agency" Dwight D. Eisenhower, State of the Union Address, January 10, 1957 (*The American Presidency Project*, by Gerhard Peters and John T. Woolley, https://www.presidency.ucsb.edu/node/233260)
- "Our nuclear weapons and our ability to employ them constitute the most effective deterrent to an attack on the free nations. We shall continue to expand our nuclear arsenal until an agreement has been reached for the reduction and regulation of armaments under safeguarded inspection guarantees. At the same time, we are increasing the portion of the production of fissionable materials allocated to peaceful uses at home and abroad, and we look forward to the day when all production may be used for peaceful purposes. This budget provides for increased effort on power reactor development and on new uses of atomic energy in biology, medicine, agriculture, and industry. It will also make possible greater sharing of our peaceful atomic energy developments with other nations through the atoms-for-peace program" (Budget Message of the President, FY1958, January 16, 1957, p. M14)
- "Although necessity forces us to keep ever in mind the destructive power of nuclear weapons, it is equally essential that we keep in mind the firm determination of the United States to share the fruits of its efforts to develop the peaceful uses for atomic energy. Seventy-two nations have now signed the charter of the International Atomic Energy Agency, which was established under the auspices of the United Nations. Prompt action by Congress is needed to authorize full participation by the United States in the work of this Agency. The United States has offered for distribution through this Agency 5,000 kilograms of fissionable uranium 235 out of the 20,000 kilograms previously offered for atomic research and power uses in other nations, as part of our atoms-for-peace program." (Ibid, p. M22)
- "Until an agreement for limitation of armaments is negotiated, and an effective inspection system is functioning, this Nation will continue to increase the number and variety of nuclear weapons. In the fiscal year 1958, emphasis will be placed on weapons for tactical purposes and weapons with reduced radioactive fallout. The substantial present effort to develop military propulsion reactors will be continued." (Ibid, p. M31)
- "Efforts to develop the peaceful uses of atomic energy will be greatly increased, particularly the development of reactors to produce atomic power at competitive prices. This budget provides for increased effort by the [AEC] to explore new power reactor concepts, to fabricate and operate reactor experiments, and to develop the basic reactor technology essential to the Nation's progress and leadership in the field. Increased support will also be given to the growing activities by private industry and public power bodies in power reactor development." (Ibid, p. M31)
- "The [Senate Appropriations] committee recommends restoration of $11,600,000 to provide the full budget estimate of $71,000,000 for physical research. The committee believes that the basic research in the physical sciences carried on under the program is vitally important to the whole atomic-energy program and should be forwarded vigorously" (S. Rpt. 85-1080, August 2, 1957, p. 2)

- "The fiscal 1958 appropriation for the [AEC] was the first to be subject to a Congressional mandate, enacted earlier in the year, requiring the AEC to obtain Congressional authorization before using its funds to construct non-military reactors, except for a small research type. The authorizing bill (HR 8996 – PL 162) cleared Congress on Aug. 20. Included in the final appropriation were funds for first-stage work on three big experimental reactors that the Eisenhower Administration did not want the Government to build. Passage of the bill with funds for the three disputed reactor projects marked a victory for Democrats in a long controversy extending back through several sessions of Congress" ("Atomic Energy Funds," *CQ Almanac 1957*, 13th ed., 03-716-03-717. Washington, DC: Congressional Quarterly, 1958)
- "A Democratic majority on the Joint Committee on Atomic Energy yesterday voted to authorize the [AEC] to spend $58 million more for speeding up its civilian atomic power program than either it of the Bureau of the Budget wanted to spend... Summarizing the program, Rep. Chuck Holifield (D-Calif) declared: 'If the prestige of the United States in atomic power development is to be regained, the AEC will accept this program and get on with the job. If they oppose it, we will continue to drop behind the British and possibly even the Soviets in the field of large atomic reactor power development" ("Civilian A-Power Given Boost As Hill Unit Votes $58 Million," *The Washington Post*, July 31, 1957)

Energy R&D Appropriations for FY1959

Bill: Supplemental Appropriation Act, 1959

Public Law: 85-766 **Enacted:** August 27, 1958 **Effective:** August 27, 1958

Function	Nominal change		Real change		Classification
	Millions ($)	YOY%	Millions ($2012)	YOY%	
Defense	$70.3	9.9%	$264.3	7.7%	Exogenous
Nondefense	$101.4	31.5%	$431.6	28.7%	Exogenous

Congress again appropriated a significant increase in funding for both defense and nondefense R&D functions of the AEC for FY1959, largely motivated by geopolitical prerogatives and the escalating Cold War. The Soviet Union's unexpected, successful launch of the Sputnik 1 satellite on October 4, 1957, galvanized greater bipartisan support for advancing the U.S. technological and scientific frontier, immediately more of an imperative. Development of more advanced thermonuclear weapons, naval nuclear reactors, nuclear airplane engines, and civilian nuclear power plants all remained very high priorities of the Eisenhower administration, and the FY1959 budget request again reflected as much. President Eisenhower also remained keen to remain the global leader in atomic energy science and to use U.S. technological advances in this field as a diplomatic tool strengthening the Western alliance through his atoms-for-peace program. The House Appropriations Committee again successfully negotiated additional funding to construct early stage civilian nuclear reactors opposed by the administration, but President Eisenhower did not veto the bill over the controversial plutonium reactor program. The policy changes do not appear to have been motivated by concerns about unemployment, inflation, or any other short-run macroeconomic prerogatives. As such, we classify these policy events as exogenous. Most pertinent narrative evidence:

- "Admittedly, most of us did not anticipate the psychological impact upon the world of the launching of the first earth satellite. Let us not make the same kind of mistake in another field, by failing to anticipate the much more serious impact of the Soviet economic offensive... In the 1959 budget, increased expenditures for missiles, nuclear ships, atomic energy, [R&D], science and education, a special contingency fund to deal with possible new technological discoveries, and increases in pay and incentives to obtain and retain competent manpower add up to a total increase over the comparable figures in the 1957 budget of about $4 billion." Dwight D. Eisenhower, State of the Union Address, January 9, 1958 (*The American Presidency Project*, by Gerhard Peters and John T. Woolley, https://www.presidency.ucsb.edu/node/233817)
- "Expenditures by the [AEC] in the fiscal year 1959 will increase to $2,550 million, $250 million more than estimated for 1958, which in turn was $310 million over 1957. These increases reflect our determination both to increase the tempo of progress in achieving a greater nuclear military capability and to press ahead in our successful development of the peaceful applications of atomic energy... During the last several years, the [AEC's] [R&D] in both peaceful and military applications of atomic energy have grown rapidly to the highest levels ever attained. Continuing emphasis will be given to basic research, and construction will continue on four additional high-energy particle accelerators in the multi-billion electron-volt range. Applied [R&D] activities will be increased in 1959 and concentrated on those aspects that appear most likely to result in reaching technical goals. In particular, there will be continuing emphasis on naval and other military nuclear propulsion reactors, and on the more promising approaches to the development of reactors to produce safe and economic electrical energy for civilian use." (Budget Message of the President, FY1959, January 13, 1958, pp. M19-20)
- "The major objective of the United States civilian nuclear power reactor program is to achieve economic nuclear power production as early as practical in the United States and to aid other nations seeking the same objective" John F. Floberg, Commissioner of the AEC, July 22, 1958 (Hearings before the Senate Appropriations Subcommittee on the Supplemental Appropriations Bill, 1959, p. 43)
- "It has become manifestly clear of late that the countries of the free world must, for their collective defense and mutual help, endeavor to combine their resources and share the large tasks that confront us. This is particularly true in the field of scientific [R&D] in support of greater collective security, notably in the field of military application of atomic energy" Dwight D. Eisenhower, Special Message to the Congress Transmitting Agreement With the United Kingdom for Cooperation on Uses of Atomic Energy for Mutual Defense, July 3, 1958 (*The American Presidency Project*, by Gerhard Peters and John T. Woolley, https://www.presidency.ucsb.edu/node/233669)
- "The [House Appropriations] committee recommends an increase of $26,179,000 above the budget for facilities needed to set up the physical research program which is the foundation stone in the development of the atomic energy art. The committee believes that an additional investment of this magnitude is a small price to pay to maintain International leadership in nuclear science." (H. Rpt. 85-2221, July 18, 1958, p. 50)
- "The First Supplemental Appropriations Act of fiscal 1959, which carried supplemental funds for a variety of Federal departments, also appropriated $2,647,335,000 for the regular fiscal 1959 operations of the [AEC]... Although the [AEC's] total allotment was $16,599,000 below the amount requested, the funds provided for plant acquisition

and construction came to $25,429,000 above the Administration request. AEC funds also included $45 million for beginning construction of a plutonium reactor—a project opposed by the President" ("First Supplemental, 1959," *CQ Almanac 1958*, 14th ed., 04-353-04-356. Washington, DC: Congressional Quarterly, 1959)

- "Because it advances various atomic energy projects required for defense and peaceful purposes, I have today approved the bill H. R. 13121. Certain of its provisions are undesirable, however." Dwight D. Eisenhower, Statement by the President Upon Signing Bill Authorizing Appropriations for the [AEC], August 4, 1958 (*The American Presidency Project*,https://www.presidency.ucsb.edu/node/233805)

Energy R&D Appropriations for FY1960

Bill: Atomic Energy Commission Appropriation Act, 1960

Public Law: 86-164 **Enacted:** August 18, 1959 **Effective:** August 18, 1959

Function	Nominal change		Real change		Classification
	Millions ($)	YOY%	Millions ($2012)	YOY%	
Defense	-$22.2	-2.8%	-$150.6	-4.1%	Exogenous
Nondefense	$87.9	20.8%	$372.8	19.2%	Exogenous

Congress again appropriated a significant increase in funding for nondefense energy R&D functions of the AEC for FY1960 but significantly decreased funding for the atomic energy defense R&D functions. Developing a new generation of more cost-effective nuclear power plants and constructing new particle accelerator facilities for physics research were top priorities, particularly for the administration and the Senate Appropriations Committee. President Eisenhower also remained keen to remain the global leader in atomic energy science and to use U.S. technological advances in this field as a diplomatic tool for strengthening the Western alliance through his atoms-for-peace program. In the aftermath of the Sputnik crisis, the Eisenhower administration was negotiating a moratorium on nuclear weapons tests with the Soviet Union, decreasing funding needs for the RDT&E budget of the AEC's nuclear weapons programs, and the Navy's new atomic submarines were progressing from nuclear reactor development and testing stages to submarine procurement. These policy changes appear to have been motivated by national security and geopolitical concerns and do not appear to have been influenced by any concerns about unemployment, inflation, or other short-run macroeconomic prerogatives. As such, we classify these policy events as exogenous. Most pertinent narrative evidence:

- "Our military and related scientific progress has been highly gratifying... Our atomic submarines have shattered endurance records and made historic voyages under the North Polar Sea... A major segment of our national scientific and engineering community is working intensively to achieve new and greater developments. Advance in military technology requires adequate financing but, of course, even more, it requires talent and time." Dwight D. Eisenhower, State of the Union Address, January 9, 1959 (*The American Presidency Project*, by Gerhard Peters and John T. Woolley, https://www.presidency.ucsb.edu/node/235339)
- "In the current fiscal year, total expenditures for basic and applied research and for scientific development have reached record amounts, and a supplemental appropriation for 1959 to advance space technology is recommended. For the fiscal year 1960,

[R&D] expenditures will be increased still further, with emphasis on space exploration, peaceful uses of atomic energy, and basic science." (Budget Message of the President, FY1960, January 19, 1959, p. M15)

- "Expenditures by the [AEC] are expected to reach an all-time high of $2.7 billion in fiscal 1960. This large amount reflects our determination to maintain our position of world leadership in the field of nuclear military armaments until such armaments are brought under adequate international control and to promote the development of peaceful applications of atomic energy. In light of our offer to suspend tests of nuclear weapons for a 1-year period starting October 31, 1958, and in view of the negotiations for further suspension, the budget does not provide for any weapons tests in the fiscal year 1960. Under the circumstances, testing grounds in Nevada and the Pacific will be kept on a standby basis. A satisfactory test suspension agreement, of course, is but a first step toward reducing the grave threat of nuclear warfare. This administration intends to explore all possible means of attaining armament control under adequate inspection guarantees despite the recent suspension of negotiations on means of avoiding surprise attacks. I hope that we shall succeed. Until an acceptable agreement is reached, however, financial authorizations must be provided to continue the development and production of nuclear weapons at current high levels to meet a variety of military needs. Programs for the development of nuclear reactors for a variety of military propulsion and power applications will be continued at or above the high levels already attained." (Ibid, p. M36)
- "At the second Conference on the Peaceful Uses of Atomic Energy in Geneva in September 1958, the United States demonstrated the range and scope of its atomic [R&D] in the peaceful applications of this new energy source. We plan to pursue energetically promising technical approaches to civilian power reactors. We will emphasize efforts to reduce the cost of the reactor fuel cycle; such a reduction is basic to the attainment of economic atomic power. This budget provides for the continuation of construction and for development, modification, and operation of a number of experimental and prototype power reactors owned by the Government, including operation of the atomic power station at Shippingport, Pa., the world's first nuclear powerplant devoted primarily to the production of electric energy... In addition, the exchange of technical information with foreign countries will be expanded through participation in international undertakings, especially the European Atomic Energy Community (Euratom) and the International Atomic Energy Agency." (Ibid, pp. M36-37)
- "The budget provides for a higher level of research in the physical and life sciences. Three large particle accelerators in the multibillion electron volt range will be put in operation in 1960. These new accelerators, together with two already completed, will produce valuable new information on the basic structure of the atomic nucleus. More advanced experimental devices will be fabricated and operated to explore the control of thermonuclear reactions. Also, as part of the life science program, the budget includes funds for the operation of the new Brookhaven Medical Center, where the first nuclear reactor designed primarily for medical research purposes is located." (Ibid, p. M37)
- "The expansions referred to are for [R&D] on civilian atomic power reactors; for development work at Stanford University on a high energy linear electron accelerator; and for development of civilian power reactors in cooperation with the European Atomic Energy Community, known as EURATOM... The increase over the $126 million anticipated in January is primarily for facilities to support the civilian atomic power program

and the physical research program" Maurice H. Stans, Director of the Bureau of the Budget, July 27, 1959 (Hearings before the Senate Appropriations Subcommittee on the [AEC] Appropriations, 1960, p. 8).

- "There is wide agreement that civilian nuclear power costs can within the next ten years or so be brought down to levels which are competitive with costs for conventionally generated electric power in the higher cost areas of the United States. In certain other countries not so fortunate in having cheap abundant coal, nuclear power can probably become competitive in as little as five years. While achievement of these immediate short-range objectives is necessary to ensure this Nation's position of leadership, longer-range efforts are directed at developing breeder reactors. It is important that future generations be able to derive energy not only from uranium 235 but from the 140 times more abundant uranium 238... The Government must continue to provide vigorous leadership, and must carry the primary responsibility for exploratory development of those reactor types which continue to show greatest promise." John A. McCone, Chairman, U.S. Atomic Energy Commission, July 27, 1959 (Ibid, p. 32)
- "The [Senate Appropriations] committee recommends the restoration of $10 million, to provide the full budget estimate of $407,400,000 for reactor development. After hearing detailed testimony as to the activities planned, the committee believes it is essential to provide such full amount in order to vigorously pursue both civilian and military reactor activities... The committee recommends the restoration of $8 million, to provide the amount of $151 million for physical research. The committee believes it is essential to avoid delay in assembling the scientific personnel and equipment required for the operation of the accelerators now nearing completion at Cambridge, Mass., and Princeton, N.J., and to assure full utilization of the existing accelerators at various universities" (S. Rpt. 86-598, July 31, 1959, p. 3).
- "HR 8283 appropriated $2,651,614,000 in fiscal 1960 funds for the [AEC]. The final total was $35,686,000 below the $2,687,300,000 Administration request. The House version of HR 8283 carried $58,186,000 less than the budget request; the Senate version, which restored most of the House cuts, totaled $6,886,000 less than the request. The two versions were compromised in conference." ("Atomic Energy Funds," *CQ Almanac 1959*, 15th ed., 04-340. Washington, DC: Congressional Quarterly, 1960)

Energy R&D Appropriations for FY1962

Bill: Public Works Appropriation Act, 1962

Public Law: 87-330 **Enacted:** September 30, 1961 **Effective:** September 30, 1961

Function	Nominal change		Real change		Classification
	Millions ($)	YOY%	Millions ($2012)	YOY%	
Defense	$182.5	22.9%	$820.2	22.2%	Exogenous
Nondefense	$98.7	18.6%	$430.3	18.1%	Exogenous

Congress appropriated significant increases in funding for both the defense and non-defense energy R&D functions of the AEC for FY1962, largely motivated by a renewed escalation of the nuclear arms race with the Soviet Union. While former President Eisenhower had been pursuing a partial nuclear test ban treaty, negotiations began to unravel after the Soviet Union shot down a U.S. U-2 spy plane in May 1960. Shortly after his inauguration, President Kennedy resumed talks, but they fell apart again after the Berlin

crisis and the Soviet Union resumed weapons testing in August 1961; President Kennedy lifted the U.S. moratorium on tests, which resumed in September 1961. Moreover, Premier Khrushchev was threatening that the Soviet Union would develop new 100-megaton warheads, roughly five times more powerful than those already tested by the U.S. or Soviet Union. Against this backdrop, Congress and the new Kennedy administration prioritized funding for more advanced nuclear weapons development, continued research for detecting nuclear weapons tests (for enforcing future nonproliferation treaties), and development of more advanced naval nuclear reactors as well as earlier stage reactor development for missiles, rockets, and warplanes. The Kennedy administration also continued running with the Eisenhower administration's heavy emphasis on civilian nuclear reactor development and physical science research, dovetailing with scientific efforts for the moon race. The policy changes appear to have been motivated by geopolitical and national security concerns, and do not seem to have been influenced by any concerns about unemployment, inflation, or other short-run macroeconomic prerogatives. As such, we classify these policy events as exogenous. Most pertinent narrative evidence:

- "We must sharpen our political and diplomatic tools the means of cooperation and agreement on which an enforceable world order must ultimately rest. I have already taken steps to coordinate and expand our disarmament effort—to increase our programs of research and study—and to make arms control a central goal of our national policy under my direction. The deadly arms race, and the huge resources it absorbs, have too long overshadowed all else we must do. We must prevent that arms race from spreading to new nations, to new nuclear powers, and to the reaches of outer space... I have asked the other governments concerned to agree to a reasonable delay in the talks on a nuclear test ban, and it is our intention to resume negotiations prepared to reach a final agreement with any nation that is equally willing to agree to an effective and enforceable treaty." John F. Kennedy, State of the Union Address, January 30, 1961 (*The American Presidency Project*, by Gerhard Peters and John T. Woolley, https://www.presidency.ucsb.edu/node/234534)
- "Programs of the [AEC] continue to emphasize weapons development and production while also providing increases for [R&D] on peaceful applications of atomic energy." (Budget Message of the President, FY1962, January 16, 1961, M20)
- "In 1962, expenditures by the [AEC] are estimated to be $2,680 million, compared with an estimated $2,660 million in 1961. There will be increases in several program areas, but these will be largely offset by reductions elsewhere, notably in the procurement of uranium concentrates. Expenditures for the production of nuclear weapons in 1962 will increase over 1961, while those for the development of weapons will continue at the same rate. Work will be carried forward in 1962 to improve methods for seismic detection of underground nuclear weapons tests. The [AEC] is also cooperating with [DOD] in the improvement of methods for detecting high altitude tests. In the naval reactor program, continued efforts will be made to develop longer-lived nuclear fuel. The development of a nuclear ramjet engine for missiles and of nuclear power plants for use at remote military installations will be pursued. The efforts to develop a nuclear engine for military aircraft will be continued in 1962..." (Ibid, p. M30)
- "Fundamental to progress in the peaceful uses of atomic energy is a sound and balanced program of basic research in the physical and life sciences. An important segment of this work is high-energy physics. Last July, the United States began operating the alternating gradient synchrotron at the [AEC's] Brookhaven National Laboratory on

Long Island at the highest energy level ever attained anywhere in the world. During fiscal year 1962 two more high energy accelerators, at Cambridge, Mass., and Princeton, N.J., will begin operation. A high-intensity accelerator is under construction at the Commission's Argonne National Laboratory near Chicago, Ill. Legislation is again proposed to authorize construction at Stanford University of a high energy linear electron accelerator which will be 2 miles long" (Ibid, pp. M30-311)

- "The development of civilian atomic power is being carried forward intensively. Expenditures of $250 million estimated for 1962 will support major development efforts on seven reactor types, and preliminary studies and experimental work on a number of other reactor concepts. The breadth and scope of our technology in this field are unmatched in the world. The next 18 months will see further advances toward our long-term objective of making atomic energy an alternative and economic source of power at home and abroad. The total number of major government-owned experimental power reactors in operation will increase by 5 to a total of 10" (Ibid, p. M31)
- "The [House Appropriations] committee responded to President Kennedy's order resuming nuclear tests by voting $30,000,000 extra to finance underground blasts. It made a last-minute change in the appropriations bill to earmark the money for weapons testing." ("House Unit Votes Water Projects: Works Bill Includes Extra Funds for Weapon Tests," *New York Times*, September 7, 1961)
- "Meanwhile, some persons in the nuclear weapons field were campaigning for the United States to develop a 1,000-megaton bomb, thus topping Premier Khrushchev's threat to test a 100-megaton "superbomb."... Among nuclear experts within the Administration and Congress, there is a growing belief that one of the principal objectives of the new Soviet test series is to develop a bomb with a yield of 100 megatons, or the explosive force of 100,000,000 tons of TNT. This would be 5,000 times more powerful than the bomb dropped on Hiroshima and about five times larger than the most powerful bombs now believed to be possessed by the United States and the Soviet Union... The possibility that the new round in the nuclear arms race may see the development by both sides of such weapons, approaching the long-suggested 'doomsday machine' capable of annihilating the world's population, is not dismissed within Administration circles. One of the president's closest advisors, for example, believes that the next generation of deterrent weapons may well see each side equipped with inter-continental ballistic missiles armed with warheads in the 100-megaton range" ("A.E.C. Head Warns of Fall-out Rise: Says Yield of 100-Megaton Soviet Bomb Would be Vast," by John w. Finney, *New York Times*, September 9, 1961)
- "Recognizing that the research carried out on materials and components provides the basic technology upon which enlarged use of reactors in the future depends, the [Senate Appropriations] committee recommends restoration of $2 million of the House reduction of $2,665,000... The Committee believes that the potential of the uses of isotopes fully warrants the amount recommended for such research, and the testimony presented to the committee indicates that any further reduction would curtail research on food irradiation and related application of isotopes" (S. Rpt. 87-1097, September 20, 1961, pp. 39-40)
- "In recommending funds for the AEC, the [House Appropriations] Committee provided an extra $30,000,000 to be used exclusively for nuclear weapons testing, thus endorsing President Kennedy's Sept. 5 decision to resume nuclear testing... The House had voted $2,352,601,000 for the AEC. The Senate Committee recommended an additional

$205,960,000 for plant acquisition and construction which had been omitted from the House version pending enactment of the authorization bill (HR 7576)." ("Public Works – AEC Funds," *CQ Almanac 1961*, 17th ed., 153-56. Washington, DC: Congressional Quarterly, 1961)

Energy R&D Appropriations for FY1963

Bill: Public Works Appropriation Act, 1963

Public Law: 87-880 **Enacted:** October 24, 1962 **Effective:** October 24, 1962

Function	Nominal change		Real change		Classification
	Millions ($)	YOY%	Millions ($2012)	YOY%	
Nondefense	$90.1	14.3%	$400.6	14.3%	Exogenous

Congress again appropriated a significant increase in both nominal and real funding for the nondefense energy R&D functions of the AEC for FY1963; nominal funding for atomic energy defense R&D activities also rose, but less significantly in real terms. Months after submitting the FY1963 budget request, President Kennedy requested an additional $211 million for the AEC related to the resumption of nuclear weapons tests and increased development and procurement of new warheads. The Kennedy administration also continued to prioritize AEC R&D efforts related to the space race, notably developing nuclear-powered rocket engines and experimenting with nuclear isotopes as a power source for satellites and other space vehicles, in addition to the development of more advanced civilian nuclear power plants. The AEC's physical research program also remained a high priority of the administration; the House Appropriations Committee tried to pare back the administration's related request for increased funding, but the Senate Appropriations Committee approved the full $30 million increase in funding over FY1962 levels. The more AEC-skeptical, economical House committee was primarily successful in paring back funds for Stanford's linear particle accelerator. The policy changes do not appear to have been motivated by concerns about unemployment, inflation, or any other short-run macroeconomic prerogatives. As such, we classify these policy events as exogenous. Most pertinent narrative evidence:

- "This Nation has the will and the faith to make a supreme effort to break the log jam on disarmament and nuclear tests—and we will persist until we prevail, until the rule of law has replaced the ever dangerous use of force." John F. Kennedy, State of the Union Address, January 11, 1962 (*The American Presidency Project*, by Gerhard Peters and John T. Woolley, https://www.presidency.ucsb.edu/node/236917)
- "Expenditures by the [AEC] in 1963 are estimated to be $2,880 million, up somewhat from 1962. Substantial increases in several program areas will be partially offset by reductions elsewhere, principally in the procurement of uranium concentrates... Expenditures for the production of nuclear weapons will rise in 1963, and design and development work will be further intensified to assure the availability of improved types of nuclear weapons. A continued high level of effort will be devoted to the development and improvement of nuclear powerplants for submarines and surface naval ships in order to improve further their operating characteristics and efficiency." (Budget Message of the President, FY1963, January 18, 1962, pp. 65-66)
- "It is expected that atomic energy will make substantial and unique contributions to the conquest of outer space. In 1963 efforts will be intensified on the development

of nuclear propulsion for rockets (Project Rover) and of highly compact atomic reactors and radioisotope sources to generate electric power for auxiliary use in satellites, space vehicles, and other specialized remote installations (Project SNAP—systems for nuclear auxiliary power)." (Ibid, p. 66)

- "The development of civilian atomic power will be carried forward in 1963 at about the levels attained in 1962. Atomic fuels offer a valuable supplement to conventional fuels in the short term and an essential replacement for them in the much longer term. Numerous large power reactors have been and are being constructed, from which valuable technical information will be obtained. Expenditures for the development of civilian atomic power and directly related supporting technology will considerably exceed $200 million in 1963." (Ibid, p. 66)
- "Underlying all of the technical development work in the atomic energy program is the fundamentally important work in basic research in the physical and life sciences. The physical research program will expand in 1963 with significantly increased expenditures in high-energy physics, low-energy physics, chemistry, and metallurgy. Research activities in the life sciences will also be increased, not only in order to expand basic understanding of the effects of radiation upon life processes..." (Ibid, p. 66)
- "President Kennedy asked Congress for an additional $164.5 million appropriation for the [AEC's] operating budget and an extra $46.3 million for AEC capital construction in fiscal 1963... Mr. Kennedy said $120 million of the added funds are required to restore 1962 funds being used for atomic weapons testing... Last year when the US resumed weapons testing, Congress appropriated an additional $30 million to cover, at least in part, the underground test series in Nevada. Additional money is available for weapons testing in the fiscal 1963 budget, the commission says. The President says the rest of the additional operating funds are required for the production of atomic weapons and a study of a new type of fuel element design" ("President Asks For $210.8 Million Extra for AEC," by a Wall Street Journal Staff Reporter, *Wall Street Journal*, May 22, 1962)
- "The $206,000,000 which the [House Appropriations] Committee recommends for this [physical research] program, while a reduction of $10,000,000 million from the budget estimate, is an increase of $30,000,000 above the funds available in fiscal year 1962, and $45,000,000 above the fiscal year 1961 level. The Committee recognizes the fact that, as more sophisticated machines for use in the high-energy physics field come into operation, the annual cost of this particular program will probably increase. Of the increase proposed in the budget for 1963, $17,234,000 is associated with the high-energy physics work in order to make the best use of the large investments in machines and equipment in this program. The Committee directs that none of the decrease be applied to the high-energy physics program... The Committee is convinced that the funds made available in this program are not producing returns commensurate with the investment and insists that there be tighter controls on research contracts to assure that they are being effectively used" (H. Rpt. 87-2223, August 14, 1962, p. 61)
- "The [Senate Appropriations] committee recommends an appropriation of $507,545,000 for this [reactor development] program, which is $11,917,000 over the House allowance and $3,800,000 above the budget estimate... As to the restoration of $3,417,000 recommended for the advanced space power system portion of the satellite and small power sources program, the committee is advised that in order for the Commission to meet its schedule for the development of the SNAP 50 program for use in communi-

cations satellites and the requirements of both the Air Force and NASA for advanced power sources, the full amount estimated will be required in 1963" (S. Rpt. 87-2178, September 28, 1962, p. 44).

- "Restoration of $10 million [for the physical research program] is recommended by the [Senate Appropriations] committee, to provide the full budget estimate of $216 million. The committee believes it is important to provide for all elements of the basic research of the entire atomic energy program, without placing undue emphasis on high-energy physics" (Ibid, p. 45)
- "The [House Appropriations]Committee reduced the budget request for AEC plant acquisition and construction by $70,500,000. The Committee recommended $35 million for funding of the construction of the Stanford linear accelerator, used in research, instead of the budget request for $95 million. The report said since "the estimated obligations for 1963 are only $35,000,000" there was "no need for appropriating the $60,000,000 balance ahead of the time of need for these funds... The [Senate Appropriations] Committee recommended $30.5 million more [for the AEC] than was voted by the House, but approved the reduction for the Stanford linear accelerator... The conferees allowed $3,134,969,000 [for the AEC]; the House had voted $3,122,819,000; the Senate, $3,153,286,000. The major increase over the House figure was in operating expenses for the AEC." ("Public Works-AEC Funds," CQ Almanac 1962, 18th ed., 04-180-04-182. Washington, DC: Congressional Quarterly, 1963)

Energy R&D Appropriations for FY1964

Bill: Public Works Appropriation Act, 1964

Public Law: 88-257 **Enacted:** December 31, 1963 **Effective:** December 31, 1963

Function	Nominal change		Real change		Classification
	Millions ($)	YOY%	Millions ($2012)	YOY%	
Defense	$75.5	7.4%	$315.0	6.7%	Exogenous

Shifting priorities, Congress appropriated a significant increase in funding for the atomic energy defense R&D functions of the AEC for FY1964, while nondefense energy R&D funding was held roughly flat in nominal terms. The Kennedy administration had proposed an increase in funding for nuclear weapons development and procurement but a decrease in weapons testing, as a result of the Partial Test Ban Treaty (PTBT, also called the Limited Test Ban Treaty), which was signed on August 5, 1963, and took effect on October 10; the treaty banned atmospheric, underwater, and outer space nuclear tests, leaving underground weapons tests the only remaining form permitted. Development of more advanced naval nuclear reactors and nuclear-powered missile engines also remained policy priorities of the Kennedy administration, as were newer efforts to develop mobile nuclear reactors for the armed forces. In Congress, the usual tug-of-war between the House and Senate committees persisted, with the House proposing large cuts to civilian nuclear energy and scientific programs, which were partially restored by the Senate, which placed higher priority on the AEC's nondefense research programs; the House Appropriations Committee proposed reductions in almost all budget accounts save weapons, which was fully funded, as it was by the Senate as well. The policy changes do not appear to have been motivated by concerns about unemployment, inflation, or any other short-run macroeconomic prerogatives. As such, we classify these policy events as exogenous. Most pertinent narrative evidence:

- "The first task of the alliance remains the common defense. Last month Prime Minister Macmillan and I laid plans for a new stage in our long cooperative effort, one which aims to assist in the wider task of framing a common nuclear defense for the whole alliance. The Nassau agreement recognizes that the security of the West is indivisible, and so must be our defense. But it also recognizes that this is an alliance of proud and sovereign nations, and works best when we do not forget it. It recognizes further that the nuclear defense of the West is not a matter for the present nuclear powers alone—that France will be such a power in the future—and that ways must be found without increasing the hazards of nuclear diffusion, to increase the role of our other partners in planning, manning, and directing a truly multilateral nuclear force within an increasingly intimate NATO alliance." John F. Kennedy, State of the Union Address, January 14, 1963 (*The American Presidency Project*, by Gerhard Peters and John T. Woolley, https://www.presidency.ucsb.edu/node/237129)
- "Expenditures for the development and production of nuclear weapons will rise slightly in 1964, but this increase will be more than offset by a reduction in the level of effort on full-scale weapons testing. The budget assumes fewer underground tests than in 1963. A capability for resuming atmospheric testing will be maintained. Work will continue on improving nuclear propulsion reactors for ships and submarines of the Navy. In 1964, the development of a full-scale experimental reactor for application to a nuclear ramjet propulsion system is expected to be completed. Further work on specific applications will await the completion of studies of the nonnuclear problems involved and of potential military uses. Emphasis will be given to the development of a compact mobile power reactor for use by our military ground forces." (Budget of the United States, FY1964, January 17, 1963, p. 68)
- "A substantial and increasing effort is planned for 1964 to foster the use of nuclear energy in the exploration of outer space. In cooperation with [NASA], emphasis will be given to the development of a nuclear-powered rocket (Rover). Work will be intensified on the development of a variety of compact nuclear electric power units with varying power outputs for satellites and space vehicles (SNAP program)." (Ibid, p. 68)
- "Expenditures in 1964 for the development of economic civilian nuclear power are estimated at $244 million, an increase of $34 million over 1963. In line with the Commission's recent Report to the President on Civilian Nuclear Power, increasing emphasis will be placed on reactors that produce more fuel than they consume ("breeders"). Breeders will be necessary if nuclear energy is to make a significant contribution to the national power supply in the long run, and a new experimental facility will be built in pursuit of this objective" (Ibid, p. 69)
- "The [AEC's] program of basic research in the physical and life sciences will continue to grow in 1964, with additional emphasis on studies in high energy physics, low energy physics, chemistry, and metallurgy. By the end of fiscal year 1964, the AEC's group of multi-billion electron-volt particle accelerators will number 8 machines and will constitute the world's finest array of high-energy physics facilities. At the Brookhaven National Laboratory, construction will begin on a particle accelerator... which promises to be the most advanced instrument in the world for research in low-energy physics. Research activities in the life sciences will also continue to expand with increased emphasis on achieving an understanding of the effects of radiation on molecular and cellular structures" (Ibid, p. 69)
- "A reduction of $33.5 million in the nuclear reactor development program [in the House

Appropriations Committee bill] eliminated about half of the increase requested for that program over the 1963 level and was based on the six-month availability of the fiscal 1964 appropriation. It also included the elimination of $3 million and $12 million in planned obligations for assistance to utilities constructing power reactors because, the Committee said, "It is no longer necessary to stimulate the construction of power reactors since it has been demonstrated that they are now producing electric power at competitive costs at least in those areas of high conventional fuel costs." Funds for physical research and biology and medicine were held, for the most part, at fiscal 1963 levels... The Senate [Appropriations] Committee restored numerous appropriations recommended by the Budget Bureau but cut by the House, for a $100,050,000 increase. Among these items were the restoration of $15 million for nuclear power reactors (the report said the Committee did not intend that already proven types would be constructed" but that aid would facilitate construction of "more advanced types"), and $7 million (total of $75,645,000) for the biology and medicine program... An additional appropriation of $17,945,000 was also provided for the construction of 12 new facilities for nuclear weapons development approved in a supplemental authorization bill (S 2267). The facilities were part of the program of safeguards to minimize the risk of the nuclear test ban treaty... The final appropriation for the [AEC] of $2,742,669,000 was $106,976,000 less than the fiscal 1964 budget estimate and $392,300,000 less than the fiscal 1963 appropriation." ("$4 Billion Granted for Public Works and Atomic Energy," *CQ Almanac 1963*, 19th ed., 178-81. Washington, DC: Congressional Quarterly, 1964)

Energy R&D Appropriations for FY1965

Bill: Public Works Appropriation Act, 1965

Public Law: 88-511 **Enacted:** August 30, 1964 **Effective:** August 30, 1964

Function	Nominal change		Real change		Classification
	Millions ($)	YOY%	Millions ($2012)	YOY%	
Defense	-$50.8	-4.6%	-$255.1	-5.1%	Exogenous
Nondefense	$55.1	7.6%	$230.0	7.2%	Exogenous

Shifting priorities yet again, Congress appropriated a significant increase in funding for nondefense energy R&D functions and a significant decrease in funding for atomic energy defense R&D functions of the AEC for FY1965. Recently sworn into office following the assassination of John F. Kennedy, President Lyndon B. Johnson was intent on staying the course in pursuing arms control treaties that had been sought by President Kennedy, and reducing the posture of U.S. nuclear weapons more broadly. President Johnson also launched a war on poverty, reflected in his first budget request, that involved a majority shift of priorities from defense expenditure—including weapons functions of the AEC—to domestic social spending; the administration, however, continued to push for increased funding for civilian nuclear power development, physical sciences research, and nuclear technologies related to the space race. The House Appropriations Committee again pushed for large cuts to civilian nuclear energy and scientific programs, which were partially restored by the Senate, which still placed higher priority on the AEC's nondefense research programs. The policy changes do not appear to have been motivated by concerns about unemployment, inflation, or any other short-run macroeconomic prerogatives. As such, we classify these policy events as exogenous. Most pertinent narrative evidence:

- "Let us carry forward the plans and programs of John Fitzgerald Kennedy—not because of our sorrow or sympathy, but because they are right... we must take new steps—and we shall make new proposals at Geneva—toward the control and the eventual abolition of arms. Even in the absence of agreement, we must not stockpile arms beyond our needs or seek an excess of military power that could be provocative as well as wasteful." Lyndon B. Johnson, State of the Union Address, January 8, 1964 (*The American Presidency Project*, by Gerhard Peters and John T. Woolley, https://www.presidency.ucsb.edu/node/242292)
- "Moreover, this budget makes provision for the initiation of a new and major effort to break the vicious circle of chronic poverty, which denies to millions of our fellow citizens a just participation in the benefits of life in our country... The urgent and necessary program increases recommended in this budget will be financed out of the savings made possible by strict economy measures and by an exhaustive screening of existing programs... [DOD] expenditures will decline by more than $1 billion from 1964 to 1965, and additional savings are expected to be realized in agriculture, atomic energy, postal services, veterans benefits, and in various lending programs" (Budget Message of the President, FY1965, January 21, 1964, p. M8)
- "Although we continue to seek a relaxation of tensions, we cannot relax our guard. While the nuclear test ban treaty is a hopeful sign, neither that treaty nor other developments to date have, by themselves, reduced our defense requirements. We will continue underground nuclear testing, maintain our above-ground test facilities in ready condition, maintain strong weapons laboratories, and continue the development of detection devices. However, because of the nuclear strength we have achieved, it will be possible to cut production of enriched uranium by 25% and to shut down four plutonium piles." (Ibid, pp. M19-20)
- "Expenditures by the [AEC] in 1965 are estimated to be $2.7 billion, down $65 million from 1964. Increases for [R&D] programs for peaceful uses of atomic energy will be more than offset by a reduction of $126 million in the procurement of uranium concentrates and the production of special nuclear materials... Expenditures for the development and production of nuclear weapons in 1965 will remain at the levels attained in 1964." (Budget of the United States, FY1965, p. 80)
- "Expenditures in 1965 for the development of civilian nuclear power are estimated at $234 million, an increase of $5 million from 1964. Increased emphasis will be placed on reactors that produce more fuel than they consume ("breeders"), and efforts will be continued to develop certain other advanced reactors... Programs to develop the use of nuclear energy in space exploration will be continued in 1965. Work will continue on the SNAP program to develop compact nuclear electric power units for satellites and space vehicles, with particular emphasis on units fueled by radioisotopes. The Rover nuclear rocket program will be reoriented to ground-based research and engineering, with deferral of flight objectives... There will be continued growth in 1965 in basic research in the physical and biomedical sciences. Particularly noteworthy in the physical sciences program will be the start of the construction of the world's finest research reactor at Argonne National Laboratory near Chicago, which will serve many scientific disciplines. Research activities in the biomedical sciences will grow in several areas, including fallout studies." (Ibid, pp. 80-81)
- "Restoration of $8 million is recommended by the [Senate Appropriations] committee, to provide a total amount of $218 million for this [physical research] program, which is

$4 million below the budget estimate. The committee is advised that this restoration is vitally needed in order to prevent serious curtailment of the entire program, and to allow for the most efficient utilization of facilities at the national laboratories, many of which are newly available" (S. Rpt. 88-1326, August 5, 1964, p. 41)

- "The [House Appropriations] Committee cut $61,927,000 from the Administration request for the operating expenses of the AEC and $7 million from other sections, for a recommendation of $2,624,073,000... The largest single cut in the Administration request for the AEC was an $8 million reduction in the physical research program. The $8 million cut was in addition to a $4 million cut already made by the Joint Atomic Energy Committee in action on the authorizing bill. The [House] Appropriations Committee said the research program had grown from $121 million in 1960 to the $210 million appropriated for fiscal 1965. The Committee reminded the AEC that, for three consecutive years, it had requested a 'tightening up' in research projects to place 'greater emphasis on the overall usefulness of the potential results'"... The [Senate Appropriations] Committee increase over the House figure was accounted for partially by the fact that the Administration raised its request by $68.3 million after the House passed HR 11579, and the Committee granted the entire new request... the Committee also restored $6,435,000 of the $7,930,000 cut by the House from the Administration request for the reactor development program of the [AEC] ("Public Works, AEC Funds," *CQ Almanac 1964*, 20th ed., 190-93. Washington, DC: Congressional Quarterly, 1965)

Energy R&D Appropriations for FY1966

Bill: Public Works Appropriation Act, 1966

Public Law: 89-299 **Enacted:** October 28, 1965 **Effective:** October 28, 1965

Function	Nominal change		Real change		Classification
	Millions ($)	YOY%	Millions ($2012)	YOY%	
Defense	-$119.8	-11.4%	-$549.8	-11.5%	Exogenous

Congress again appropriated a significant decrease in funding for defense R&D functions of the AEC for FY1966, while nondefense R&D funding was instead held nearly flat in nominal terms. The Johnson administration continued to reprioritize budgetary resources away from defense expenditures—including weapons functions of the AEC—to domestic nondefense spending, including scientific research. The recently signed PTBT and a nuclear arsenal that had grown substantially during the Kennedy administration again facilitated decreasing expenditures on weapons programs, particularly plant and capital spending for nuclear weapons development and testing. The administration continued to push for increased funding for physical sciences research and nuclear technologies related to the space race but proposed a modest cut to funding for civilian nuclear power development; the House Appropriations Committee pared back the administration's requests for most nondefense programs, particularly civilian reactor development and physical sciences research, which the Senate Appropriations Committee only partially restored. The House committee's general frustration with AEC budget underruns in recent fiscal years—requesting more money than actually obligated—spilled over to the weapons program, which was also modestly cut relative to the administration's request, a first in recent years. The policy changes do not appear to have been motivated by concerns about unemployment, inflation, or any other short-run macroeconomic prerogatives. As such, we classify these policy events as exogenous. Most pertinent narrative evidence:

- "Partly because of the investments already made and partly because of substantial economies flowing from cost reduction efforts and improved management procedures, expenditures for national defense programs are estimated to continue to decline in 1966. The estimated $52.5 billion of outlays in 1966 will be $0.3 billion less than in 1965, and $2.0 billion lower than in 1964. In addition to the military functions of [DOD], these estimates include outlays for military assistance to our allies, for the [AEC], and for various other activities that directly support the defense effort. Barring a significant change in the threats which face us, it should be possible to maintain the necessary forces, make selective improvements, and conduct a vigorous program of [R&D] without increasing defense outlays each year." (Budget of the United States, FY1966, p. 69)
- "Expenditures by the [AEC] in 1966 are estimated to be $2.5 billion, down $170 million from 1965. The decreases from 1965 will result from such factors as a $55 million reduction in the procurement of uranium concentrates and a lower production level for enriched uranium and plutonium. In addition, fewer construction projects in support of [R&D] programs and less equipment procurement will reduce expenditures by $75 million. These decreases more than offset increases in some [R&D] programs for the peaceful uses of nuclear energy. Expenditures for the development and production of nuclear weapons in 1966 will decrease by $19 million from 1965 levels, reflecting the significant quantities of weapons stockpiled in recent years. Achievement in 1965 of the capability to resume atmospheric testing in the event of violation by others of the limited nuclear test ban treaty will make possible a decline of $29 million in test program expenditures in 1966. In a joint Defense-AEC program, work will continue on development and underground testing of nuclear weapons, on maintenance of readiness for atmospheric testing, and on improved detection and identification capabilities" (Ibid, pp. 77-78)
- "Expenditures in 1966 for the development of civilian nuclear power are estimated at $214 million, a decrease of $5 million from 1965. Continued emphasis will be given to the development of reactors that produce significantly more fuel than they consume ("high-gain breeders") as the long-range objective for civilian power reactors... Development of nuclear energy uses in space exploration will continue in 1966. The SNAP program to develop compact nuclear electric power units will focus on promising units fueled by radioisotopes and on the technology, fabrication, and testing of reactor-powered units. The Rover program to develop nuclear rockets, being pursued jointly with [NASA], will continue to be directed toward ground-based research and engineering. Basic research in the physical and biomedical sciences related to nuclear energy will continue to grow. Highly selective improvements and additions to existing major facilities will be initiated." (Ibid, p. 78)
- "The [House Appropriations] Committee has recommended a total of $471,450,000 for the reactor development program, a decrease of $29,000,000 in the budget estimate including reductions totaling $12,900,000 in the Authorization Bill" (H. Rpt. 89-527, June 17, 1965, p. 56)
- "The reduction of $3,000,000 [for the weapons program], including a decrease of $1,000,000 made in the Authorization Bill, is based on underrun experience similar to that in the Special nuclear materials program. Additional underruns are anticipated in 1966 in view of the 1965 underruns of $26 million" (Ibid, p. 56)
- "In addition to the cuts made in HR 8122, the [House] Appropriations Committee took

the following action on AEC's budget: Reduced funds for the raw materials program to $210 million because program costs had run considerably under budget estimates in recent years. For the same reason, it recommended further cuts in two other programs, appropriating $376 million for special nuclear materials and $702.4 million for the weapons program" ("Public Works, AEC Funds," *CQ Almanac 1965*, 21st ed., 208-13. Washington, DC: Congressional Quarterly, 1966).

- "Conferees recommended $2,412,520,000 for the AEC—about midway between the House and Senate figures and $115,105,000 less than the Budget request. They agreed to a portion of the Senate's restoration of cuts made by the House... They retained the House's $3 million cut, which the Senate had restored, in funds for the physical research program, leaving $236 million" (Ibid)
- "Twenty years after the first atomic bomb, Federal spending for the peaceful atom has finally drawn abreast of spending for nuclear weapons. Fifty percent of the [AEC]'s $2.5 billion budget is for nonmilitary operations. Three years ago, military operations accounted for nearly three-fourths of the budget... Even in the [AEC] there is little tendency to view this as a triumph of peace over preparations for the possibility of war. It is rather that military needs have been largely taken care of, so that they demand less money." ("Peaceful Atom Gains Equality with the Bomb," by Evert Clark, *New York Times*, July 17, 1965)

Energy R&D Appropriations for FY1968

Bill: Public Works and Atomic Energy Commission Appropriation Act, 1968

Public Law: 90-147 **Enacted:** November 20, 1967 **Effective:** November 20, 1967

Function	Nominal change		Real change		Classification
	Millions ($)	YOY%	Millions ($2012)	YOY%	
Defense	$57.1	9.6%	$216.1	8.0%	Exogenous

Congress appropriated a significant increase in funding for atomic energy defense R&D functions of the AEC for FY1966, while nondefense R&D funding was held nearly flat in nominal terms. Budgetary pressures from the Vietnam War and recent higher inflationary pressures had ushered in a new era of fiscal restraint for most programs, but wartime national security concerns again proved an exception to the rule. In his January 1967 State of the Union Address, President Johnson pledged that "we shall continue on a sensible course of fiscal and budgetary policy that we believe will keep our economy growing without new inflationary spirals; that will finance responsibly the needs of our men in Vietnam and the progress of our people at home." Yet [DOD] and the Joint Committee on Atomic Energy, the authorizing committee of jurisdiction, were keen to increase the AEC's weapons programs funding above and beyond the administration's budget request, specifically for the development and testing of new nuclear warheads compatible with the Spartan and Poseidon missiles concurrently being developed by the Army and Navy, respectively. The House Appropriations was inclined to only fund the weapons program at the level requested by the administration, because of the "critical budgetary situation," but the Senate Appropriations Committee thought such national security concerns "transcend budgetary restrictions," and the extra unrequested weapons funds won out in conference. Budgetary concerns did, however, restrain funding growth for the AEC's civilian reactor development and physical sciences research programs. The increase in the AEC's defense R&D funding

does not appear to have been motivated by concerns about unemployment, inflation, or any other short-run macroeconomic prerogatives. As such, we classify this policy event as exogenous. Most pertinent narrative evidence:

- "The Soviet Union has in the past year increased its long-range missile capabilities. It has begun to place near Moscow a limited antimissile defense. My first responsibility to our people is to assure that no nation can ever find it rational to launch a nuclear attack or to use its nuclear power as a credible threat against us or against our allies. I would emphasize that that is why an important link between Russia and the United States is in our common interest, in arms control and in disarmament. We have the solemn duty to slow down the arms race between us, if that is at all possible, in both conventional and nuclear weapons and defenses." Lyndon B. Johnson, State of the Union Address, January 10, 1967 (*The American Presidency Project*, by Gerhard Peters and John T. Woolley, https://www.presidency.ucsb.edu/node/238176)
- "Expenditures by the [AEC] in 1968 are estimated to be $2.3 billion, $60 million higher than in 1967. An estimated decline in expenditures for the procurement of uranium concentrates and for the production of special nuclear materials will be more than offset by increases in expenditures for the nuclear weapons program and for the development of nuclear power for civilian purposes... The military applications of atomic energy comprise primarily the weapons program and the naval reactor development program. Increased costs will be incurred in 1968 to prepare for and conduct underground nuclear tests in central Nevada and Alaska" (Budget of the United States, FY1968, pp. 85-86)
- "The program to develop advanced designs of nuclear power plants for civilian purposes will emphasize the fast breeder reactor program in 1968, a technology that promises to produce more fissionable nuclear fuel than is consumed in the process of producing power. Construction of a fast flux test facility for the fast breeder program will begin in 1968 at an estimated total cost of $87.5 million... The extensive program of basic research in the physical and biomedical sciences will be marked in 1968 by the initiation of the definitive design of a 200 billion electron volt (Bev) circular proton accelerator. The total cost of this accelerator facility, excluding the cost of supporting equipment, is estimated at about $240 million... AEC will also intensify its exploration into the controlled thermonuclear fusion reaction, with the objective of ultimately developing means of generating electric power from this reaction" (Ibid, pp. 86-87)
- "The estimated operating costs for the weapons program in fiscal year 1968 are $700.5 million. This provides for the production of nuclear weapons to meet the Presidentially approved stockpile requirements, the conduct of an aggressive [R&D] program, the conduct of the underground testing program, maintenance of an atmospheric test readiness capability, and cooperation with [DOD] in special test detection activities. The planned program is one that will enable us to continue to meet our responsibilities for the four safeguards related to the limited nuclear test ban treaty. The fiscal year 1968 estimate represents an increase of $37.0 million over the estimate for fiscal year 1967, which is a net change consisting of increases of $44.1 million for the development of supplemental test sites and $7.0 million for [R&D] activities, offset by decreases in production and in other testing estimates." Glenn T. Seaborg, Chairman, U.S. Atomic Energy Commission, August 3, 1967 (Hearings before the Senate Appropriations Subcommittee on the Public Works and Atomic Energy Commission Appropriations for Fiscal Year 1968, p. 16)

- "Furthermore, we have experience in the past year and a half and have moved toward a much firmer weaponization program. What we mean by this is instead of working on as many concepts for the future—[DOD] has actually indicated their need to go into particular weapons. When those requirements are placed upon us these become the priority requirements, and we have before us right now something like [deleted] such systems which have to go into weaponization... The requirements of the DOD with respect to weaponization have increased in the past year or so, and we have been taking these on immediately but at the expense of some of the advanced development work." Gerald F. Tape, Commissioner, U.S. Atomic Energy Commission, August 3, 1967 (Ibid, p. 25)
- "Because of the critical budgetary situation, the [House Appropriations] Committee has not approved the additional unbudgeted amount of $15,000,000 contained in the authorization bill [for the weapons program]" (H. Rpt. 90-505, July 20, 1967, p. 86)
- "The [Senate Appropriations] committee recommends adding $15,000,000 to the weapons program, to provide a total amount of $715,500,000, as authorized by the Joint Committee on Atomic Energy. Of this addition, $5,000,000 is added to [R&D], and $10,000,000 is added to the testing of atomic weapons... In its report on the authorization for 1968 (S. Rept. No. 349), the Joint Committee stated: '*Development and testing of nuclear warhead designs are required if new weapons systems such as Poseidon and Spartan are to be produced. It is apparent to the committee, on the basis of information elicited in executive hearings, that a more intensive development and testing program than would be possible with the amount of money requested by the AEC is required if the development of new weapons systems and their entry into production are to occur at a pace consistent with the national security... The paramount objective of the Atomic Energy Act—to develop atomic energy in such a way as to make the maximum contribution to the common defense and security—cannot be attained, in the committee's opinion, if the Commission's weapons development program is provided only the barest minimum of necessary support. It is with this objective in mind that the committee recommends an increase of $15 million in the fiscal year 1968 operating funds authorization for the Commission's weapons programs.*' The committee is advised that additional tests, beyond those planned for in the original budget submission, will be required in order to meet the needs of the weapons program, and the committee is convinced that the responsibility to meet such needs transcends budgetary restrictions" (S. Rpt. 90-574, September 28, 1967, pp. 43-45)
- "Congress Nov. 9 enacted the annual public works and Atomic Energy Commission appropriations bill (HR 11641)... of the $170,181,000 increase [for the AEC] over the previous year, $52 million was for nuclear weapons development and $93,103,000 was for plant and capital equipment. Although it did provide for the significant advance over fiscal 1967, nevertheless Congress declined to allow the AEC to carry on its program at a level as high as the Administration had requested. The Administration had asked Congress to provide appropriations that would make possible an AEC program level of $2,716,754,000 in fiscal 1968. Funding provided by Congress fell short of that request by $113,247,000." ("Congress Votes $4.7 Billion for Public Works," *CQ Almanac 1967*, 23rd ed., 05-395-05-401. Washington, DC: Congressional Quarterly, 1968)
- "The [Senate Appropriations] Committee provided $2,142,402,000 for [AEC] operating expenses in fiscal 1968... The figure included a $15-million increase over both the House-approved and the requested sum for research, development, and testing of

nuclear weapons. The Administration-opposed increase was required, the Committee believed, because 'the responsibility to meet' a need for additional weapons development and testing 'transcends budgetary restrictions.' The increase was proposed in 1967 by the Joint Atomic Energy Committee... The Committee concurred with House action in deciding to fund two major construction projects—a fast flux test facility and a meson physics facility—on an annual basis instead of providing full funding immediately as the Budget proposed... In major action, conferees provided the Senate-passed amount of $715.5 million for nuclear weapons programs... which included an unrequested additional $15 million for weapons testing and development." (Ibid)

Energy R&D Appropriations for FY1969

Bill: Public Works for Water and Power Resources Development and Atomic Energy Commission Appropriation Act, 1969

Public Law: 90-479 **Enacted:** August 12, 1968 **Effective:** August 12, 1968

Function	Nominal change		Real change		Classification
	Millions ($)	YOY%	Millions ($2012)	YOY%	
Defense	$90.1	13.8%	$296.7	10.2%	Exogenous

Congress again appropriated a significant increase in funding for atomic energy defense R&D functions of the AEC for FY1969, while other funding for the AEC was pared back. Budgetary pressures from the Vietnam War continued to compel an era of fiscal restraint, and Congress cut funding below the administration's requests for almost all appropriations bills, the Public Works-AEC bill included. Within that bill, the appropriators funded almost every AEC budget function below the administration's request, but fully funded the requested increase for the weapons program, giving great deference to wartime national security concerns; the administration had requested nearly a 25% increase in funding for the weapons program, overwhelmingly to support development and testing of nuclear warheads for the new Sentinel anti-ballistic missile and the Poseidon submarine-launched ballistic missile systems being developed by DOD. The Johnson administration had been negotiating the Nuclear Non-Proliferation Treaty (NPT, also known as the Treaty on Non-Proliferation of Nuclear Weapons), finalized and signed by the U.S. in July 1968, but the new arms control treaty would not take effect until March 1970 and did not concretely limit America's development, testing, or deployment of nuclear weapons, though it did commit the U.S. to pursue eventual total nuclear disarmament. The increase in the AEC's defense R&D funding does not appear to have been motivated by concerns about unemployment, inflation, or any other short-run macroeconomic prerogatives. As such, we classify this policy event as exogenous. Most pertinent narrative evidence:

- "Because we believe the nuclear danger must be narrowed, we have worked with the Soviet Union and with other nations to reach an agreement that will halt the spread of nuclear weapons. On the basis of communications from Ambassador Fisher in Geneva this afternoon, I am encouraged to believe that a draft treaty can be laid before the conference in Geneva in the very near future. I hope to be able to present that treaty to the Senate this year for the Senate's approval." Lyndon B. Johnson, State of the Union Address, January 17, 1968 (*The American Presidency Project*, by Gerhard Peters and John T. Woolley, https://www.presidency.ucsb.edu/node/237325)

- "While we maintain our unremitting search for a just and reasonable peace, we must also continue a determined defense against aggression. This budget provides the funds needed for that defense, and for the maintenance and improvement of our total defense forces. The costs of that defense—even after a thorough review and screening—remain very large" (Budget Message of the President, FY1969, January 29, 1968, p. 7)
- "Expenditures for the [AEC] will rise, primarily as a result of increased activity for the design, underground testing, and production of nuclear weapons... The primary military applications of atomic energy comprise the nuclear weapons program and the naval reactors program. Largely as a result of the recent decision to deploy the Sentinel anti-ballistic missile system, expenditures in the weapons program will increase substantially above 1968. Additional funds will be needed for the development and full-scale underground testing of nuclear weapons, as well as for the construction of facilities to produce the nuclear warheads for the Sentinel and other advanced weapons systems. The cost of the facilities for the production of advanced weapons is now tentatively estimated at $285 million." (Budget of the United States, FY1969 p. 82)
- "Because of the current critical budgetary situation, the Committee has made every effort to reduce the appropriation requests to the minimum believed essential to maintain the ongoing programs covered by the Bill" (H. Rpt. 90-1549, June 14, 1968, p. 2)
- "There is a widespread misconception that it should be possible during the current fiscal crisis to make large-scale reductions in the funding of public works projects and, therefore, that this particular bill, involving estimates of $4.9 billion, should provide a fertile field for savings... Fifty-six percent of the funds included in the bill, or $2.5 billion, are for the [AEC]. $1.4 billion of this total is for the weapons program, including an essential increase of $281 million, or 25 percent, for new weapons requirements. Against the other programs of A.E.C., the Committee has imposed a $218 million reduction in the budget request, or 17 percent, and a reduction of $253.7 million, or 19 percent, below the 1968 level of appropriations" (Ibid, p. 5)
- "The net increase of $87.5 million allowed over the 1968 appropriation includes an increase of $113.3 million for the weapons program to provide the additional construction and equipment required to meet the additional production capability requirements for the POSEIDON and SENTINEL systems and a decrease of $25.8 million in the other plant and capital equipment requirements of the [AEC]" (Ibid, p. 85)
- "[T]he total fiscal 1969 program level of the AEC would be $2,773,421,000, compared to $2,603,507,000 the previous year. Much of the increase was accounted for by a substantial boost in appropriations for the AEC's weapons program. Operating expenses in this program were increased to $840.8 million, $125.3 million more than in fiscal 1968. Plant and capital equipment expenses for weapons showed similar increases. The House Appropriations Committee said that about $1.4 billion of the AEC's entire budget was for weapons, and that the allotment for new weapons systems had shown a 25 percent increase. Two major new weapons systems that were to receive increased attention by the AEC were the Sentinel anti-ballistic missile system and the Poseidon, the new generation of submarine-launched offensive missiles. Another highlight of the AEC appropriation was the allotment of $60.3 million for the NERVA nuclear rocket engine development program" ("Public Works – AEC Funds,' *CQ Almanac 1968*, 24th ed., 06-373-6-378. Washington, DC: Congressional Quarterly, 1969)

- "The mandatory cut on spending and revenues from the recently enacted tax increase could cut the fiscal 1969 budget deficit to about $2.4 billion, according to Congressional economists. It would be the smallest deficit since 1965... Congress, which approved the spending cut over strong administration objections has consistently trimmed budget requests as it moved through appropriations bills" ("$2.4 Billion Deficit Seen Possible in '68," by United Press International, *The Washington Post*, July 17, 1968)

Energy R&D Appropriations for FY1970

Primary Bill: Public Works for Water, Pollution Control, and Power Development and Atomic Energy Commission Appropriation Act, 1970

Public Law: 91-144 **Enacted:** December 11, 1969 **Effective:** December 11, 1969

Function	Nominal change		Real change		Classification
	Millions ($)	YOY%	Millions ($2012)	YOY%	
Defense	-$57.6	-7.8%	-$381.5	-11.9%	Endogenous
Nondefense	-$26.3	-3.1%	-$274.9	-7.7%	Endogenous

In a quick reversal, Congress appropriated significant decreases in real funding for both defense and nondefense energy R&D functions of the AEC for FY1970, motivated by inflationary concerns. In his final budget, outgoing President Johnson proposed a fiscal policy explicitly intended to "contain inflationary pressures" but nonetheless requested increases for the AEC, particularly for the development of new naval nuclear reactors and the production of new nuclear weapons. The administration was on the cusp of entering the NPT treaty, which had been signed on July 1, 1968, but not yet ratified by the Senate, somewhat easing pressure to fund new development on nuclear weapons. Johnson had also requested an increase in AEC funding for physical research in the FY1970 budget request, primarily for the construction of new physics facilities. The budgetary and inflationary situation continued to devolve after President Nixon was sworn into office in January 1969. On September 4, 1969, President Nixon directed a 75% reduction in new federal contracts for construction, intended to curb inflationary pressures; the appropriations committees responded accordingly and cut or deferred AEC plant and capital funding to future years because of the "current serious fiscal situation." The authorizers and appropriators both broadly reduced AEC funding relative to the budget request; even the relatively sacrosanct weapons program saw funding cut. President Nixon had also requested that the Senate ratify the NPT Treaty in March 1969 and signed the ratification agreement that December. The decreases in the AEC's R&D funding appear to have been largely motivated by concerns about inflation. As such, we classify this policy event as endogenous. Most pertinent narrative evidence:

- "The quest for a durable peace, I think, has absorbed every administration since the end of World War II. It has required us to seek a limitation of arms races not only among the superpowers, but among the smaller nations as well. We have joined in the test ban treaty of 1963, the outer space treaty of 1967, and the treaty against the spread of nuclear weapons in 1968. This latter agreement—the nonproliferation treaty—is now pending in the Senate, and it has been pending there since last July. In my opinion, delay in ratifying it is not going to be helpful to the cause of peace. America took the lead in negotiating this treaty and America should now take steps to have it approved at the earliest possible date. Until a way can be found to scale down the level of arms among the superpowers, mankind cannot view the future without fear

and great apprehension. So, I believe that we should resume the talks with the Soviet Union about limiting offensive and defensive missile systems." Lyndon B. Johnson, State of the Union Address, January 14, 1969 (*The American Presidency Project*, by Gerhard Peters and John T. Woolley, https://www.presidency.ucsb.edu/node/236130)

- "The fiscal policy I am recommending is designed to: Foster continued growth in employment and real income; Contain inflationary pressures; Ease the upward pressure on interest rates; and Continue the improvement in our balance of payments position... recent price developments have not been satisfactory, even though our record compares favorably with other major nations of the world. We have also had a sharp increase in interest rates, and our balance of payments position needs strengthening, although substantial progress has been made toward equilibrium" (Budget Message of the President, FY1970, January 15, 1969, p. 11)
- "Outlays by the [AEC] in 1970 will be $2.6 billion, $120 million higher than 1969. Increases will occur in outlays for the production of nuclear weapons, for the development of naval propulsion reactors, and for the construction of facilities for nonmilitary purposes... The program to develop improved propulsion reactors for submarines and naval ships will be intensified in 1970. Particular emphasis will be given to the development of reactors for higher-performance submarines. New and improved models of nuclear weapons will be produced in 1970" (Budget of the United States, FY1970, pp. 79-80)
- "AEC's extensive program of basic research in the physical and biomedical sciences will be highlighted in 1970 by intensified construction activity on two major particle accelerator projects. These are the 200 billion electron volt (Bev) proton accelerator in Batavia, Illinois, and the Meson Physics Facility in Los Alamos, New Mexico. These facilities are estimated to cost $250 million and $55 million, respectively, not counting supporting research equipment. The 200 Bev accelerator when completed will be the world's largest accelerator for research in high energy physics." (Ibid, p. 81)
- "After receiving the advice of the National Security Council, I have decided that it will serve the national interest to proceed with the ratification of the Treaty on Non-Proliferation of Nuclear Weapons. Accordingly, I request that the Senate act promptly to consider the Treaty and give its advice and consent to ratification. I have always supported the goal of halting the spread of nuclear weapons... I believe that the Treaty can be an important step in our endeavor to curb the spread of nuclear weapons and that it advances the purposes of our Atoms for Peace program which I have supported since its inception during President Eisenhower's Administration." President Richard M. Nixon, Message to the U.S. Senate, February 5, 1969 (*The American Presidency Project*, by Gerhard Peters and John T. Woolley, https://www.presidency.ucsb.edu/node/239765)
- "The reduction recommended by the [House Appropriations] Committee of $79.5 million below the budget estimate includes $32.8 million for items deleted in the 1970 Authorization Act (Public Law 91-44, approved July 11, 1969) and additional reductions (net) of $46.7 million imposed by the Committee based on its review. In each instance, the reductions have been made without prejudice to the items, being based on the need to defer and stretch out programs wherever possible because of the current serious fiscal situation." (H. Rpt. 91-548, October 2, 1969, p. 10)
- "The decrease below the budget request of $52.3 million [for plant and capital equipment] includes reductions of $3.3 million made in the 1970 Authorization Act and

additional reductions totaling $49.0 million made by the Committee. These reductions have been made without prejudice to the items involved, but merely reflect the necessity of curtailing expenditures to the greatest extent possible at the present time... A general reduction of $6,360,000 has been made in the funds allowed for construction projects based on anticipated slippage as a result of the recent presidential order deferring certain public works construction" (Ibid, p. 15)

- "The rapidly rising costs of housing are a particular cause for major concern when we are striving to bring the forces of inflation under control... We must take action that will directly affect construction supply and demand, which is what really determines prices... For the near term, we must take steps to relieve immediate strains in the [construction] industry. And for the long term, we must take action now to accelerate the growth in this industry's basic capacity to build... First, I am directing all agencies of the Federal Government to put into effect immediately a 75 percent reduction in new contracts for Government construction. This limitation, which will continue until conditions ease, will still permit projects of the highest social priority to be carried forward" Richard M. Nixon, Statement on the Construction Industry, September 4, 1969 (*The American Presidency Project*, by Gerhard Peters and John T. Woolley, https://www.presidency.ucsb.edu/node/240159)
- "I have today signed the Instrument of Ratification of the Treaty on the Non-Proliferation of Nuclear Weapons to which the Senate gave its advice and consent on March 13, 1969. This Government is thus completing the process of ratifying a major international agreement designed to make our world a safer home for all mankind. The negotiation and ratification of this treaty spans the administrations of three Presidents and reflects our country's dedication to the cause of peace... This administration seeks equitable and meaningful agreements to limit armaments and to resolve the dangerous conflicts that threaten peace and security." President Richard M. Nixon, Message to the U.S. Senate, November 24, 1969 (*The American Presidency Project*, by Gerhard Peters and John T. Woolley, https://www.presidency.ucsb.edu/node/240192)

Energy R&D Appropriations for FY1971

Bill: Public Works for Water, Pollution Control, and Power Development and Atomic Energy Commission Appropriation Act, 1971

Public Law: 91-439 **Enacted:** October 7, 1970 **Effective:** October 7, 1970

Function	Nominal change		Real change		Classification
	Millions ($)	YOY%	Millions ($2012)	YOY%	
Defense	-$2.7	-0.4%	-$161.7	-5.7%	Endogenous
Nondefense	$3.3	0.4%	-$165.3	-5.0%	Endogenous

Congress again appropriated significant decreases in real funding for both defense and nondefense R&D functions of the AEC for FY1971; defense R&D functions saw a modest nominal cut and nondefense functions a slight increase in nominal terms, but in the high inflationary environment, real funding for both functions fell by more than 5% year-over-year. President Nixon's budget request for FY1971 sought to reduce spending growth in order to "relieve pressure on prices," and Congress shared these concerns about inflation and budgetary restraint. The House Appropriations Committee approved less funding for

the AEC than the administration's request, and the Senate Appropriations Committee approved even less than the House. Research and development funding for civilian nuclear power was viewed as having the "'best potential' for solving energy problems," and Congress appropriated a sizable increase in funding to accelerate the development of the liquid metal fast breeder reactor, which was intended to help decrease the long-run cost of generating electricity. Beyond concerns about inflation, the growing environmental movement was generating more of a backlash against nuclear weapons, and environmental concerns influenced the Senate Appropriations Committee to cut the budget request for nuclear weapons development and testing. The decreases in the AEC's energy R&D funding appear to have been largely motivated by concerns about inflation, in addition to growing environmental concerns, while short-run energy supply concerns also influenced the appropriations process. As such, we classify these policy events as endogenous. Most pertinent narrative evidence:

- "With this budget we will... Help restore economic stability by holding down spending in order to provide another budget surplus and to relieve pressure on prices—and to achieve that surplus without income or excise tax increases" (Budget Message of the President, FY1971, February 2, 1970, p. 8)
- "Outlays by the [AEC] in 1971 are estimated at $2.4 billion, $50 million lower than 1970. Increases are planned for the production of enriched uranium to fuel nuclear powerplants, production of nuclear weapons, and development of naval propulsion reactors." (Budget of the United States, FY1971, p. 88)
- "In order to concentrate resources on higher priority projects, one large particle accelerator for high energy physics research will be shut down in 1971. However, AEC has under construction two major facilities for research on the frontiers of physics. These are the 200 billion electron volt (Bev) proton accelerator in Batavia, Ill., and the Meson Physics Facility in Los Alamos, N. Mex." (Ibid, p. 89)
- "Sen. Henry M. Jackson (D-Wash.) said yesterday that the Defense Department and the [AEC] have decided to reduce that national nuclear test readiness program to one-third of what it has been as an 'economy measure' in the President's budget for fiscal 1971" ("U.S. Readiness For A-Tests To Be Reduced," *The Washington Post*, December 20, 1969)
- "Budget Cuts: ... During the two-year period from July 1, 1969, to June 30, 1971, the AEC said, 'it is expected that a total of 4,000 positions will have been eliminated at AEC laboratories. In the year ending June 30, 1971, alone, projected reductions involve about 280 people at Lawrence Radiation Laboratory in Livermore'" ("Persecution of 2 Denied by AEC," by Thomas O'Toole, *The Washington Post*, July 8, 1970)
- "For the first time since the beginning of the nuclear age 25 years ago tomorrow, the powerful and once-unquestionable interests that have grown up around this nation's atomic technology are being forced onto the defensive by a rising public clamor for reform. Bitter, often emotional accusations of carelessness, duplicity and indifference are being sounded over a broad range of subjects by scientists, politicians, peace groups, environmentalists, and laymen concerned about health and safety. Within the Nixon Administration major reorganization plans are being considered" ("Atomic Power: A Bitter Controversy," by Anthony Ripley, *New York Times*, July 16, 1970)
- "The Senate Appropriations Committee, reporting out a $5.2 billion public works bill yesterday, trimmed funds sought to prepare for underground testing of antiballistic missile warheads at Amchitka Island in the Aleutians. A Senate source said the cut

was $15 million. It was made because the [AEC] failed to file a satisfactory statement of such tests' environmental effects, according to Sen. Edward S. Muskie (D-Maine)" ("Funds Trimmed For ABM Test In the Aleutians," *The Washington Post*, August 12, 1970)

- "The principal reductions in the budget are: (a) A reduction of $20,500,000 in the weapons program. Of this amount, $15 million is applied to the nuclear testing program principally against the supplemental test site activities conducted in support of the development of the nuclear warhead for a classified weapons system. Such a reduction is largely possible because of the change in scheduling of one experiment by several months. The later executions of this experiment will give the AEC an opportunity to make a more thorough study of the environment in the region of Amchitka Island in Alaska and will permit conducting the experiment at a more favorable season to assure maximum protection to this environment." (S. Rpt. 91-1118, August 11, 1970, p. 7)
- "Environmental activities of the AEC would be increased under the bill, the [House Appropriations] Committee said. Planned AEC expenditures of over $71 million (out of a total $2.3 billion) would provide for further research on the biological effects of radiation, radioactive waste management, and the effects of thermal alteration of the environment... Civilian nuclear power had the "best potential" for solving energy problems, said the Committee. Although fears over the safety of nuclear power were understandable, the Committee said, the AEC had a perfect safety record and was acting to assure nuclear power would be developed without harm to man or his environment." ("Public Works – AEC Appropriations," *CQ Almanac 1970*, 26th ed., 02-323-02-328. Washington, DC: Congressional Quarterly, 1971)
- "To speed development of a liquid metal fast breeder reactor, the [House Appropriations] Committee recommended $85 million. The fast breeder reactor was expected to decrease the costs of electric power by minimizing the quantity of uranium consumed per unit of electricity generated." (Ibid)
- "The major cuts made in the [Senate Appropriations] bill were for the [AEC]. The total appropriation was set at $2,271,270,000—which was $54,330,000 less than the House had approved and $91,730,000 less than the President had requested. The most significant cuts were $8 million for the Commission's weapons program, $2 million for the special nuclear materials program, $3.56 million for the reactor development program, and $2 million for physical research." (Ibid)
- "The only Senator to vote against HR 18127 was William Proxmire (D Wis.), who called the bill "highly inflationary" and urged the President to veto it. "At a time of severe budgetary pressures, we must place programs that help to educate and house and heal our people well above the pouring of cement for new dams and canals." Many of the public works projects were boondoggles which could not be justified, he said." (Ibid)

Energy R&D Appropriations for FY1972

Bill: Public Works for Water and Power Development and Atomic Energy Commission Appropriation Act, 1972

Public Law: 92-134 **Enacted:** October 5, 1971 **Effective:** October 5, 1971

Function	Nominal change		Real change		Classification
	Millions ($)	YOY%	Millions ($2012)	YOY%	
Defense	-$85.4	-12.5%	-$423.4	-15.9%	Exogenous
Nondefense	$3.7	0.4%	-$112.5	-3.6%	Exogenous

Congress again appropriated significant decreases in real funding for both the defense and nondefense energy R&D functions of the AEC for FY1972; defense R&D functions saw a significant nominal cut whereas nondefense functions saw a slight increase in nominal terms, nonetheless resulting in a significant decline in real funding. President Nixon's budget message for FY1972 proclaimed that excessive demand had been "eliminated as a source of inflationary pressure" over the previous two years, and the budget pivoted to new priorities, including environmental stewardship and developing clean sources of energy. The budget again prioritized the development of the liquid metal fast breeder reactor, intended to help decrease the cost of generating electricity in the long run, as well as thermonuclear energy research, which the appropriations committees willingly funded. The budget request held flat R&D for the weapons program and took a hatchet to AEC's nuclear rocket reactor program—a joint program with NASA—and development of nuclear technologies for space energy applications, singled out among budget savings from "inefficient, obsolete, or lower priority programs." Congress had also largely lost interest in funding space R&D programs in the aftermath of the moon landing in July 1969. In June 1971, President Nixon sent Congress a message on energy, the first of its kind, arguing that the federal government needed to play a more proactive role in promoting the development of "clean energy that will not pollute the air, will not pollute the environment." The policy changes were primarily motivated by environmental concerns and loss of interest in space programs, and do not appear to have been motivated by concerns about unemployment, inflation, or any other short-run macroeconomic prerogatives. As such, we classify these policy events as exogenous. Most pertinent narrative evidence:

- "When I took office two years ago, rampant inflation was the Nation's principal economic problem... My administration acted promptly to move us out of that war and cool the superheated economy. We controlled Federal spending in 1969 and achieved a budget surplus. Spending was restrained again in 1970. Independently, the Federal Reserve System maintained a monetary policy of restraint which increased in severity throughout calendar year 1969 and continued into early 1970. The forces of inflation have been durable and persistent—and they remain strong. But their momentum was slowed in calendar year 1969 and early 1970. Excessive demand was eliminated as a source of inflationary pressure during this period. The turnaround of this inflationary trend permitted us to enter the second phase of our plan: to follow more expansive economic policies without losing ground in the battle against inflation" (Budget Message of the President, FY1972, January 29, 1971, p. 8)
- "The changing pattern of national needs sometimes renders Government programs obsolete. Some Federal programs should never have been started in the first place. All too often, however, all Federal activities continue unless vigorous efforts are made to curtail them. There are other programs which, while not obsolete, have declined in importance relative to the conditions and priorities of today's world... The 1972 budget incorporates the results of a diligent search to uncover inefficient, obsolete, or lower-priority programs... Included are the termination and reduction of certain projects in both the [AEC] and [NASA]" (Budget of the United States, FY1972, p. 50)

- "outlays for AEC's program activities will decline by $81 million in 1972... AEC will continue to develop improved types of nuclear weapons at its weapons laboratories. AEC will also continue to develop improved designs of propulsion reactors for nuclear submarines and naval ships for use by the Navy in its shipbuilding program... High priority is being given to the development of an economic liquid-metal, fast-breeder power reactor. This technology is expected to make a major contribution in the long term to meet the rapidly growing energy needs of the Nation. Construction will proceed on a 200 billion electron volt proton accelerator at Batavia, Illinois, for basic research in high energy physics." (Ibid, pp. 92-93).
- "The request for weapons [R&D] funds in fiscal year 1972 remains at about the 1971 level... The estimate for fiscal year 1972 reactor development program operating costs is $411.5 million, an overall decrease of $22.1 million from the 1971 estimate of $433.6 million. This decrease results primarily from a significant reduction in the estimate for the space propulsion and electric power program" Glenn T. Seaborg, Chairman, U.S. Atomic Energy Commission, April 27, 1971 (Hearings before the Senate Appropriations Subcommittee on the Public Works for Water and Power Development and Atomic Energy Commission Appropriations for Fiscal Year 1972, p. 56).
- "I am sending to the Congress today a message on energy. This is the first time that a message on energy of a comprehensive nature has been sent to Congress by the President of the United States. The reason it is essential, and I consider the program urgent, is that in all great industrial societies, we face two challenges: one, to find new sources of energy to fuel the economy; and two, to find sources of energy that will not pollute the environment. We have learned in our own country, and in countries abroad as well—they have the same experience—that usually these two goals come in conflict; that while new sources of energy may provide what the needs of the economy are, inevitably there is the polluting of the environment. This message points the way for America—at a considerable cost in money, but an investment that is urgent and, therefore, justified—points the way for finding new sources of energy and, at the same time, clean energy that will not pollute the air, will not pollute the environment." Richard Nixon, Remarks About a Special Message to the Congress on Energy Resources, June 4, 1971 (*The American Presidency Project*, by Gerhard Peters and John T. Woolley, https://www.presidency.ucsb.edu/node/240205)
- "For most of our history, a plentiful supply of energy is something the American people have taken very much for granted. In the past twenty years alone, we have been able to double our consumption of energy without exhausting the supply. But the assumption that sufficient energy will always be readily available has been brought sharply into question within the last year. The brownouts that have affected some areas of our country, the possible shortages of fuel that were threatened last fall, the sharp increases in certain fuel prices, and our growing awareness of the environmental consequences of energy production have all demonstrated that we cannot take our energy supply for granted any longer. A sufficient supply of clean energy is essential if we are to sustain healthy economic growth and improve the quality of our national life. I am therefore announcing today a broad range of actions to ensure an adequate supply of clean energy for the years ahead. Private industry, of course, will still play the major role in providing our energy, but government can do a great deal to help in meeting this challenge." Richard Nixon, Special Message to the Congress on Energy Resources, June 4, 1971 (*The American Presidency Project*, by Gerhard Peters and John T. Woolley,

https://www.presidency.ucsb.edu/node/240214)

- "The reduction recommended by the [House Appropriations] committee of $40,751,000 below the budget estimate [for the AEC] includes a net reduction of $5,251,000 based on the 1972 Authorization Bill and additional reductions of $35,500,000 imposed by the committee due primarily to anticipated slippages in the programs and the availability of unobligated carryover balances... The committee has allowed the full budget request of $15 million for Space propulsion systems but has not recommended funding of the unbudgeted increase of $37 million contained in the 1972 authorization bill. In view of the many high-priority programs requiring increased funding in the Bill, the Committee believes expansion of the Reactor propulsion development program (NERVA), involving commitment to large follow-on annual appropriations, should be deferred at this time." (H. Rpt. 92-381, July 26, 1971, pp. 9-10)
- "Because of the doubling every ten years of the demands for electricity, the report said, "enormous problems have emerged—soaring fuel prices, potential fuel shortages, rapidly rising electricity rates, brownouts, black-outs, widespread opposition to the construction of new power facilities and a host of environmental factors"... The [House Appropriations] committee stressed the need to achieve the goal of adequate and pollution-free energy sources. "Of the five sources for producing electrical power—hydropower, coal, oil, natural gas, and uranium—the committee is impressed that only uranium offers the potential of meeting long-range energy requirements." To exploit this potential, the committee approved $258 million for the Liquid Metal Fast Breeder Reactor, a device to minimize the consumption of uranium in producing electric power. The committee also continued funding for controlled thermonuclear research to develop methods of using nuclear fusion and water sources to produce electricity." ("$4.7-Billion Appropriated for AEC, Army Engineers," *CQ Almanac 1971*, 27th ed., 02-639-02-643. Washington, DC: Congressional Quarterly, 1972)
- "The [House Appropriations] committee recommended $2,270,000,000 for the AEC in fiscal 1972, a net reduction of $68,202,000 from the budget estimate and a reduction of $38,260,000 from the fiscal 1971 appropriations. The reduction from the budget estimate included a cut of $5.3 million in operating expenses and programs contained in the AEC authorization for fiscal 1972 (HR 9388) and additional reductions of $35.5 million imposed by the committee due to unspent funds carried over from fiscal 1971 and revised cost estimates. The committee also decreased the AEC budget request for plant and equipment by $27.4 million, to $344,000,000 from $371,451,000. Included in the AEC appropriation was $19.7 million for the Cannikin underground nuclear test at Amchitka Island, Alaska" (Ibid).

Energy R&D Appropriations for FY1973

Bill: Public Works for Water and Power Development and Atomic Energy Commission Appropriation Act, 1973

Public Law: 92-405 **Enacted:** August 25, 1972 **Effective:** August 25, 1972

Function	Nominal change		Real change		Classification
	Millions ($)	YOY%	Millions ($2012)	YOY%	
Defense	$69.7	11.7%	$167.7	7.5%	Exogenous
Nondefense	$91.1	10.9%	$198.9	6.6%	Endogenous

Congress reversed course and appropriated significant increases in both nominal and real funding for both the defense and nondefense energy R&D functions of the AEC for FY1973. The budget again prioritized the development of the liquid metal fast breeder reactor, intended to help decrease the cost of generating electricity in the long run, as well as thermonuclear energy research, which the appropriations committees willingly funded; Congress and the public were increasingly concerned about summer brownouts and blackouts, and the precarity of the nation's energy supply more generally. The U.S. signed the Strategic Arms Limitation Talks Agreement (SALT I) on May 26, 1972 and the Senate ratified the treaty on August 3, 1972; the treaty froze and limited the number of offensive land- and sea-based ballistic deployed by the U.S. and the Soviet Union, thus raising the importance of quality of weapons over quantity; the budget requested a significant increases in funding for the weapons program R&D and the naval propulsion reactor program. The defense R&D policy changes were primarily motivated by national security concerns and do not appear to have been motivated by concerns about unemployment, inflation, or any other short-run macroeconomic prerogatives; as such, we classify that policy event as exogenous. The nondefense R&D policy changes were motivated by a mix of concerns about the environment, the "energy crisis," and expanding the nation's supply of energy in the short run; as such, we classify that policy event as endogenous. Most pertinent narrative evidence:

- "The budget for 1973, held to full-employment balance, diminishes stimulation as the new prosperity takes hold and, by so doing, acts as a barrier against the renewal of inflationary pressure" (Budget Message of the President, FY1973, January 24, 1972, p. 7).
- "A sufficient supply of clean electrical power is essential to economic growth and the quality of national life. A broad [R&D] program is crucial to the attainment of these goals—both in the short- and long-run—and particularly to balance environmental and energy needs... In 1973 there will also be further expansion of [R&D] programs identified in the Energy Message of June 1971. These programs include the fast breeder reactor for nuclear power, coal gasification, magnetohydrodynamics, controlled thermonuclear fusion power, solar energy, and mapping and basic assessment of the resources of the Outer Continental Shelf. To reach further ahead in time—to provide more options for the future and to begin to draw more on the capabilities of the high technology agencies—the 1973 budget provides for research on advanced dry cooling towers and large-scale energy storage batteries in the AEC, cryogenic power generation and transmission in the AEC and National Bureau of Standards, greater use of laser technology in fusion power research under AEC..." (Budget of the United States, FY1973, p. 57).
- "We are negotiating with the Soviet Union in the Strategic Arms Limitation Talks (SALT) in order to limit offensive and defensive systems. However, until such time as there are agreed limits on strategic forces, we must prepare to meet the growing Soviet threat. Therefore, an increase from $7.6 billion total obligational authority in 1972 to $8.8 billion in 1973 is proposed for the strategic forces." (Ibid, pp. 79-80)
- "Program outlays by the [AEC] will increase by $122 million in 1973... Fabrication of new types of nuclear weapons to replace obsolescent weapons will increase. Taken together, the development and testing of nuclear weapons will continue at about the same outlay level in 1973 as in 1972... AEC's top priority civilian program is the development of an economic, liquid-metal, fast-breeder power reactor. This program

will be accelerated in 1973 in order to demonstrate the large-scale technical feasibility of this concept by 1980. The Administration has also announced an intention to build a second demonstration plant. The timely development of an economic fast-breeder reactor is an important part of our plan to ensure the availability of electricity to meet growing national energy needs. In addition, AEC will continue to develop improved designs of propulsion reactors for nuclear submarines and ships for use by the Navy... In 1973, emphasis will be placed on the controlled thermonuclear fusion research program. This program seeks to develop another source of clean energy for the long-term future. AEC will also emphasize its environmental research in 1973 to assure a fuller understanding of the effects of radiation upon the environment." (Ibid, pp. 85-86)

- "If we look at the SALT agreements, what we have is an acceptance by the United States in the particular categories that were covered by the agreements of the numerical inferiority to the Soviet Union which is offset by our technological superiority. In the agreements, the main accomplishment was to stop the onward thrust of the major Soviet weapon programs, the offensive programs. The agreement does not alter our position with regard to our offensive programs. It is assumed that these programs will continue. They are qualitative improvements that compensate to some extent for the numerical superiority that the Soviets will retain in the ICBM forces and the numerical superiority that they will achieve in the [submarine-launched ballistic missile] forces over a period of production. Now, these numerical superiorities are offset to some extent, to a large extent, by our technological superiority, if we take the Poseidon boat, for example. A Poseidon has a great deal more capability in it than the Soviet Yankee class submarines. So it is assumed in order to maintain this rough parity which has been agreed on at the summit, that we would continue with our qualitative programs. The reason that I mention this, Mr, Chairman, is that some question has been raised by a number of public witnesses with regard to our weapons budget and I believe that it is essential for us to continue with those qualitative improvements." James R. Schlesinger, Chairman, Atomic Energy Commission, June 19, 1972 Hearings before the Senate Appropriations Subcommittee on the Public Works Appropriations for Fiscal Year 1973, p. 19).
- "It is clear that the Nation should continue to explore all available energy sources for meeting its future energy requirements. A mix of technologies will continue to be relied upon in the future to meet these requirements. The President's clean energy program will provide a diversity of new energy options to augment present sources so as to ensure both an adequate supply of energy and a cleaner means of producing it... We believe that the Nation should explore all available energy sources for meeting its future needs as set forth so clearly in the President's energy message of June 4, 1971. Research and development must continue on potential systems to utilize these sources. The breeder is but one of a diversity of clean energy sources that must be developed..." Milton Shaw, Director, Division of Reactor Development and Technology, Atomic Energy Commission, June 19, 1972 (Ibid, p. 19).
- "Controlled thermonuclear fusion provides an attractive potential technology for utilizing essentially unlimited energy resources. Recent progress has been impressive and has stimulated an increase in effort in this area. The confidence of scientists and engineers in the successful proof of the scientific feasibility of fusion is illustrated by the recent increase in conceptual studies of fusion reactors, such as structural, material,

and operational questions that must be faced before practical fusion power is achieved. In recognition of the increasing importance of this potential new energy source, the AEC has recently taken action to facilitate the development of fusion power by forming a new Division of Controlled Thermonuclear Research and is requesting a significant increase in budget for fiscal year 1973" Roy W. Gould, Director, Division of Controller Thermonuclear Research, Atomic Energy Commission, June 19, 1972 (Ibid, p. 26).

- "Power Generation–Energy Crisis: Because of the serious energy situation facing the nation, the Committee has continued to give high funding priority to the many power-related agencies and activities covered by the bill including planning and construction of hydroelectric projects by the Corps of Engineers and the Bureau of Reclamation, the expenses of the power agencies of the Department of the Interior in the marketing of power from federal projects, and [R&D] on nuclear power reactors by the [AEC]. The Committee has continued in the bill its full support of the budget request of the [AEC] for the development of an economic Liquid Metal Fast Breeder Reactor (LMFBR). A total of $285 million is included in the bill for research, development, and demonstration of this technology which is expected to make a major contribution toward meeting the rapidly growing energy needs of the nation. " (H. Rpt. 92-1151, June 19, 1972, p. 4).
- "Major funds provided by the bill included $285-million for President Nixon's top-priority liquid metal fast breeder reactor (LMFBR) project—an advanced type of nuclear power plant for the 1980s and beyond; $21.2-million for a plutonium recovery facility at Rocky Flats, Colo.; $56-million for a prototype nuclear propulsion plant at West Milton, N.Y., in connection with the Undersea Long Range Missile System (ULMS); and $4.75- million to begin construction of a laser fusion laboratory at Los Alamos Scientific Laboratory, N.M... The LMFBR was expected to make a major contribution toward conserving the nation's energy resources for generating electric power because it utilized uranium more efficiently than existing nuclear plants. The breeder converted low-grade uranium into plutonium, thus producing more nuclear fuel than it consumed in the process of churning out electric power. Environmentalists were vigorously opposed to the project because of its use of plutonium—one of the most hazardous substances known to man. President Nixon strongly endorsed the AEC's LMFBR program in a 1971 energy message to Congress" ("Public Works, AEC: $5.5-Billion for Fiscal 1973," *CQ Almanac 1972*, 28th ed., 02-295-02-299. Washington, DC: Congressional Quarterly, 1973)
- "John G. Dow (D N.Y.) offered an amendment to delete $50-million for construction of the LMFBR demonstration plant. Dow said the dangers of the reactor "should make us stop dead in our tracks" because of the increased production of plutonium, "one of the most toxic substances known to man"... The amendment was opposed by [Joe L.] Evins Evins [D Tenn.], who said the nation was confronted with a power crisis and warned of possible summer blackouts and brownouts." (Ibid)
- "Conferees agreed to an allotment of $2,138,800,000 for AEC operating expenses—$9.8-million more than the House allowance and $11.8-million less than the Senate allotment. The increase over the House figure included compromise amounts of $4.5-million for the weapons program (Senate increase: $9-million); $4 million for the civilian reactor development program including thorium utilization and space propulsion systems (Senate increase: $8.5-million); and $1.3-million for selected resources to provide financing for changes in the bill's program levels (Senate increase: $3.1-million)." (Ibid)
- "It was a blackout that first alerted the nation to the energy crisis, the now infamous

Northeast blackout that turned out the lights of 30 million people for 13 hours 7 years ago... electrical supply cannot keep pace with electrical demand, and therein lies another reason the United States is in the midst of an energy crisis" ("America Is Going Nuclear: U.S. Utilities Turn to the Atom for Power," by Thomas O'Toole, *The Washington Post*, November 30, 1972)

Energy R&D Appropriations for FY1974

Bill: Public Works for Water and Power Development and Atomic Energy Commission Appropriation Act, 1974

Public Law: 93-97 **Enacted:** August 16, 1973 **Effective:** August 16, 1973

Function	Nominal change		Real change		Classification
	Millions ($)	YOY%	Millions ($2012)	YOY%	
Defense	$7.4	1.1%	-$153.4	-6.4%	Endogenous
Nondefense	$144.3	15.6%	$226.1	7.0%	Endogenous

Congress again appropriated significant increases in both nominal and real funding for the nondefense R&D functions of the AEC for FY1974; atomic energy defense R&D functions, conversely, were held roughly flat in nominal terms and saw a significant decline in real funding. The House Appropriations Committee expressed that it was "deeply concerned about the energy crisis" and compelled government agencies related to the "energy problem... to accelerate their efforts to solve the many and varied aspects of this situation." President Nixon's budget message emphasized that "the budget must now guard against inflation," and the budget request proposed limiting federal spending accordingly. Echoing a similar note, Dixy Lee Ray, Chairman of the [AEC], testified that the AEC's budget request had been made "in the context of the financial restraint reflected in the overall Federal budget and the President's strong desire to meet the test of fiscal responsibility," which affected spending restraint for the weapons programs. The appropriations bill also prioritized funding for accelerated construction of hydroelectric power projects in addition to new nuclear reactors to address the short-run energy crisis. Because the decreases in real energy R&D funding appear to have been motivated in part by the energy crisis as well as efforts to curb short-run inflationary pressures from the federal budget, we classify both of these policy changes as endogenous. Most pertinent narrative evidence:

- "One of the highest priorities of my Administration during the coming year will be a concern for energy supplies—a concern underscored this winter by occasional fuel shortages. We must face up to a stark fact in America: we are now consuming more energy than we produce. A year and a half ago I sent to the Congress the first Presidential message ever devoted to the energy question. I shall soon submit a new and far more comprehensive energy message containing wide-ranging initiatives to ensure necessary supplies of energy at acceptable economic and environmental costs. In the meantime, to help meet immediate needs, I have temporarily suspended import quotas on home heating oil east of the Rocky Mountains. As we work to expand our supplies of energy, we should also recognize that we must balance those efforts with our concern to preserve our environment." Richard M. Nixon, State of the Union Message to the Congress on Natural Resources and the Environment, February 15, 1973 (*The American Presidency Project*, by Gerhard Peters and John T. Woolley, https://www.presidency.ucsb.edu/node/255945)

- "instead of operating primarily as a stimulus, the budget must now guard against inflation. The surest way to avoid inflation or higher taxes or both is for Congress to join me in a concerted effort to control Federal spending. I therefore propose that before the Congress approves any spending bill, it establishes a rigid ceiling on spending, limiting total 1974 outlays to the $268.7 billion recommended in this budget" (Budget Message of the President, FY1974, January 29, 1973, p. 4)
- "The SALT talks also resulted in an interim agreement to limit offensive nuclear forces and have led to further negotiations aimed at achieving an equitable and effective treaty on offensive force limitations. However, until such a treaty is negotiated, we will maintain our current strength to ensure the viability of our deterrent and to provide the Soviet Union an incentive for meaningful negotiations." (Budget of the United States, FY1974, pp. 74-75)
- "AEC plays an important part in the Administration's program to assure an adequate long-term supply of clean electric energy for the Nation. In 1974 AEC will further intensify its top priority civilian program, the development of an economical, liquid metal fast breeder power reactor. Work will proceed on a 400,000-kilowatt fast breeder power plant to achieve a Presidential goal through large-scale demonstration of the technical feasibility of this concept by 1980... New emphasis will be placed on controlled thermonuclear fusion research, a long-term effort to produce clean electric energy. The development of a technology to use nuclear explosives to stimulate additional quantities of natural gas will be continued. Further measures will be taken to increase the capacity of AEC's uranium enrichment plants, which are used primarily to produce fuels for nuclear power plants... It is proposed to increase energy programs by $171 million in 1974." (Ibid, p. 81)
- "AEC's program of basic and applied research in the physical sciences will be marked by the first full year of operation of the world's largest accelerator for high energy physics near Chicago. The decline in basic and applied research and space applications reflects primarily the completion of this accelerator." (Ibid, p. 81)
- "We are very conscious of the fact that our budget for fiscal year 1974 is submitted to you in the context of the financial restraint reflected in the overall Federal budget and the President's strong desire to meet the test of fiscal responsibility. It has, therefore, been structured to give priority increases to those programs that contribute most directly to solving vital national problems such as that of providing abundant electrical energy at reasonable cost and without unacceptable degradation of the natural environment or erosion of our standard of living. When we review the details of this budget you will see that we have had to make many difficult decisions in order to meet these objectives. Chart II... compares our 1973 budget estimates, on the basis of program costs with our 1974 requests by major programmatic activities... In the first category in chart II are the programs with major increases. These include the production of nuclear materials for use as fuel in civilian power reactors; the development of the liquid metal fast breeder reactor (LMFBR); nuclear safety, which covers the research for safe operation of light water and breeder reactors; regulation activities; including licensing, standards, and operations; research in controlled thermonuclear fusion; and waste management. These high-priority activities, which represent some 25 percent of total costs, receive 70 percent of our requested increase. These activities are provided with an increase of 24 percent over their 1973 levels and, for the most part, are related to the peaceful uses of nuclear energy. In the second category are programs for which we have

provided smaller increases, essentially cost-of-living adjustments. These include physical research, biomedical and environmental research, weapons production and weapons R&D, naval reactor development, and operational program direction. Major program activities that are reduced below the 1973 levels are shown in the third category. These activities are weapons testing, civilian reactor development other than the LMIFBR and nuclear safety efforts, space nuclear systems, isotopes development, the Plowshare program, and our support of education and training in nuclear science and engineering." Dixy Lee Ray, Chairman, Atomic Energy Commission, April 4, 1973 (Hearings before the House Appropriations Subcommittee on the Public Works Appropriations for Fiscal Year 1974, pp. 21-22)

- "The [weapons activities] [R&D] budget of $277.4 million is an increase of $14.0 million, or about 5 percent, and will provide resources at about the same level as in fiscal year 1973. Within this level, we plan to place increased emphasis on the laser-fusion activities at our weapons laboratories. The testing budget is $168.5 million, a decrease of $10.2 million or about 6 percent from fiscal year 1973. This funding provides for our underground test program at the Nevada Test Site at a small dollar reduction. The balance of the reduction in testing is associated with our Supplemental Test Site activities on Amchitka Island where we are concluding rollup operations. This was the site of the successful proof testing of the SPARTAN warhead for the ABM system." Dixy Lee Ray, Chairman, Atomic Energy Commission, April 5, 1973 (Hearings before the Senate Appropriations Subcommittee on the Public Works Appropriations for Fiscal Year 1974, p. 3736)
- "The [House Appropriations] Committee is deeply concerned about the energy crisis. This problem is emerging in many forms such as gasoline shortages brownouts and blackouts of electrical power, increased prices for fuel, opposition to the location of power plants, and the temporary closing of some businesses and schools during the past winter. Agencies funded in this bill are helping to provide an adequate supply of energy to the American people. The extensive hydropower facilities of the Bureau of Reclamation and the Army Corps of Engineers are making an important pollution-free contribution to the Nation's energy supply. A number of the [AEC's] programs have as their goal the development of improved energy generation sources with a minimal environmental impact. We do not have the luxury of time. The Agencies of government concerned with the energy problem are urged to accelerate their efforts to solve the many and varied aspects of this situation. An adequate supply of energy is essential to every aspect of the national economy." (H. Rpt. 93-327, June 25, 1973, pp. 4-5)
- "The Committee fully recognizes and supports the invaluable role of AEC's weapons laboratories, testing installations, and production facilities in the development of a credible nuclear deterrent for the United States. The Committee totally concurs with the [AEC's] and [DOD] belief that a strong, reliable nuclear deterrent is essential to the Nation's defense. The Committee does not, however, agree with budget recommendations as to the number and type of warheads and the overall level of funding necessary to maintain a strong and reliable nuclear deterrent" (Ibid, p. 6).
- "Stressing the need for action to meet the energy crisis, the Senate yesterday approved a $4.7 billion money bill for public works projects and the [AEC]. In its report, the Senate Appropriations Committee said 'the energy situation makes it mandatory that planning and construction of hydroelectric projects... and [R&D] of new nuclear power reactors proceed in an effort to provide an adequate supply of energy to the American

people'" ("Senate Votes Funds To Ease Energy Need," *The Washington Post*, July 24, 1973)

- "Major reductions in the final version from the budget requests included funds for the AEC weapons program and AEC plant and capital equipment projects. But because of concern about the energy crisis, the final version increased requests for various civilian nuclear reactor programs and controlled thermonuclear (fusion) research" ("Public Works-AEC- $4.8-Billion for Fiscal 1974," *CQ Almanac 1973*, 29th ed., 89-94. Washington, DC: Congressional Quarterly, 1974)
- "The [House Appropriations] committee urged the AEC and other power-related agencies to accelerate their attempts to ease the energy crisis. "We do not have the luxury of time," it declared. The committee recommended the full request of $148 million for the top-priority base technology program for the liquid metal fast breeder nuclear reactor... The committee recommended major cuts in the nuclear weapons program and for funding of plant and capital equipment. Although the fiscal 1974 AEC authorization bill already had proposed to cut the request for weapons by $50 million to $833.3 million, the committee proposed an even deeper cut—$67.7 million. Cuts beyond the authorization bill were made primarily in the weapons testing program. The committee disagreed with administration proposals for the number and types of nuclear warheads... The [Senate Appropriations] committee restored $17.7-million of a $67.7-million House-approved cut in the budget request for nuclear weapons programs. Most of the restored funds were earmarked for weapons testing programs" (Ibid)
- "The final appropriation of $2,336,538,000 was $92,837,000 less than the budget request, $34,150,000 above the House allowance and $11,800,000 below the Senate-passed amount. The conferees accepted Senate increases over the House allowances of $15.1 million for weapons testing programs and $4 million for several civilian reactor programs, including $1 million for design studies of a second Liquid Metal Fast Breeder Reactor demonstration plant. Other increases above the House allowances included $3.8 million for fusion research... David Towell (R Nev.) applauded the reinstatement of $15.1 million for nuclear weapons testing as important to the U.S. position in international talks on nuclear weapons." (Ibid)

Energy R&D Appropriations for FY1975

Primary Bill: Special Energy Research and Development Appropriation Act, 1975

Public Law: 93-322 **Enacted:** June 30, 1974 **Effective:** July 1, 1974

Secondary: Public Works for Water and Power Development and Atomic Energy Commission Appropriation Act, 1975

Public Law: 93-393 **Enacted:** August 28, 1974 **Effective:** August 28, 1974

Function	Nominal change		Real change		Classification
	Millions ($)	YOY%	Millions ($2012)	YOY%	
Defense	$15.5	2.2%	-$164.9	-6.9%	Endogenous
Nondefense	$384.4	35.9%	$835.4	24.2%	Endogenous

Congress again appropriated significant increases in both nominal and real funding for the nondefense R&D functions of the AEC for FY1975, motivated by the energy crisis, while atomic energy defense R&D functions were again held roughly flat in nominal terms and

declined significantly in real terms. In his annual State of the Union address, President Nixon declared that the "energy crisis" was his top policy priority and proposed $1.8 billion in funding for energy R&D programs, nearly twice the level appropriated for FY1974. In responding to the OPEC oil shock, the administration also proposed the creation of the Energy Research and Development Administration (ERDA), building from the research functions of the AEC, but with a considerably broader scope for energy R&D than nuclear physics work; pursuant to the request, Congress passed the Energy Reorganization Act of 1974 (Pub. L. 93-438) in October 1974, shortly after completing work on the FY1975 appropriations process. In limbo during this reorganization, the appropriators, in an unusual move, bundled together a single bill funding all energy programs, providing $2.2 billion, more than the administration's request, to "significantly accelerate the Federal program of energy [R&D]." The single bill, which was meant to "speed up" appropriations to address the crisis, almost passed unanimously in the House of Representatives, another unusual sign of the times. Congress took a kitchen-sink approach to energy policy priorities, but nuclear energy research continued to be the largest area of funding. The subsequently passed regular order Public Works-AEC appropriations bill for FY1975 provided additional funding for energy R&D programs, but cut into the request for the AEC's weapons program; the Senate partially reversed deeper cuts proposed by the House specifically because prices and wages were rising, while inflation was also cited as a reason to cut the AEC's military programs. The increase in nondefense energy R&D funding appears to have been largely motivated by concerns about energy production, energy inflation, and short-run macroeconomic conditions, while the decrease in real funding for the atomic energy defense R&D programs appears to have been motivated by curbing inflationary pressure in the federal budget and prioritizing AEC funding for energy supply development. As such, we classify both policy changes as endogenous. Most pertinent narrative evidence:

- "H.R. 11510, titled "The Energy Reorganization Act of 1973," will reorganize and consolidate major energy [R&D] functions in the Federal Government. The bill provides for: (1) The creation of an independent Energy Research and Development Administration (ERDA), which will encompass all non-regulatory functions of the [AEC] and designated energy [R&D] functions transferred from other agencies... Building upon the scientific and technical base of the present Atomic Energy Commission, ERDA will be a central agency for the conduct and coordination of major Federal energy R&D programs. The bill gives the new agency a broad charter to conduct or sponsor R&D on all energy resources and utilization processes. Technologies for extraction, conversion, storage, transmission, and utilization are included. ERDA will be so organized and managed that fossil fuel, advanced energy sources, conservation of energy, and environmental considerations will receive full recognition and appropriate emphasis along with nuclear R&D functions" (H. Rpt. 93-707, December 7, 1973, p. 3)
- "No single legislative area is more critical or more challenging to us as a people, however, than the subject of this first message to the Congress: The energy crisis. It is because of its importance and because of the urgent need for action that I have chosen to break tradition, outlining to Congress my legislative requests in energy before delivering my State of the Union Address... For the last five years, I have provided for a continual expansion of our efforts in energy [R&D]. Federal funding increased almost 75 percent from $382 million in fiscal year 1970 to $672 million in fiscal year 1973 and was then raised to $1 billion for fiscal year 1974. Last June I announced my commitment to an even more rapid acceleration of this effort through a $10 billion Federal program over

the next five years, and I asked the Chairman of the [AEC] to develop recommendations for the expanded program. Today I am announcing that in fiscal year 1975—the first year of my proposed five-year energy R&D program—total Federal commitment for direct energy [R&D] will be increased to $1.8 billion, almost double the level of a year ago... Regardless of short-term fluctuations in the energy supplies, our Nation must move swiftly and steadily on a course to self-sufficiency." Richard Nixon, Special Message to the Congress on the Energy Crisis, (*The American Presidency Project*, by Gerhard Peters and John T. Woolley, https://www.presidency.ucsb.edu/node/255742)

- "In particular, 1974 can be the year in which: First, we not only break the back of the energy crisis but also, through Project Independence, lay the foundation for our future capacity to meet America's energy needs from America's own resources—at reasonable prices and with adequate environmental protection... Third, we will check the rise in prices, without administering the harsh medicine of recession, and move the economy into a period of steady growth at a sustainable level... At the start of this Congressional session, the number one legislative concern must be the energy crisis." Richard Nixon, State of the Union Address, January 30, 1974 (*The American Presidency Project*, by Gerhard Peters and John T. Woolley, https://www.presidency.ucsb.edu/node/256219)
- "We must press forward with the development of reliable new energy sources, and we must adjust to the fact that the age of unlimited supplies of cheap energy has ended. The immediate energy crisis began with the oil embargo imposed in the Middle East last fall. But the embargo only hastened a shortage that was already anticipated. For a number of years, our fuel consumption had been climbing while our production of domestic energy supplies declined. We became more and more heavily dependent on oil imports and, consequently, more vulnerable to any interruption or reduction in those imports, as well as to sudden increases in foreign prices. Today, we have an interruption in supplies, and we face sharply increased prices for those supplies when they are restored. Irrespective of the possibility of restoring the flow of Middle East oil, we must act now to ensure that we are never again dependent on foreign sources of supply for our energy needs. We must continue to slow the rise in our rate of consumption, and we must sharply increase our domestic production." (Ibid)
- "The required increase in domestic supplies cannot be achieved so rapidly. It will involve the development of entirely new sources of energy as well as the expanded development of oil and coal resources; it will require a significant expansion of our [R&D] efforts; it will require a shift from the use of scarce fuels to those which are more plentiful but also more expensive than the cheap energy to which we have been accustomed; it will require that we encourage both exploration and production" (Ibid)
- "I am also asking that Congress quickly establish the Federal Energy Administration and the Energy Research and Development Administration to provide the appropriate organizational structure for administering the national energy policy, as we work toward the establishment of a Department of Energy and Natural Resources. Of special concern today is the reorganization of the Government to meet the energy crisis. I have by Executive Order already established the Federal Energy Office to serve as a focal point for energy actions taken by the Government... Recognizing that this country should no longer remain dependent upon foreign energy sources, I have also urged the creation of an Energy Research and Development Administration to develop the necessary technology to tap new domestic sources of energy and a separate Nuclear Energy Commission to carry on the regulatory activities presently assigned to the [AEC]."

(Ibid)

- "In the face of economic uncertainty, my budget recommendations provide for a fiscal policy that would support high employment while restraining inflation. It would maintain the flexibility to take further action, if needed, to offset the effects of energy shortages. My budget recommendations hold the rise of Federal spending to the minimum increases necessary" (Budget Message of the President, FY1975, February 4, 1974, p. 3)
- "There is now evidence that the economy is slowing down. In part, this is due to the energy shortage, which limits our ability to produce some products and reduces demand for others. Our energy-use policies are designed to minimize the adverse impact of the energy shortage on the economy, but some effect is inescapable" (Ibid, p. 6)
- "Until recent years, this country was largely self-sufficient in energy production. With low energy prices in this country, households and industries increased their consumption rapidly. The growing demand for energy has now outstripped readily available domestic supplies. Thus, we have become more dependent on imported petroleum, which was, until recently, low in cost, and the development of higher-priced domestic sources lagged. The interruption of oil exports by Arab countries following the Middle East war, which aggravated the energy problem, underscores sharply the need for this country to reestablish its ability to be self-sufficient in energy. The 1975 budget provides funds for the Federal role in a comprehensive national energy policy to deal with current shortages and funds to initiate Project Independence. This is an accelerated private and governmental effort to reestablish the Nation's capability for self-sufficiency in energy by 1980. The [R&D] component of this program, which takes into account the recommendations of the Chairman of the [AEC], anticipates Federal funding of $10 billion or more during the next five years... It is intended that this R&D program will encourage and complement, rather than supplant, a vigorous [R&D] effort by private industry." (Budget of the United States, FY1975, p. 55)
- "The budget provides for a substantial increase in nuclear energy programs. Specifically, this increase provides for continued growth in the program to develop the liquid metal fast breeder reactor as well as a greatly expanded effort to develop the technology for harnessing nuclear fusion as a future energy source. Funds under the total shown for the [AEC] will also be used for programs to develop other advanced converter and breeder reactors, to make nuclear systems even safer, to develop improved methods for producing enriched uranium, and to increase basic research in relevant physical and biological sciences" (Ibid, pp. 57-58)
- "Outlays by the [AEC] will increase by $558 million in 1975 to $2.9 billion. Outlays are expected to reach $3.0 billion in 1976... The development, underground testing, and production of nuclear weapons will continue at about the 1974 level... The development of improved naval nuclear propulsion plants will increase, primarily because of additional [R&D] on the Trident submarine reactor... The increase of $259 million [for civilian energy programs] from the 1974 level reflects the President's commitment to a greatly increased energy program over the next five years... AEC will increase spending on programs to provide new knowledge of physical properties and phenomena applicable to energy problems and to increase understanding of the environmental and health effects of energy production" (Ibid, pp. 69-70)
- "In recognition of the energy crisis, the [House] Committee on Appropriations has lifted from the budgets of the various departments and agencies of government estimates for

energy [R&D] activities and has assembled them into a single special appropriation bill for fiscal year 1975. The Committee considers that it is imperative to have these appropriations enacted into law by the first day of the new fiscal year so that planning and administration of critical energy research and development programs can progress in the most efficient and timely manner... The $2.2 billion that the bill provides will significantly accelerate the Federal program of energy [R&D], particularly in the fields of atomic energy and coal gasification and liquefaction. This bill will help move the nation toward the objective of energy independence. Major items recommended in the bill include the following: $1,507,760,000 for energy [R&D] efforts of the [AEC], including funds for accelerated research for the Liquid Metal Fast Breeder Reactor, nuclear reactor safety research, development of nuclear materials, space nuclear systems, nuclear fusion, biomedical and environmental research and safety, and plant and capital equipment" (H. Rpt. 93-1010, April 25, 1974, p. 2)

- "Regardless of the causes, by 1973 the U.S. was dependent on foreign sources for 17% of its total energy supply, or 6 million barrels of oil per day. With the outbreak of the Mideast War in October of 1973 and the resulting oil embargo, the United States found itself in serious economic difficulty of unknown dimensions. The Arab oil embargo caused, almost overnight, a national consensus that called for energy independence as soon as possible. That consensus remains today although probably not with the same degree of intensity, now that gasoline is more easily available." (Ibid, p. 4)
- "The House yesterday passed a special $2.2 billion appropriations measure that combines several agencies' funding for energy [R&D] in a single bill. The vote was 392-4. The funds would normally be provided through 6 different bills, but Appropriations Committee Chairman George Mahon (D-Tex) said his committee took the unusual step of combining them in order to speed up the government's energy research programs and to give Congress an overview of those programs" ("House Passes Energy Funds," by Mary Russell, *The Washington Post*, May 1, 1974)
- "Congress June 24 cleared for the President HR 14434 (PL 93-322) providing fiscal 1975 appropriations for federal energy research and development programs. As cleared, HR 14434 appropriated $2,236,089,000 for energy [R&D] programs for fiscal 1975. President Nixon Feb. 4 requested $2,203,728,000. The House had approved $2,269,828,000 and the Senate voted $2,219,716,000... In the House, H.R. Gross (R Iowa) complained that the final total was more than $32 million above the budget request. Appropriations Committee Chairman George Mahon (D Texas) responded: "In view of the fact that the cost of energy is throwing the world in an economic tailspin, I do not think it is unreasonable for the Congress to try to meet the crisis... in the best manner it can." ("Congress Clears Energy Research Funds" *CQ Almanac 1974*, 30th ed., 54-58. Washington, DC: Congressional Quarterly, 1975)
- "The [Public Works-AEC, FY1975 bill] will also strengthen the muscle of America by providing for [R&D] by the [AEC] for defense and defense-related missions... Over the past five years, the Public Works-AEC Appropriations bills have provided some 80 percent of the total funding for Federal programs in the energy field. The Committee is committed to the development of our nation's resources to the maximum extent to alleviate energy-related problems for future generations and to make this nation self-sufficient in its energy needs. Energy is the lifeblood of our civilization. Technology must be developed which in turn can produce our future energy supply to meet our needs. While it is imperative to solve our long-term energy problem, current needs

must not be overlooked" (H. Rpt. 93-1077, June 3, 1974, pp. 3-4).

- "The major reductions [in the House bill] were in the AEC's weapons program. The committee reduced by $9,800,000—to $805,297,000—the request for support of nuclear weapons research, development, testing, and production... The [Senate] committee restored $9,800,000 which the House had cut from the nuclear weapons program, bringing the amount to the $820,130,000 level of the budget request. Rising prices and wages were cited as the reason for restoring the cuts... Conferees agreed to appropriate $8 million for the Trident submarine program as proposed by the Senate rather than $10 million proposed by the House. For the AEC's nuclear weapons construction program, conferees agreed to a $2 million appropriation for which the administration had requested $10 million. The House had deleted the request entirely; the Senate had voted $4 million." ("Public Works-AEC," *CQ Almanac 1974*, 30th ed., 69-74. Washington, DC: Congressional Quarterly, 1975)
- "The Senate by a tie vote of 47–47 rejected an amendment sponsored by William Proxmire (D Wis.) to reduce spending on the AEC's military programs by 3 1/2 percent... Proxmire emphasized that the cut was to be in fiscal 1975 spending, not in the appropriations, some of which would be spent in future years. He argued that the program should be cut to fight inflation: 'The inflation is now, it is not two or three years from now. If we are going to have an impact on inflation through cutting federal spending, we have to cut the outlays for this year.'" (Ibid)

Energy R&D Appropriations for FY1976

Primary Bill: Public Works for Water and Power Development and Energy Research Appropriation Act, 1976

Public Law: 94-180 **Enacted:** December 26, 1975 **Effective:** December 26, 1975

Secondary: Department of the Interior and Related Agencies Appropriation Act, 1976

Public Law: 94-165 **Enacted:** December 23, 1975 **Effective:** December 23, 1975

Function	Nominal change		Real change		Classification
	Millions ($)	YOY%	Millions ($2012)	YOY%	
Nondefense	$276.9	19.0%	$493.0	11.5%	Endogenous

Congress again appropriated significant increases in both nominal and real funding for nondefense energy R&D programs—recently reorganized and now being run by ERDA, the newly created agency—in FY1976, again largely motivated by the energy crisis.[22] Atomic energy defense R&D functions, conversely, were increased nearly in line with inflation, rising only modestly in real terms. The Ford administration proposed a budget that broadly reined in federal spending growth to curb inflationary pressures, with a major exception for R&D programs to address the energy crisis; in his annual State of the Union address, President Ford declared that "no new spending programs can be initiated this year, except for energy." The administration's FY1976 budget request proposed a massive 36% increase in outlays

[22]In the reorganizations of the mid-1970s, the Office of Coal Research was migrated from the Department of the Interior to ERDA, but ERDA's expanded fossil fuel energy R&D programs remained in the Department of the Interior and Related Agencies appropriations bills while the vast majority of ERDA's energy R&D programs remained in the renamed Public Works and Power Development and Energy Research appropriations bills (formerly Public Works-AEC); we follow the money and primarily focus attention to congressional oversight of the latter appropriations bills.

for energy R&D programs over FY1975 levels, with particular emphasis on nuclear energy research and high energy physics research. Solar and fusion energy research were also top priorities of the appropriations committees, and Congress funded considerably more for solar energy R&D than the already significant increase requested in the president's budget. The administration also transferred existing energy R&D functions of the NSF to ERDA—roughly $52 million for FY1976. The increase in funding for nuclear weapons development and testing was intended to address the aging stockpile of warheads and the development of the Trident ballistic missile submarine compelled an increase in naval reactor development, but the budget request also cited "increased labor and fuel costs" in its request for higher funding for atomic energy defense activities. The United States had recently signed the Threshold Test Ban Treaty (TTBT, also known as the Treaty on the Limitation of Underground Nuclear Weapon Tests) in July 1974, which limited underground tests to weapons with a yield below 150 kilotons; the treaty was to take effect in March 1976, during FY1976, and nuclear weapons R&D saw an increase in funding "to complete the detailed design and testing of specific weapons already approved for development prior to the effective date" of the new treaty.[23] While inflation and energy supply were top concerns of the Ford administration when the budget was being drafted, the House Appropriations Committee noted that concerns had "shifted to a fight against recession and unemployment" by the time it was taking up its work, and the committee added public works projects in their bill to boost employment. More broadly, the increase in ERDA's R&D funding appears to have been largely motivated by concerns about energy production, energy inflation, and deteriorating short-run macroeconomic conditions. As such, we classify these policy changes as endogenous. Most pertinent narrative evidence:

- "I have just concluded the process of preparing the budget submissions for fiscal year 1976. In that budget, I will propose legislation to restrain the growth of a number of existing programs. I have also concluded that no new spending programs can be initiated this year, except for energy... we must develop our energy technology and resources so that the United States has the ability to supply a significant share of the energy needs of the free world by the end of this century... I will ask for the funds needed for energy [R&D] activities" Gerald R. Ford, State of the Union Address, January 15, 1975 (*The American Presidency Project*, by Gerhard Peters and John T. Woolley, https://www.presidency.ucsb.edu/node/256753)
- "In addition, the Federal Government has further expanded its [R&D] program to provide the new and improved technologies necessary for increasing the use of our domestic energy resources. Outlays for energy [R&D] will be $1.7 billion in 1976, an increase of 36% over 1975 and 102% over 1974. My budget recommendations continue our vigorous nuclear [R&D] program and further accelerate nonnuclear energy [R&D]—particularly in coal and solar energy. To provide a better organizational framework for this effort, last October I signed into law an act creating the Energy Research and Development Administration, which brings together within a single agency the Government's various [R&D] programs relating to fossil fuels, nuclear energy, and other energy technologies such as geothermal and solar. An independent Nuclear Regulatory Commission has also been established to improve the regulatory process associated with nuclear plant licensing, safety, and nuclear materials safeguards, and to separate this function from

[23]U.S. Department of State, "Treaty Between The United States of America and The Union of Soviet Socialist Republics on the Limitation of Underground Nuclear Weapon Tests (and Protocol Thereto) (TTBT)," https://2009-2017.state.gov/t/isn/5204.htm

nuclear power development activities." (Budget Message of the President, FY1976, February 3, 1975, p. 12)

- "In general, the outlay projections assume that program levels remain constant except where there is an explicit budget recommendation to increase or decrease program levels over time. One example is the anticipated increase in energy [R&D] programs between 1976 and 1977." (Ibid, p. 43)
- "The [R&D] weapons will increase in 1976 primarily to complete the detailed design and testing of specific weapons already approved for development prior to the effective date of the Threshold Test Ban Treaty. Spending on the production of plutonium and tritium related to future nuclear weapons production will rise due to increased labor and fuel costs. Funds for the development of improved nuclear propulsion plants for naval ships will increase primarily because of requirements for the Trident submarines." (Budget of the United States, FY1976, p. 78)
- "Funds for high energy physics research [of ERDA] will increase to improve utilization of the large accelerator facilities which investigate the basic nature of matter. Other physical research funding will increase to provide a foundation of technology in support of energy [R&D]. Efforts on advanced technology for nuclear power systems to be used in space will continue." (Ibid, p. 91)
- "Testimony before the Committee by administration officials disclosed that the budget request was prepared several months ago when the Nation's first priority was to fight inflation, but that priority has since changed and shifted to a fight against recession and unemployment. Thus, the Committee has exercised its prerogatives and discretion in setting some priorities. A limited number of projects have been added and increased which will not only provide jobs but also capital assets for the Nation" (H. Rpt. 94-319, June 20, 1975, p. 3)
- "Over the long-range, there is simply no alternative to developing new and additional sources of energy. Two of the most important potential sources of infinite energy are solar power and controlled thermonuclear fusion... Based on the level of funding recommended by the Committee, the costs for fusion research, including magnetic confinement and laser fusion, is up by 150% since FY 1974" (Ibid, p. 8)
- "The Committee feels that it is essential that funding be provided to speed up vitally needed research programs. Therefore, it was not considered prudent to wait for the agency's reevaluation" (Ibid, p. 11)
- "For ERDA operating expenses, the conferees provided $3,130,765,000—$81.6-million more than the House and $1.1-million less than the Senate. Major compromises on items within this category included decisions to provide: The House-approved amount of $82.7-million for solar energy—$14.4-million less than the Senate, but $16-million more than the budget request; The Senate-approved and budget amount of $31.2-million for geothermal energy—$2.2-million less than approved by the House; $1,721,700,000 for nuclear energy programs—$19-million less than the request, but $113.7-million more than provided by the House and $4.5 million more than provided by the Senate. Of this final amount, $120 million would be allocated to fusion power research, $404 million to fission power programs, including the liquid metal fast breeder reactor program, and $958.5- million to nuclear materials research. This last figure was $13.2 million less than the administration had requested; $920.6 million for national security, including $849 million for weapons systems. The total was $53 million less

than requested and $6.5-million less than approved by the Senate, but $1.5-million more than provided by the House" ("Energy, Public Works," *CQ Almanac 1975*, 31st ed., 841-46. Washington, DC: Congressional Quarterly, 1976)

Energy R&D Appropriations for FY1977

Bill: Public Works for Water and Power Development and Energy Research Appropriation Act, 1977

Public Law: 94-355 **Enacted:** July 12, 1976 **Effective:** October 1, 1976

Function	Nominal change		Real change		Classification
	Millions ($)	YOY%	Millions ($2012)	YOY%	
Defense	$118.5	14.7%	$205.3	9.0%	Endogenous
Nondefense	$760.7	43.9%	$1,769.9	37.1%	Endogenous

Congress again appropriated significant increases in both nominal and real funding for ERDA's nondefense energy R&D functions for FY1977, while also providing significant increases in nominal and real appropriations for their atomic energy defense R&D functions, in a change form recent years. The Ford administration remained focused on inflation, developing and expanding domestic energy supplies, and striving for energy independence in the aftermath of the OPEC oil shock. The administration's FY1977 budget request tried to rein in government spending at large to hold down inflationary pressures, but proposed a massive 30% increase in funding for energy programs, with particular emphasis on nuclear energy development and high energy physics research. Solar power and fusion power [R&D] were also top congressional priorities, funded above the levels requested in the FY1977 budget. The Senate Appropriations Committee even expressed that an increase in the nuclear weapons activities program, as requested by the administration, would also "hopefully make a significant contribution towards supplying energy for the Nation" in their budget justification. More broadly, the increase in ERDA's R&D funding appears to have been largely motivated by concerns about energy production, energy inflation, and short-run macroeconomic conditions. As such, we classify these policy events as endogenous. Most pertinent narrative evidence:

- "My first objective is to have sound economic growth without inflation. We all know from recent experience what runaway inflation does to ruin every other worthy purpose. We are slowing it. We must stop it cold. For many Americans, the way to a healthy, noninflationary economy has become increasingly apparent. The Government must stop spending so much and stop borrowing so much of our money. More money must remain in private hands where it will do the most good. To hold down the cost of living, we must hold down the cost of government. In the past decade, the Federal budget has been growing at an average rate of over 10 percent a year. The budget I am submitting Wednesday cuts this rate of growth in half" Gerald R. Ford, State of the Union Address, January 19, 1976 (*The American Presidency Project*, by Gerhard Peters and John T. Woolley, https://www.presidency.ucsb.edu/node/257493)
- "I again urge Congress to move ahead immediately on the remainder of my energy proposals to make America invulnerable to the foreign oil cartel. My proposals, as all of you know, would reduce domestic natural gas shortages; allow production from Federal petroleum reserves; stimulate effective conservation, including revitalization of our railroads and the expansion of our urban transportation systems; develop more

and cleaner energy from our vast coal resources; expedite clean and safe nuclear power production; create a new national energy independence authority to stimulate vital energy investment; and accelerate development of technology to capture energy from the Sun and the Earth for this and future generations." (Ibid)

- "Assuring our Nation's needs for energy must also be among our highest priorities. My budget gives that priority" (Budget Message of the President, FY1977, January 21, 1976, p. M5)
- "Nuclear weapons research, development, underground testing, and production activities are expected to remain at about 1976 levels. Additional funds are requested for safety, environmental, and waste storage improvements as well as cost increases. The physical security of nuclear weapons and nuclear materials at Government sites will continue to be improved." (Budget of the United States, FY1977, p. 70)
- "Funds for high energy physics research will increase to provide for the construction of a large positron-electron colliding beam facility at the Stanford Linear Accelerator Center. The use of this facility can lead to a new depth of understanding of elementary particles and the fundamental laws of physics. The 1977 budget also provides for the continued utilization of four existing national accelerator facilities. These high-energy facilities assist scientists in advancing knowledge of the basic nature of matter. In addition, increases are included for a balanced program in basic energy sciences to support the future development of both nuclear and non-nuclear energy technologies." (Ibid, p. 83)
- "Pursuing the theme of 'energy independence,' President Ford's budget proposed a 30 percent increase in spending for energy programs in fiscal year 1977, to a record $10.4 billion. The biggest increase in dollar amounts was for nuclear energy, the most expensive and controversial part of the energy research effort... Outlays for nuclear energy would climb by $386 million, to $1.3 billion under the President's budget proposals: Nuclear energy's share of energy research programs would remain essentially unchanged at 65 percent" ("30% Rise in Spending Proposed to Reach Energy Independence," by Edward Cowan, *New York Times*, January 22, 1976)
- "Also recommended in the [House] bill are appropriations for a broad range of energy [R&D] programs that will assist in solving the energy crisis and attaining a reasonable level of energy self-sufficiency. Funds are also included for programs which will strengthen America through [R&D] for defense and related missions" (H. Rpt. 94-1223, June 8, 1976, p. 3)
- "While energy consumption has leveled off in the past two years, it should be kept in mind that America has been going through the most severe economic downturn since the depression, and as the economy revives, the consumption of energy has been accelerating... However, we must make certain that the scarcity of energy does not become a permanent fact of American life. We must take steps to speed up and increase conventional and new sources of energy. Our goal is to help America to achieve energy self-sufficiency and hopefully see the return of low cost electricity to the American consumer... America and the world are rapidly consuming fossil energy supplies which are, of course, finite. The impact of future population growth and rising living standards makes it inevitable that tremendous strain will be placed on the supply of finite fossil fuels. Thus it is highly important that we proceed rapidly toward developing inexhaustible supplies of energy for mankind. Two promising technologies

which hopefully will offer abundant inexhaustible sources of energy are solar power and fusion power." (Ibid, p. 7)

- "The [House Appropriations] Committee recommends a total of $191,800,000, an increase of $50,000,000 over' the budget estimate, for Solar Energy Research and Development operating expenses. The purpose of this program is to significantly expand the Nation's energy supply through the development and demonstration of solar energy systems that are economically attractive and environmentally acceptable" (Ibid, p. 14)
- "The [Senate Appropriations] Committee recommends $1,012,005,000, the same as the budget estimate for Weapons Activities... The Committee is advised that the actual size of the nuclear stockpile is declining in number. However, many weapons in the stockpile are extremely old and must be replaced. The production of new nuclear weapons is needed to maintain an adequate defense posture and to incorporate new technology into new warheads which will be compatible with the new weapons systems being developed by [DOD]. It should be noted that the cost of the warheads is relatively small when compared to the total cost of the weapons systems being developed by [DOD]... At times the weapons complex does undertake missions in the civilian energy field. Because of the nature of its research effort, it is especially qualified in the area of laser fusion research which will hopefully make a significant contribution towards supplying energy for the Nation" (S. Rpt. 94-960, June 17, 1976, p. 20)
- "Congress moved toward putting solar and other exotic potential energy sources on more equal footing with nuclear power projects... Despite some uneasiness about the safety of nuclear plants, Congress also continued all-out financial support for nuclear reactor development as it funded the nation's increasingly urgent search for dependable, long-term energy supplies" ("Public Works, Energy Funds," *CQ Almanac 1976*, 32nd ed., 713-17. Washington, DC: Congressional Quarterly, 1977)

Energy R&D Appropriations for FY1978

Bill: Public Works for Water and Power Development and Energy Research Appropriation Act, 1978

Public Law: 95-96 **Enacted:** August 7, 1977 **Effective:** October 1, 1977

Function	Nominal change		Real change		Classification
	Millions ($)	YOY%	Millions ($2012)	YOY%	
Nondefense	$1,094.5	43.9%	$2,381.2	36.4%	Endogenous

Congress again appropriated significant increases in both nominal and real funding for ERDA's nondefense energy R&D functions for FY1978; atomic energy defense R&D functions, conversely, were increased nearly in line with inflation, falling slightly in real terms. The outgoing Ford administration, incoming Carter administration, and appropriations committees all remained focused on the "energy crisis" and developing expanded domestic energy supplies. The Senate Appropriations Committee proposed "a significant commitment of Federal resources for the purposes of energy [R&D]" and noted that funding reductions relative to the budget request were "comprised almost entirely of reductions in programs other than those for energy research, development, and demonstration or basic research and technology development." President Carter had proposed the creation of the Department of Energy (DOE) to better address the energy crisis and develop a national energy policy, and enacted the Department of Energy Organization Act of 1977 (Pub. L. 95–91) on August

4, 1977, just days before the FY1978 public works and energy research appropriations bill was enacted; the former bill consolidated ERDA, the Federal Energy Administration, and the Federal Power Commission into a single cabinet-level agency, dissolving its predecessors. R&D appropriations for solar energy, geothermal energy, and fusion energy work were all top congressional policy priorities, funded above levels requested by the Carter administration. The increase in ERDA's nondefense R&D funding appears to have been largely motivated by concerns about energy production, energy inflation, and short-run macroeconomic conditions. As such, we classify this policy event as endogenous. Most pertinent narrative evidence:

- "We have successfully cut inflation by more than half. When I took office, the Consumer Price Index was rising at 12.2 percent a year. During 1976 the rate of inflation was 5 percent. We have had some successes, and there have been some disappointments. Bluntly, I must remind you that we have not made satisfactory progress toward achieving energy independence. Energy is absolutely vital to the defense of our country, to the strength of our economy, and to the quality of our lives. Two years ago I proposed to Congress the first comprehensive national energy program—a specific and coordinated set of measures that would end our vulnerability to embargo, blockade, or arbitrary price increases and would mobilize U.S. technology and resources to supply a significant share of the free world's energy after 1985. Of the major energy proposals I submitted two years ago, only half, belatedly, became law. In 1973 we were dependent upon foreign oil imports for 36 percent of our needs. Today, we are 40 percent dependent, and we'll pay out $34 billion for foreign oil this year. Such vulnerability at present or in the future is intolerable and must be ended." Gerald R. Ford, State of the Union Address, January 12, 1977 (*The American Presidency Project*, by Gerhard Peters and John T. Woolley, https://www.presidency.ucsb.edu/node/257781)
- "I am again proposing real growth for basic [R&D] programs this year because I am convinced that we must maintain our world leadership in science and technology in order to increase our national productivity and attain the better life we want for our people and the rest of the world" (Budget Message of the President, FY1978, January 17, 1977, p. M5)
- "Among the major program expansions and new programs proposed in the 1978 budget are defense modernization, increases in education and health programs, several important energy initiatives, increases in [R&D] programs, and the Bicentennial land heritage program." (Budget of the United States, FY1978, p. 10)
- "Proposed nuclear weapons research activities for 1978 are higher than 1977 levels because of greater emphasis on advanced research. Underground nuclear testing and weapons development activities are expected to remain at the 1977 levels. Additional funds are requested for safety, environmental, and physical security improvements. Outlays for these defense activities conducted by the Energy Research and Development Administration are estimated to increase from $1.8 billion in 1977 to $2.2 billion in 1978 and $2.5 billion in 1979." (Ibid, p. 86)
- "[The Department of Energy Organization Act] will bring about a major reorganization of the executive branch of the Federal Government to more effectively meet the grave energy crisis facing our nation. It will create a Department of Energy which will consolidate within it a number of major energy functions now scattered among different departments and agencies and thereby give to the new Department the broad authority needed to deal with energy problems in a comprehensive way. It will also carry out

such other programs as the Congress may adopt in response to the energy crisis" (H. Rpt. 95-346 Part 1, May 16, 1977, p. 2)

- "An increase in space nuclear applications research is proposed to develop new nuclear power sources for planned NASA spacecraft and Department of Defense systems. In the nuclear physics program, the Bevalac facility at the Lawrence Berkeley Laboratory is to be upgraded to allow advanced scientific investigation of heavy elements. Increased funding for high-energy physics research is proposed to allow greater utilization of accelerators to pursue recent advances in theoretical understanding of fundamental physical phenomena. Construction of the positron-electron project (PEP) at the Stanford Linear Accelerator Center, initiated in 1977, is to continue with initial operations scheduled for 1980. Outlays for ERDA in this subfunction are estimated to increase by about $50 million a year" (Ibid, p. 99)
- "In recognizing the President's expressed desire to control expenditures and because of the immediate problems facing the Congress on controlling outlays, the [House Appropriations] Committee has applied an across-the-board general reduction of three percent to each appropriation in the bill" (H. Rpt. 95-379, June 2, 1977, p. 3)
- "The era of cheap, abundant energy which played such an important role in enabling the United States to become the world's most productive and prosperous nation has ended. We must make every effort to keep our country the most productive and prosperous nation by developing energy sources. We must take steps to speed up and increase both conventional and new energy sources. The energy crisis with which we are confronted is one of the greatest challenges in history. We must respond to this crisis through the recognition of the severity of the situation, the development of sound policies and programs to deal with the crisis, and the allocation of resources necessary to solve this problem. A dramatic drop in energy supply would have a severe impact on the economic well-being of this nation... We must pursue all potential energy producing alternatives and also put great emphasis on conservation" (Ibid, pp. 11-12)
- "The Committee recommendation provides a total of $6,072,765,000 for ERDA's programs and activities. This is a net increase of $189,701,000 over the House allowance. These recommendations represent a significant commitment of Federal resources for the purposes of energy [R&D]. Energy self-sufficiency and continuing economic vitality cannot be achieved without such commitment. The decrease of $199,662,000 from the budget request is comprised almost entirely of reductions in programs other than those for energy research, development, and demonstration or basic research and technology development" (S. Rpt. 95-301, June 25, 1977, p. 8)
- "The final bill continued the trend of recent years of pouring substantial sums into solar energy [R&D]. It appropriated $319.4 million, about $20 million above the administration request, for ERDA's solar work. As recently as 1975, this activity received only $43 million. Congress also increased the budget for geothermal energy development from the request of $98.5 million to $113.7 million... Some of the [House] bill's increases above the fiscal 1977 estimates were striking: solar energy [R&D] $368.2-million, an increase of $74.2-million; fusion research, including both magnetic fusion and laser fusion, $474.1 million, up $58.1-million; operating expenses for geothermal energy development $117.9 million, or $64.7 million more than the fiscal 1977 level... The [Senate Appropriations] Committee's recommendation of nearly $6.1 billion for ERDA was $189.7 million more than the House bill but $199.7 million less than Carter's request. For solar energy development, the committee recommended $358.5 million, $38.5 million

more than the administration requested but $9.7 million less than the House" ("Public Works, ERDA–Key Issues Arose," *CQ Almanac 1977*, 33rd ed., 247-51. Washington, DC: Congressional Quarterly, 1978)

Energy R&D Appropriations for FY1979

Primary Bill: Continuing Appropriations, 1979

Public Law: 95-482 **Enacted:** October 18, 1978 **Effective:** October 18, 1978

Secondary: Department of the Interior and Related Agencies Appropriations, 1979

Public Law: 95-465 **Enacted:** October 17, 1978 **Effective:** October 17, 1978

Function	Nominal change		Real change		Classification
	Millions ($)	YOY%	Millions ($2012)	YOY%	
Defense	$30.2	3.1%	-$87.1	-3.5%	Exogenous
Nondefense	-$3.5	-0.1%	-$578.3	-6.5%	Endogenous

Reversing course, Congress appropriated significant decreases in real funding for both the defense and nondefense energy R&D functions of DOE for FY1979. For the first time since the OPEC oil shock, nondefense energy R&D programs were cut in nominal terms, resulting in a significant decline in real funding. The Carter administration requested a nominal increase in atomic energy defense activities R&D, principally to develop nuclear warheads for the Trident and Minuteman ballistic missiles as well as new cruise missiles and artillery shells, but proposed a slight decline in funds for weapons testing; the House Appropriations Committee approved both accounts at requested funding levels while significantly paring back a requested funding increase for production and surveillance, whereas the Senate committee modestly cut into the weapons R&D account and approved the increase in production and surveillance funding. The modest nominal increase in appropriations for atomic energy defense R&D activities resulted in a significant decline in real funding given the persistently high inflationary environment. Concerns about inflation heavily influenced the legislation. The House Appropriations Committee increased funding for certain top energy R&D priorities, but given a "strong desire to restrain the growth of Federal expenditures to help control inflation," offset this funding with reductions in other DOE areas. And President Carter initially vetoed the FY1979 Energy and Water Development Appropriations bill because new water development programs were viewed to be "wasteful" and contrary to "objectives of controlling inflation." A slightly modified version of the bill was bundled into a continuing appropriations bill for FY1979, which struck funds for some of the water development projects President Carter had objected to. Because the change in nondefense energy R&D appears to have been heavily influenced by concerns about inflation and short-run macroeconomic conditions, we classify it as endogenous. Policy decisions regarding the atomic energy defense activities appear to have been motivated by national security concerns and exempt from anti-inflationary budget restraint, so we classify the change in energy R&D for defense functions as exogenous. Most pertinent narrative evidence:

- "We here in Washington must move away from crisis management, and we must establish clear goals for the future—immediate and the distant future—which will let us work together and not in conflict. Never again should we neglect a growing crisis like the shortage of energy, where further delay will only lead to more harsh and painful solutions... But the fact remains that on the energy legislation, we have failed the

American people. Almost five years after the oil embargo dramatized the problem for us all, we still do not have a national energy program. Not much longer can we tolerate this stalemate. It undermines our national interest both at home and abroad. We must succeed, and I believe we will. Our main task at home this year, with energy a central element, is the Nation's economy. We must continue the recovery and further cut unemployment and inflation." Jimmy Carter, State of the Union Address, January 19, 1978 (*The American Presidency Project*, by Gerhard Peters and John T. Woolley, https://www.presidency.ucsb.edu/node/245063)

- "The strategic arms limitation talks have been long and difficult. We want a mutual limit on both the quality and the quantity of the giant nuclear arsenals of both nations and then we want actual reductions in strategic arms as a major step toward the ultimate elimination of nuclear weapons from the face of the Earth... For 30 years, concerted but unsuccessful efforts have been made to ban the testing of atomic explosives—both military weapons and peaceful nuclear devices. We are hard at work with Great Britain and the Soviet Union on an agreement that will stop testing and will protect our national security and provide for adequate verification of compliance. We are now making, I believe, good progress toward this comprehensive ban on nuclear explosions." (Ibid)
- "Included [in the budget] are increased emphases on conservation and nonnuclear [R&D], energy grants and technical assistance to States and localities, accelerated acquisition of the strategic petroleum reserve, and greater emphases on nuclear waste management. I continue in the unswerving belief that the Nation's leaders have the obligation to plan for the future and that the national energy plan is essential to the future health and vigor of the American economy. The United States also must take the lead in minimizing the risks of nuclear weapons proliferation as we advance nuclear power technology. Thus, this budget increases [R&D] funding for systems that present fewer risks than the plutonium-fueled liquid metal fast breeder reactor" (Budget Message of the President, FY1979, January 20, 1978, p. 4).
- "In April, the President announced his policy of deferring indefinitely the commercial reprocessing and recycling of nuclear fuel as well as the commercialization of the liquid metal cooled fast breeder reactor" (Budget of the United States, FY1979, p. 16)
- "[DOE] is responsible for the mission of research, development, testing, and production of nuclear weapons, special nuclear materials, and nuclear reactors for defense needs. Total outlays for this mission are estimated to rise from $1.9 billion in 1977 to $2.3 billion in 1978 and to $2.5 billion in 1979. Outlays of $1,271 million in 1978 and $1,387 million in 1979 are recommended to design, develop, test, and produce new nuclear weapons. Funding increases are proposed for higher production levels for warheads for Trident, Minuteman, and air-launched cruise missiles; artillery shells; and nuclear weapons for other systems" (Ibid, pp. 77-78)
- "An increase in outlays from $363 million in 1978 to $415 million is recommended in 1979 for research by the Department of Energy in high-energy physics, nuclear physics, and in the biomedical and life sciences." (Ibid, pp. 94-95)
- "The [House Appropriations] Committee is concerned by the reductions in the 1979 budget request for developing adequate and assured energy supply options for the future. The budget request reflected reductions from 1978 levels for solar energy, hydroelectric power development, nuclear energy, and related environmental research.

In addition, only moderate increases were provided for key programs which have high potential for near and mid-term additions to energy supplies, including geothermal energy, biomass conversion, and others" (H. Rpt. 95-1247, June 1, 1978, p. 10)

- "The Committee feels strongly that we must provide adequate resources to develop future supply technologies that provide economic options to energy imports if we are to maintain our historic growth, improve the standard of living for all Americans, and maintain our posture of leadership in the World. Thus, in its recommendations, the Committee has increased programs for the development and demonstration of energy technology by a total of $406,100,000 or about 18 over the 1979 request, and $260,391,000 or about about 11 percent over 1978 levels. Mindful, however, of the strong desire to restrain the growth of Federal expenditures to help control inflation, the Committee has identified offsetting reductions in other areas of the Department's programs" (Ibid, p. 10)
- "Today I am returning HR 12928, the Energy and Water Development Appropriations bill, to Congress without my approval. This bill would hamper the nation's ability to control inflation, eliminate waste, and make the government more efficient... HR 12928 also contains energy [R&D] programs that are important to our nation's energy future. These appropriations are generally in accord with national needs, and I support them. But this bill also contains provisions for excessive, wasteful water projects and ill-advised limitations on efficient program management..." Jimmy Carter, Presidential Veto Message, October 5, 1978 ("Presidential Veto Message: Carter Vetoes Public Works Bill," *CQ Almanac 1978*, 34th ed., 60-E-61-E. Washington, DC: Congressional Quarterly, 1979)

Energy R&D Appropriations for FY1980

Primary Bill: Energy and Water Development Appropriation Act, 1980

Public Law: 96-69 **Enacted:** September 25, 1979 **Effective:** October 1, 1979

Secondary: Continuing Appropriations, 1980; Department of the Interior and Related Agencies Appropriation Act, 1980

Public Law: 96-86 **Enacted:** October 12, 1979 **Effective:** October 12, 1979

Function	Nominal change		Real change		Classification
	Millions ($)	YOY%	Millions ($2012)	YOY%	
Defense	$189.1	19.0%	$219.8	9.2%	Exogenous

Congress appropriated significant increases in both nominal and real funding for DOE's atomic energy defense R&D functions for FY1980; nondefense energy R&D funding, on the other hand, was increased roughly in line with inflation, seeing a slight decrease in real terms. President Carter was a huge proponent of solar energy and proposed a 40% increase in funding for solar R&D, including funds for the construction of a new solar research facility at the Solar Energy Research Institute site in Golden, Colorado (now the National Renewable Energy Laboratory). Conversely, the Carter administration was more skeptical of nuclear power, proposing a funding cut for nuclear fission R&D and again trying to kill the polarizing Clinch River Breeder Reactor project; the nuclear accident at Three Mile Island, near Harrisburg, PA, on March 28, 1979, altered the national conversation about nuclear power, which began to pivot away from short-run energy needs and toward

environmental and safety concerns. The Carter administration also requested a 12% increase in R&D for weapons activities, aimed at developing and producing "several new strategic and tactical systems." The appropriations committee approved nearly the full request for weapons R&D and increased funding for testing above the administration's request. Nuclear arms control was also a top priority of the Carter administration, which had continued with the resumed Strategic Arms Limitation Talks. President Carter and General Secretary Brezhnev signed the SALT II treaty on June 18, 1979, months before the appropriations bill was enacted, and the treaty had been transmitted to the U.S. Senate for consideration on ratification; the treaty would have imposed quantitative and qualitative limits on ICBMs and cruise missiles, but ratification was indefinitely delayed after the Soviet Union's invasion of Afghanistan in December 1979.[24] Policy decisions regarding the atomic energy defense activities appear to have been motivated by national security concerns and exempt from broader anti-inflationary budget restraint, so we classify the change in energy R&D for defense functions as exogenous. Most pertinent narrative evidence:

- "During the last 2 years, in bringing our economy out of the deepest recession since the 1930's, we've created 7,100,000 new jobs. The unemployment rate has gone down 25 percent. And now we must redouble our fight against the persistent inflation that has wracked our country for more than a decade. That's our important domestic issue, and we must do it together. We know that inflation is a burden for all Americans, but it's a disaster for the poor, the sick, and the old..." Jimmy Carter, State of the Union Address, January 23, 1979 (*The American Presidency Project*, by Gerhard Peters and John T. Woolley, https://www.presidency.ucsb.edu/node/249816)
- "Three months ago, I outlined to the Nation a balanced anti-inflation program that couples responsible government restraint with responsible wage and price restraint... I've sent to this Congress a stringent but fair budget, one that, since I ran for President in 1976, will have cut the Federal deficit in half... The 1980 budget provides enough spending restraint to begin unwinding inflation, but enough support for our country to keep American workers productive and to encourage the investments that provide new jobs... I call on Congress to take other anti-inflation action—to expand our exports to protect American jobs threatened by unfair trade, to conserve energy, to increase production and to speed development of solar power, and to reassess our Nation's technological superiority" (Ibid)
- "Ten years ago, the United States and the Soviet Union made the historic decision to open the strategic arms limitations talks, or SALT. The purpose of SALT, then as now, is not to gain a unilateral advantage for either nation, but to protect the security of both nations, to reverse the costly and dangerous momentum of the nuclear arms race, to preserve a stable balance of nuclear forces, and to demonstrate to a concerned world that we are determined to help preserve the peace... The American nuclear deterrent will remain strong after SALT II. For example, just one of our relatively invulnerable Poseidon submarines—comprising less than 2 percent of our total nuclear force of submarines, aircraft, and land-based missiles—carries enough warheads to destroy every large- and medium-sized city in the Soviet Union. Our deterrent is overwhelming, and I will sign no agreement unless our deterrent force will remain overwhelming. A SALT agreement, of course, cannot substitute for wise diplomacy or a strong defense, nor will it end the danger of nuclear war. But it will certainly reduce

[24] U.S. Department of State, "Treaty Between The United States of America and The Union of Soviet Socialist Republics on the Limitation of Strategic Offensive Arms (SALT II)," https://2009-2017.state.gov/t/isn/5195.htm

that danger. It will strengthen our efforts to ban nuclear tests and to stop the spread of atomic weapons to other nations... In this year 1979, nothing is more important than that the Congress and the people of the United States resolve to continue with me on that path of nuclear arms control and world peace. This is paramount." (Ibid)

- "This budget for fiscal year 1980 is lean and austere. It recommends a spending level well below that suggested by the recent momentum of Federal spending. It will disappoint those who seek expanded Federal efforts across the board. It meets my commitment to a deficit of $30 billion or less. This policy of restraint is not a casual one. It is imperative if we are to overcome the threat of accelerating inflation" (Budget Message of the President, FY1980, January 22, 1979, p. 3)
- "The spending restraint in this budget means that in some areas the Government will simply not be able to do as much as it has in the past. Inevitably, real sacrifices must be made if we are to overcome inflation. In formulating this budget, I have made every effort to spread that burden fairly and objectively. Restraint has not been applied arbitrarily. However, there are areas where we cannot make major reductions. I have sought to reconcile the need for extraordinary restrictions on Government spending with the need to maintain a strong defense; to implement a national energy policy; to assist people in need; and to continue important public services and investments." (Ibid, p. 4)
- "Second, the 1980 budget recognizes the vital importance of energy to the Nation. Because of our dependence on foreign oil, we continue to be in danger of having supplies disrupted as they were five years ago. It is essential that we continue to move forward with an effective national energy program that will decrease our demand for foreign oil and protect against disruption of foreign oil supplies... [The budget] continues to assist in the development of technologies to tap our domestic energy resources more effectively. I have given special emphasis to developing advanced solar power technologies. The budget proposals give increased attention to more efficient use of uranium, to nuclear proliferation and environmental problems, and to effective measures to deal with nuclear waste" (Ibid, p. 5)
- "Department of Energy responsibilities for national defense include R&D, testing and production of nuclear weapons, production of special nuclear materials, storage of nuclear wastes from defense programs and design of reactors for navy vessels... Budget authority of $3.0 billion is requested for 1980, compared to $2.6 billion in 1979... Funding proposed for 1979 and 1980 supports increased missile warhead production." (Budget of the United States, FY1980, p. 99)
- "Solar is the one area of energy technology for which a large overall increase is proposed in 1980. This increase reflects the administration's belief that solar energy can, in time, make a significant contribution as a clean and renewable source of energy. Proposed outlays for solar energy R&D governmentwide increase by 40% between 1979 and 1980... The budget supports the continued development of large facilities to produce electricity from the heat of the sun and the oceans. Basic and applied solar research is also significantly increased, including funds for the construction of a new 300-acre solar research facility to be built at the Solar Energy Research Institute site in Golden, Colorado." (Ibid, p. 128)
- "Total outlays for nuclear fission are estimated to be $970 million in 1980. This represents a decrease of $125 million from 1979, largely resulting from the administration's

policies not to reprocess spent fuel from commercial nuclear power plants and not to proceed with the construction of the Clinch River breeder reactor project." (Ibid, p. 131)

- "No one feels more strongly than I do about the need to harness cost-effective technology to solve our energy problems, but we must never allow ourselves to become the victim of our own technology. If we've learned anything about the recent accident at Three Mile Island, it should be this: As we develop our Nation's energy policy, the safety of every American must be uppermost in our minds. More than two years before the accident in Pennsylvania, I began an effort to kill the Clinch River breeder reactor, so that this country could have a rational, safe, and responsible nuclear energy policy. This is no time to change America into a plutonium society. The recent vote by the House Science and Technology Committee to proceed with the Clinch River fast breeder reactor over my consistent opposition is a major, potential setback to this effort. The Clinch River breeder reactor is a technological dinosaur. It's a waste of more than $1 1/2 billion of taxpayers' money. It's an assault on our attempts to control the spread of dangerous nuclear materials. It marches our nuclear policy in exactly the wrong direction. We can avoid that mistake by proceeding with an orderly and scientifically sound breeder [R&D] program, but our immediate attention must be focused on improving the safety of our current nuclear technology to ensure that a Three Mile Island accident never happens again" Jimmy Carter, The President's News Conference, May 4, 1979 (*The American Presidency Project*, by Gerhard Peters and John T. Woolley, https://www.presidency.ucsb.edu/node/249104)
- "The department's request for fiscal year 1980 [for basic energy sciences] reflects a growth of 25% over 1979 levels. The committee believes that such a large increase on top of prior year increases may be approaching diminishing returns" (H. Rpt. 96-243, June 7, 1979, p. 25)
- "It is with mixed reactions that I sign H.R. 4388, the energy and water development appropriations bill. With one major exception, this is a sound and responsible bill. It recognizes the need to hold down spending. It does not commit to unacceptable future expenditures. It provides for sound water projects and for energy development. It represents a commendable step by the Congress in the direction I have been urging through my water resources development and energy policies" Jimmy Carter, Energy and Water Development Appropriation Act, 1980 Statement on Signing H.R. 4388 Into Law, September 25, 1979 (*The American Presidency Project*, by Gerhard Peters and John T. Woolley, https://www.presidency.ucsb.edu/node/248442)

Energy R&D Appropriations for FY1981

Primary Bill: Energy and Water Development Appropriation Act, 1981

Public Law: 96-367 **Enacted:** October 1, 1980 **Effective:** October 1, 1980

Secondary: Department of the Interior and Related Agencies Appropriations, 1981

Public Law: 96-514 **Enacted:** December 12, 1980 **Effective:** December 12, 1980

Function	Nominal change		Real change		Classification
	Millions ($)	YOY%	Millions ($2012)	YOY%	
Defense	$246.4	20.8%	$278.4	10.7%	Exogenous
Nondefense	$684.7	17.9%	$661.6	8.1%	Exogenous

Congress appropriated significant increases in both nominal and real funding for both the defense and nondefense R&D functions of DOE for FY1981. The Soviet invasion of Afghanistan prompted the Carter administration to punt on requesting ratification of the SALT II treaty and propose a significant increase in national security spending, atomic energy weapons programs included. In his State of the Union address, President Carter warned that the Soviet Union must "pay a concrete price" for their hostilities and pledged to develop and deploy new intermediate-range nuclear weapons in Europe. The Iran hostage crisis and the Soviet invasion of Afghanistan were both political liabilities while running for reelection, which the Carter administration was trying to mitigate in part by proposing to reverse "a long decline in real spending for defense" in the FY1981 budget request. The nuclear accident at Three Mile Island helped tip the scales against the development of civilian nuclear power and toward environmental and safety research for nuclear energy, and the Carter administration continued to heavily push funding for solar energy research, but Congress appropriated more funds than requested for both fusion and fission energy research in addition to a sizable—but less than requested—increase for solar energy research. Policy decisions regarding atomic energy defense activities appear to have been motivated by national security concerns and unrelated to any concerns about inflation, unemployment, or other short-run macroeconomic conditions. And the budgetary increases for nondefense energy R&D programs appear to have been motivated by ideological preferences of the Carter administration and a response to public safety concerns about nuclear energy following Three Mile Island accident, as opposed to inflationary pressure or short-run energy supply needs. As such, we classify both policy events as exogenous. Most pertinent narrative evidence:

- "The crises in Iran and Afghanistan have dramatized a very important lesson: Our excessive dependence on foreign oil is a clear and present danger to our Nation's security. The need has never been more urgent. At long last, we must have a clear, comprehensive energy policy for the United States. Congress must act promptly now to complete final action on this vital energy legislation. Our Nation will then have a major conservation effort, important initiatives to develop solar power, realistic pricing based on the true value of oil, strong incentives for the production of coal and other fossil fuels in the United States, and our Nation's most massive peacetime investment in the development of synthetic fuels." Jimmy Carter, State of the Union Address, January 23, 1980 (*The American Presidency Project*, by Gerhard Peters and John T. Woolley, https://www.presidency.ucsb.edu/node/249681)
- "Preventing nuclear war is the foremost responsibility of the two superpowers. That's why we've negotiated the strategic arms limitation treaties—SALT I and SALT II. Especially now, in a time of great tension, observing the mutual constraints imposed by the terms of these treaties will be in the best interest of both countries and will help to preserve world peace... But now the Soviet Union has taken a radical and aggressive new step. It's using its great military power against a relatively defenseless nation. The implications of the Soviet invasion of Afghanistan could pose the most serious threat to the peace since the Second World War... The region which is now threatened by Soviet troops in Afghanistan is of great strategic importance: It contains more than two-thirds of the world's exportable oil. The Soviet effort to dominate Afghanistan has brought Soviet military forces to within 300 miles of the Indian Ocean and close to the Straits of Hormuz, a waterway through which most of the world's oil must flow. The Soviet Union is now attempting to consolidate a strategic position, therefore, that

poses a grave threat to the free movement of Middle East oil... The Soviet Union must pay a concrete price for their aggression. We've helped to strengthen NATO and our other alliances, and recently we and other NATO members have decided to develop and deploy modernized, intermediate-range nuclear forces to meet an unwarranted and increased threat from the nuclear weapons of the Soviet Union." (Ibid)

- "Of course, we must take other actions to strengthen our Nation's economy. First, we will continue to reduce the deficit and then balance the Federal budget. Second, as we continue to work with businesses to hold down prices, we'll also build on the historic national accord with organized labor to restrain pay increases in a fair fight against inflation." (Ibid)
- "By continuing a clear and consistent policy of restraint, the 1981 budget ensures that the Federal budget will not be an inflationary force in the economy. Although I have kept spending in this budget from rising in real terms, I have found it necessary to increase funds in a few critical areas. The most important of these are defense, energy, basic research, and the training and employment of our Nation's young people. The long decline in real spending for defense that began in 1969 has been reversed. The uncertain and sometimes hostile world we live in requires that we continue to rebuild our defense forces... I cannot ignore the major increases in Soviet military spending that have taken place inexorably over the past 20 years. I cannot ignore our commitment to our NATO allies for mutual real increases in our investment in national defense. I cannot ignore the implications of terrorism in Iran, or Soviet aggression in Afghanistan. Therefore, my budget proposes a defense program in 1981 of $158.2 billion in budget authority, an increase of over 5% in real terms." (Budget Message of the President, FY1981, January 28, 1980, p. M4)
- "We are significantly increasing our expenditures on fossil fuels, on solar energy, and on nuclear fusion. Nuclear fission research, on the other hand, declines, while greater emphasis is placed on solving the current problems of nuclear power... We will significantly reduce our dangerous reliance upon foreign oil. We will remove a major source of inflation" (Ibid, pp. M5-6)
- "Expenditures for essential defense modernization—primarily to strengthen NATO-related and strategic capabilities and to increase our flexibility to meet crises in other areas—are proposed to increase in real terms. Necessary increases are provided for programs that will increase energy production and conservation and reduce our reliance on foreign oil." (Budget of the United States, FY1981, p. 2)
- "All existing sources of energy, including nuclear power, must play a part in restoring our national energy security. Nuclear power programs in the 1981 budget continue a shift away from support of advanced reactor types such as the breeder reactor, with greater resources devoted to increased efficiency and safety in existing nuclear plants. Staffing and funding for the Nuclear Regulatory Commission have been significantly increased to correct deficiencies uncovered following the accident at Three Mile Island." (Ibid, p. 8)
- "Department of Energy responsibilities for national defense include [R&D], testing and production of nuclear weapons, production of special nuclear materials, storage of nuclear wastes from defense programs and design of reactors for Navy vessels... Budget authority of $3.4 billion is requested for 1981, compared to $3.0 billion in 1980." (Ibid, p. 101)

- "Despite overall budget constraints, the administration is committed to increasing support for basic scientific inquiry and to helping advance the frontiers of technology in areas of general application. This commitment has been demonstrated by a policy of "real growth" for basic research in each of the budgets of this administration. The Federal Government now supports about 70% of the Nation's basic research and since 1977 Federal support has increased by about 40% (9% in real terms). Basic research is aimed at increasing our understanding of fundamental scientific principles that encompass a wide range of natural phenomena. Research on the laws of matter, of the universe, and on biological processes can provide the foundation for technological progress that is essential to maintaining the Nation's long-term prospects for industrial growth, agricultural productivity, a safe environment, medical advances, energy sufficiency and national security." (Ibid, p. 120)
- "The [House Appropriations] committee has strongly supported the development of alternative energy technologies to reduce the dependence on oil imports and to meet the Nation's needs for energy in the future. For example, funding for solar energy development and demonstration has been increased from $15,000,000 in 1974 to $643,000,000 in 1980... The nuclear energy development program deserves special comment. The Three Mile Island incident serves to remind us that nuclear power is not a panacea to our energy ills and must be used wisely... The committee has provided funding to address several emerging issues relating to the expanding use of nuclear power. Examination of the Three Mile Island event; improvements in reactor systems; nuclear safety; handling, storage and disposal of nuclear waste; emergency planning and related matters" (H. Rpt. 96-1093, June 16, 1980, pp. 3-6).
- "The committee recommendation provides an increase of $5,000,000 over the request for weapons activities R&D of which $3,000,000 is for the development of a 4-module unit in the S-1 computer development program and $2,000,000 is to maintain fiscal year 1980 employment levels at the Lawrence Livermore National Laboratory for weapons [R&D]. The committee recommendations provide an increase of $20,000,000 over the request to provide for additional testing activities deemed essential to meet [R&D] and weaponization requirements." (Ibid, p. 33)
- "A large portion of the funds added by the [Senate Appropriations] committee went for the atomic energy work done by the Energy Department for the Pentagon. The panel added $220 million to this section of the bill, bringing the total to $3.5 billion—about $6 million less than the administration's request. Of the addition, $159 million was included for nuclear weapons programs, providing $22 million more than the $2.1 billion requested by the administration." ("$12 Billion Energy, Water Funds Bill Cleared," CQ Almanac 1980, 36th ed., 160-64. Washington, DC: Congressional Quarterly, 1981)
- "The final bill exceeded the administration's request for nuclear fission and fusion programs, while providing less for solar programs than the president had requested. In some cases, the conferees provided more funds than either house had approved. For example, the conference agreement included $393 million for nuclear fusion programs although the House bill recommended $313 million and the Senate approved $295 million. The administration had requested $307 million" (Ibid)

Energy R&D Appropriations for FY1982

Primary Bill: Energy and Water Development Appropriation Act, 1982

Public Law: 97-88 **Enacted:** December 4, 1981 **Effective:** December 4, 1981

Secondary: Department of the Interior and Related Agencies Appropriations, 1982
Public Law: 97-100 **Enacted:** December 23, 1981 **Effective:** December 23, 1981

Function	Nominal change		Real change		Classification
	Millions ($)	YOY%	Millions ($2012)	YOY%	
Defense	$240.0	16.8%	$239.9	8.3%	Exogenous
Nondefense	-$1,357.7	-30.1%	-$3,101.8	-35.0%	Exogenous

Congress appropriated significant increases in both nominal and real funding for the atomic energy defense R&D functions of DOE for FY1982, while nondefense energy R&D functions were subjected to significant cuts for the year. In the aftermath of the Soviet Union's invasion of Afghanistan and rising Cold War tensions, President Reagan's military buildup prioritized a modernization of U.S. strategic forces, and the FY1982 budget request again proposed sizable increases for nuclear weapons programs and naval nuclear reactor development. President Reagan had campaigned on a promise to abolish the Department of Energy, established by his recently defeated electoral opponent, and his proposed budget revisions for FY1982 reflected as much; the new administration took a hatchet to DOE's budget, particularly fossil fuel and solar energy R&D, and proposed eliminating the agency entirely a few weeks after the appropriations bill was signed into law (Congress did not take kindly to this proposal, which proved a nonstarter). Policy decisions regarding atomic energy defense activities appear to have been motivated by national security concerns and unrelated to any concerns about inflation, unemployment, or other short-run macroeconomic conditions. The budget cuts to nondefense energy R&D programs appear to have been motivated by campaign promises, ideological preferences of the Reagan administration, and a broader reshuffling of budgetary resources away from domestic spending and toward defense spending. As such, we classify both policy events as exogenous. Most pertinent narrative evidence:

- "We must pay whatever price is required to remain the strongest nation in the world. That price has increased as the military power of our major adversary has grown and its readiness to use that power has been made all too evident in Afghanistan. The real increases in defense spending, therefore probably will be higher than previously projected; protecting our security may require a larger share of our national wealth in the future." Jimmy Carter, State of the Union Address, January 16, 1981 (*The American Presidency Project*, https://www.presidency.ucsb.edu/node/250760)
- "We are demonstrating to the Soviet Union across a broad front that it will pay a heavy price for its aggression in terms of our relationship. Throughout the last decades, U.S.-Soviet relations have been a mixture of cooperation and competition. The Soviet invasion of Afghanistan and the imposition of a puppet government have highlighted in the starkest terms the darker side of their policies, going well beyond competition and the legitimate pursuit of national interest, and violating all norms of international law and practice" (Ibid)
- "The defense program emphasizes four areas: It ensures that our strategic nuclear forces will be equivalent to those of the Soviet Union and that deterrence against nuclear war will be maintained; It upgrades our forces so that the military balance between NATO and the Warsaw Pact will continue to deter the outbreak of war—conventional or nuclear—in Europe..." (Ibid)

- "The growth of budget outlays is puzzling to many Americans, but it arises from valid social and national security concerns... We face a threat to our security, as events in Afghanistan, the Middle East, and Eastern Europe make clear." (Budget Message of the President, FY1982, January 15, 1981, p. M5)
- "Scientific and technological issues seldom provoke bitter partisan battles in Congress, but extensive changes in the makeup of key science-related committees in the new Congress portend some significant shifts in American science policy... The 1980 elections swept out many important friends of science, such as Representative Mike McCormack, the Washington Democrat who was the leading proponent of fusion energy research..." ("New Faces in Congress Mean Sweeping Change in Science Policy," New York Times, February 10, 1981)
- "[DOE] is responsible for research, development, testing, and production of nuclear weapons and special nuclear materials, storage of nuclear wastes from defense programs, and design of reactors for navy vessels... Budget authority of $4.7 billion is requested for 1982 compared to $3.7 billion for 1981." (Budget of the United States, FY1982, p. 104)
- "The President's budget revisions propose a dramatic change in government policies designed to slow inflation, encourage saving and investment, stimulate economic growth, and strengthen national defense. Toward these ends the President proposes to reduce sharply the growth of federal budget outlays over the next five years, cut personal taxes over the next three years, reduce business taxes through accelerated depreciation, and increase significantly the relative share of the budget allocated to national defense... The Administration also proposes to increase the share of defense in the budget from 23.4 percent in 1980 to 33.2 percent in 1984. Defense spending would grow by an average of 17.1 percent annually between 1980 and 1984, while nondefense spending would be held to an increase of about 1 percent per year after 1981" ("An Analysis of President Reagan's Budget Revisions for Fiscal Year 1982," CBO 1981, pp. xiii-xiv)
- "The 1982 request for atomic energy defense activities includes about $1 billion real growth over 1981, primarily for increased production of special nuclear materials and missile warheads (about $700 million). The March revisions provide increases to the January budget amounting to about $300 million, including $180 million for weapons activities, about $100 million for additional materials production, and about $50 million for defense waste management and naval reactor development... Most of the Administration's proposed budget cuts in the energy area would reduce the level of federal support given to new forms of energy supply. Demonstration plants for synthetic gas and liquid fuel production, to be funded by the Department of Energy, would be eliminated. Support for [R&D] of new technologies involving fossil fuels would be reduced, as would support for demonstration and commercialization of solar energy forms; longer-range solar research would continue." (Ibid, pp. 89, 98-99)
- "[DOE] conducts a variety of research, development, and demonstration programs that are intended to develop or improve energy technologies and to subsidize the adoption of these technologies by private industry. Rising energy prices, new tax incentives for investment, regulatory relief and economic recovery make many of these programs unnecessary. The Administration, therefore, plans to restructure the technology programs of the Department of Energy to emphasize longer-term, high-risk, but potentially high-payoff [R&D] while terminating larger technical demonstrations. The Administration believes that Federal support for energy research is appropriate, but that larger demon-

strations and the development of commercial applications should be left to the private sector" (H. Rpt. 97-177, July 14, 1981, p. 70).

- "Laboratory personnel increases of 450 full-time equivalent personnel were proposed in the fiscal year 1982 budget [for weapons activities R&D]. The Committee questions the ability of the laboratories to find and hire this many appropriately qualified personnel in one fiscal year. The recommendation reduces the request by 10 percent, or $3,800,000... The Committee recommendation includes an additional $3,000,000 for increased operating costs at the Los Alamos Meson Physics Facility to increase the number of weeks of operating time available for experimental activities. The Committee's intention is that additional funding should be directly applied for LAMPF operations, not laboratory overhead." (Ibid, p. 97)
- "The administration has proposed substantial reductions in solar energy activities. These reductions signal a fundamental change in the level and nature of Federal support. In general, the Government's role in technology development would be focused on long-term [R&D], and there is a move away from commercialization activities. Increased reliance is placed on private market forces and tax incentives rather than near-term demonstration and development" (S. Rpt. 97-256, October 14, 1981, p. 89).
- "On Nov. 30, U.S. and Soviet negotiators met in Geneva to seek limitations on the deployment of intermediate-range nuclear weapons based in Europe... The goal, Reagan insisted, should be substantial reductions in the existing strategic arsenals. That would be in contrast to the unratified strategic arms limitation (SALT II) treaty that, Reagan said, would have allowed both countries to continue expanding their nuclear forces. To symbolize this change, Reagan called the new negotiations START: Strategic Arms Reduction Talks." ("Defense 1981: Overview," *CQ Almanac 1981*, 37th ed., 191-94. Washington, DC: Congressional Quarterly, 1982)
- "Although the bill exceeded his revised September budget request by $375 million, President Reagan signed it into law Dec. 4, expressing his gratitude that it contained nearly three-fourths of the additional savings he had requested. It was $938 million below his initial March budget request of $13.4 billion. The bill, which Reagan called "a model for a responsible approach to reducing budget deficits," provided less spending than either the House- or Senate-passed version, and the spending for non-defense programs in the bill was lower than in 1981, he noted. The total was $291 million below the amount approved by the Senate Nov. 5 and $718 million below the amount approved by the House on July 24, before Reagan revised his budget requests... Although the largest chunk of money in the bill was for weapons research and manufacturing done by the Energy Department for the Department of Defense, some senators felt that was not enough. The Senate voted to add another $335 million for defense, but conference deleted the addition... While the bill provided less than Reagan wanted for military weapons, it gave him more than he requested for energy programs, particularly for solar energy." ("$12.5 Billion Energy-Water Bill Cleared," *CQ Almanac 1981*, 37th ed., 301-6. Washington, DC: Congressional Quarterly, 1982)
- "President Reagan has approved a proposal to abolish the Department of Energy and transfer most of its surviving functions to the Department of Commerce, Administration officials said today. Mr. Reagan made the decision this morning to lodge the Energy Department functions in a semiautonomous agency within the Commerce Department, to be called the Energy Research and Technology Administration, a White House official said. The production of nuclear weapons, which accounts for about half

the $14.4 billion budget that Energy officials requested for the fiscal year 1983, would be included in the new agency. Administration officials had considered transferring that part of the Energy Department's duties to [DOD]. The decision to transfer nuclear weapons production to the new Commerce Agency continues a policy of civilian control of nuclear weapons production that dates back to 1946... The order by Mr. Reagan had been expected, because he had promised in his campaign to eliminate the department, a creation of the Carter Administration" ("Reagan Adopts Plan to End Energy Dept. and Shift its Duties," by Howell Raines, *The New York Times*, December 17, 1981)

Energy R&D Appropriations for FY1984

Primary Bill: Energy and Water Development Appropriation Act, 1984

Public Law: 98-50 **Enacted:** July 14, 1983 **Effective:** October 1, 1983

Secondary: Interior Department and Related Agencies Appropriations, 1984

Public Law: 98-146 **Enacted:** November 4, 1983 **Effective:** November 4, 1983

Function	Nominal change		Real change		Classification
	Millions ($)	YOY%	Millions ($2012)	YOY%	
Defense	$274.5	15.3%	$343.1	10.8%	Exogenous
Nondefense	-$230.5	-7.1%	-$609.5	-10.8%	Exogenous

Congress appropriated significant increases in both nominal and real funding for the defense R&D functions of DOE for FY1984, while nondefense energy R&D functions were subjected to significant cuts for the year. President Reagan's military buildup continued to prioritize modernization of U.S. strategic forces, and the FY1984 budget request again proposed sizable increases for atomic energy weapons programs and naval nuclear reactor development. The Reagan administration also maintained a laissez-faire approach to energy policy, viewing energy development as something to be left to the private sector; the budget request proposed a 23% reduction in funding for energy development, particularly fossil fuel and solar energy R&D, which received pushback from the House Appropriations Committee. Policy decisions regarding atomic energy defense activities appear to have been motivated by national security concerns and policy preferences unrelated to any concerns about inflation, unemployment, or other short-run macroeconomic conditions. The budget cuts to nondefense energy R&D programs appear to have been motivated by ideological preferences of the Reagan administration and a broader reshuffling of budgetary resources away from domestic spending and toward defense spending. As such, we classify both policy events as exogenous. Most pertinent narrative evidence:

- "Let's be clear about where the deficit problem comes from. Contrary to the drumbeat we've been hearing for the last few months, the deficits we face are not rooted in defense spending. Taken as a percentage of the gross national product, our defense spending happens to be only about four-fifths of what it was in 1970. Nor is the deficit, as some would have it, rooted in tax cuts. Even with our tax cuts, taxes as a fraction of gross national product remain about the same as they were in 1970. The fact is, our deficits come from the uncontrolled growth of the budget for domestic spending" Ronald Reagan, State of the Union Address, January 25, 1983 (*The American Presidency Project*, by Gerhard Peters and John T. Woolley, https://www.presidency.ucsb.edu/node/263103)

- "As we begin our third year, we have put in place a defense program that redeems the neglect of the past decade. We have developed a realistic military strategy to deter threats to peace and to protect freedom if deterrence fails... For our part, we're vigorously pursuing arms reduction negotiations with the Soviet Union. Supported by our allies, we've put forward draft agreements proposing significant weapon reductions to equal and verifiable lower levels. We insist on an equal balance of forces. And given the overwhelming evidence of Soviet violations of international treaties concerning chemical and biological weapons, we also insist that any agreement we sign can and will be verifiable. In the case of intermediate-range nuclear forces, we have proposed the complete elimination of the entire class of land-based missiles" (Ibid)
- "The administration has significantly reoriented the country's approach to energy matters in the past two years. Reliance on market forces—instead of Government regulation and massive, indiscriminate Federal spending—has resulted in greater energy production, more efficient use of energy, and more favorable energy prices" (Budget Message of the President, FY1984, January 31, 1983, p. M15)
- "These activities include research, development, testing, and production of nuclear weapons; production of special nuclear materials; storage of nuclear wastes from defense programs; and design of reactors for nuclear-powered Navy vessels... In total, budget authority of $6.8 billion is requested for 1984, compared to $5.7 billion for 1983." (Ibid, p. 5-14)
- "The Nation needs to let market forces work to encourage efficient energy production and use. The Federal Government should limit its role to such responsibilities as support for long-term research and the strategic petroleum reserve... The budget proposes $2.9 billion in budget authority in 1984 for programs included in this function, a 23% reduction from 1983 levels. The reduction results largely from removing the Federal Government from activities, especially in technology development and demonstration, that are better undertaken and financed by the private sector..." (Ibid, p. 5-33)
- "The [House Appropriations] Committee has had to respond to a budget request for fiscal year 1984 that reflected a fossil energy [R&D] program less than half of the fiscal year 1983 level... The Committee has made significant changes to this budget request" (H. Rpt. 98-253, June 21, 1983, p. 4)
- "The [House Appropriations] committee voted budget authority of $1,296,029,000 for the Department of Energy, almost double Reagan's request of $666,638,000, and significantly above the 1983 appropriation of $1,202,428,000. The bulk of the increase was in the area of energy conservation. Another large increase came in fossil energy [R&D], which included "synfuels" and other technologies for squeezing more usable energy from nonnuclear fuels. The committee approved $265.91 million for fossil energy research, well above the 1983 appropriation of $217.51 million, while the administration asked for $94 million... The Senate committee also made cuts in House spending levels for Department of Energy programs funded in this bill, allocating $1.08 billion compared to the House level of $1.30 billion. But that was still far above the Reagan request of $667 million" ("Congress Clears 1984 Interior Funding Bill," *CQ Almanac 1983*, 39th ed., 462-69. Washington, DC: Congressional Quarterly, 1984)

Energy R&D Appropriations for FY1985

Primary Bill: Energy and Water Development Appropriation Act, 1985

Public Law: 98-360 **Enacted:** July 16, 1984 **Effective:** October 1, 1984

Secondary: Continuing Appropriations, Fiscal Year 1985; Department of the Interior and Related Agencies Appropriations Act, 1985

Public Law: 98-473 **Enacted:** October 12, 1984 **Effective:** October 12, 1984

Function	Nominal change		Real change		Classification
	Millions ($)	YOY%	Millions ($2012)	YOY%	
Defense	$247.3	12.0%	$331.3	9.4%	Exogenous

Congress appropriated significant increases in both nominal and real funding for the defense R&D functions of DOE for FY1985; nondefense energy R&D funding, on the other hand, was modestly increased roughly in line with inflation, seeing only a slight increase in real terms. President Reagan's military buildup continued to prioritize modernization of U.S. strategic forces, and the FY1985 budget request again proposed sizable increases for atomic energy weapons programs and naval nuclear reactor development. The House Appropriations Committee was particularly receptive to this request, approving most of the proposed $1.2 billion increase, and expressed concerns that much of the U.S. nuclear arsenal was built a quarter century earlier and was now outdated or obsolete. The Reagan administration also maintained a laissez-faire approach to energy policy, viewing energy development as something to be left to the private sector; the budget request continued to slash R&D funding for solar and other renewable energy sources. Policy decisions regarding atomic energy defense activities appear to have been motivated by national security concerns and unrelated to any concerns about inflation, unemployment, or other short-run macroeconomic conditions. As such, we classify the change in energy R&D funding for defense functions as exogenous. Most pertinent narrative evidence:

- "Now, some insist that any further budget savings must be obtained by reducing the portion spent on defense. This ignores the fact that national defense is solely the responsibility of the Federal Government; indeed, it is its prime responsibility. And yet defense spending is less than a third of the total budget. During the years of President Kennedy and the years before that, defense was almost half the total budget. And then came several years in which our military capability was allowed to deteriorate to a very dangerous degree. We are just now restoring, through the essential modernization of our conventional and strategic forces, our capability to meet our present and future security needs. Together, we can continue to advance our agenda for peace. We can establish a more stable basis for peaceful relations with the Soviet Union; strengthen allied relations across the board; achieve real and equitable reductions in the levels of nuclear arms..." Ronald Reagan, State of the Union Address, January 25, 1984 (*The American Presidency Project*, by Gerhard Peters and John T. Woolley, https://www.presidency.ucsb.edu/node/261634)
- "My administration has significantly reoriented the country's approach to energy matters toward reliance on market forces—instead of Government regulation and massive, indiscriminate Federal spending... Energy programs proposed in the budget are designed to complement market forces by focusing resources on limited but appropriate responsibilities of the Federal Government and by managing these programs well. Thus, for example, the budget proposes increased spending for basic and other long-term energy research." (Budget Message of the President, FY1985, February 1, 1984, p. M11)

- "The increases for atomic energy defense (DOE) are largely driven by the strategic weapons modernization program and the need to upgrade weapons research, production, and testing facilities" (Budget of the United States, FY1985, p. 3-49)
- "Atomic energy defense activities: These activities include research, development, testing, and production of nuclear weapons; production of special nuclear materials; storage of nuclear wastes from defense programs, and design of reactors for nuclear-powered Navy vessels... In total, budget authority of $7.8 billion is requested for 1985, compared to $6.7 billion for 1984." (Ibid, p. 5-18)
- "The [House Appropriations] Committee recommendations for Weapons Activities totals $4,292,880,000 of which $3,426,130,000 is for Operating Expenses and $866,750,000 is for Plant and Capital Equipment. This reflects an increase of $585,260,000 compared to fiscal year 1984 appropriations and a decrease of $250,224,000 from the budget request. It is often stated or assumed that the quantity of nuclear weapons possessed by the United States has steadily increased and that we now possess more nuclear weapons than ever. This is not so. By the term "stockpile" we mean the totality of our nuclear weapons whether mounted on delivery systems, deployed with forces overseas, or stored in the United States. The stockpile quantity reached its highest level in the mid-1960s and since that time, despite a few fluctuations, has declined. Moreover, the total yield (detonation energy) of the stockpile has decreased significantly. Because the bulk of the United States stockpile was built during the 1960s, those weapons are now becoming obsolete. At present, the production rates are increasing in order to replace those obsolete weapons with newer versions that have characteristics better suited to today's needs. During this period of increased weapons production, almost as many old, obsolete weapons will be dismantled and destroyed. The net result will be a moderate increase in the size of the stockpile, although the totals will still be below the peak quantity of the mid-1960s. The Committee recommendation for [R&D] totals $1,038,285,000 which reflects an increase of $212,455,000 compared to fiscal year 1984 and a decrease of $46,900,000 from the budget request. The Committee's recommended reduction of $10,000,000 to operating funds can be accommodated from support activities from within the Research and Development account without disrupting research on new weapons designs or the Administration's initiative for "third generation" weapons" (H. Rpt. 98-755, May 15, 1984, p. 110)
- "The [Senate] Committee recommends an appropriation of $2,345,000,000 for ICBM modernization. This program funds development and flight testing of the MX Peacekeeper ICBM, small ICBM missile and basing development, silo hardening [R&D], and deep basing." (S. Rpt. 98-636, September 26, 1984, p. 181)
- "Congress' biggest cut in the Reagan budget came in the area of atomic energy defense activities, which accounted for roughly half of the funds in the bill. Reagan had asked for $7.8 billion, while Congress gave him $7.3 billion. But the bill still gave Reagan almost two-thirds of the $1.2 billion increase over fiscal 1984 levels he sought for nuclear weapons" ("Energy/Water Spending Bill is First to Clear," *CQ Almanac 1984*, 40th ed., 369-73. Washington, DC: Congressional Quarterly, 1985).
- "The House rejected, 171-229, an amendment offered by Richard L. Ottinger, D-N.Y. that would have shifted funds from nuclear breeder reactor research into solar energy research and other programs. Ottinger argued that before Reagan took office, "we had a very balanced energy budget—spending was spread reasonably among all energy technologies." During Reagan's tenure in the White House, "this balance was

destroyed," Ottinger claimed. "Since 1981, solar energy programs have been cut by 70 percent. Conservation programs have been cut by 50 percent. Fossil energy was cut by over 80 percent. Meanwhile, nuclear fission (including waste) and nuclear fusion have remained about the same" (Ibid)

Energy R&D Appropriations for FY1986

Primary Bill: Energy and Water Development Appropriation Act, 1986

Public Law: 99-141 **Enacted:** November 1, 1985 **Effective:** November 1, 1985

Secondary: Further Continuing Appropriations, 1986; Department of the Interior and Related Agencies Appropriations Act, 1986

Public Law: 99-190 **Enacted:** December 19, 1985 **Effective:** December 19, 1985

Function	Nominal change		Real change		Classification
	Millions ($)	YOY%	Millions ($2012)	YOY%	
Nondefense	-$324.4	-10.4%	-$586.3	-11.5%	Exogenous

Congress appropriated significant decreases in both nominal and real funding for DOE's nondefense energy R&D functions for FY1986; atomic energy defense R&D funding, on the other hand, was held fairly flat, seeing only a slight decrease in real terms. President Reagan's military buildup had led to renewed arms control talks with the Soviet Union, and funding for weapons modernization had increased markedly in recent years. The Reagan administration continued its laissez-faire approach to energy policy, viewing energy development as something to be left to the private sector; the budget request continued to cut funding for fossil energy [R&D] and prioritize more basic research, " in line with an appropriate governmental role." The House Appropriations Committee had been growing frustrated with DOE for uncompleted construction projects and took the agency to task in its committee report accompanying the FY1986 appropriations bill, in addition to launching an investigation. The Senate Appropriations Committee continued to try to blunt the requested cuts to solar energy R&D programs, a priority of the committee but not the administration. The reduced nondefense energy R&D funding levels appear to have been motivated by ideological preferences about the role of government in relation to the energy sector, frustration with DOE's management, and concerns about the structural budget deficit; the policy change appears unrelated to any concerns about inflation, unemployment, or other short-run macroeconomic conditions, and as such, we classify it as exogenous. Most pertinent narrative evidence:

- "Since 1981 we've been committed to seeking fair and verifiable arms agreements that would lower the risk of war and reduce the size of nuclear arsenals. Now our determination to maintain a strong defense has influenced the Soviet Union to return to the bargaining table... Each Member of Congress has a role to play in modernizing our defenses, thus supporting our chances for a meaningful arms agreement... For the past 20 years, we've believed that no war will be launched as long as each side knows it can retaliate with a deadly counterstrike. Well, I believe there's a better way of eliminating the threat of nuclear war. It is a Strategic Defense Initiative aimed ultimately at finding a nonnuclear defense against ballistic missiles." Ronald Reagan, State of the Union Address, February 6, 1985 (*The American Presidency Project*, by Gerhard Peters and John T. Woolley, https://www.presidency.ucsb.edu/node/258923)

- "The administration proposes to phase out energy conservation programs over the next five years because of the improvement in oil market conditions. In addition, the administration proposes to reduce fossil energy [R&D] and emphasize more fundamental research in order to bring the program in line with an appropriate governmental role" (Budget of the United States, FY1986, pp. 2-15-16)
- "The proposed budget for energy supply [R&D] reflects a shift away from Federal funding of costly development and demonstration projects" (Ibid, p. 2-20)
- "The general science programs of the DOE continue to support basic research in nuclear and high energy physics. The goal of this research is to achieve a comprehensive understanding of the basic constituents of matter and energy and the forces that govern their interaction. Budget authority of $685 million is requested for support of these programs in 1986, a decrease of 6% from 1985, largely reflecting the lower overall funding needs of ongoing accelerator construction activities in 1986." (Ibid, p. 5-29)
- "[DOE] conducts one of the largest facility construction programs of the Federal Government... The total construction program for the Department has averaged $1.8 billion annually over the past five years. In a program of this scope and breadth, mistakes are bound to occur. It might be acceptable if these were relatively minor mistakes, as often occur in construction programs, or if they were few and far between. Unfortunately, however, the Department of Energy's construction program is replete with many, very large-scale construction projects that have been canceled, left incomplete, completed but not used, delayed or deferred, or otherwise... There are a variety of reasons for the cancellation of these projects or the failure to fully utilize or complete these facilities for the purpose for which they were intended. Some of the reasons are within the control of the Department, and some are outside its control. But the case can be made that management decisions have occurred that have resulted in the expenditure of nearly $6 billion in the last five years in the construction of just these major facilities that were never finished, not fully utilized, or simply did not work. Whatever the reasons, the magnitude of the apparent waste is too great for the Committee to overlook. Consequently, the Committee has directed its Surveys and Investigative staff to investigate the DOE major facilities program" (H. Rpt. 99-195, July 10, 1985, p. 73)
- "After the hearings on the FY1986 budget request, and after reviewing the Department's efforts to establish priorities and define a focus for the civilian nuclear research program, the Committee is not satisfied that the Department's efforts have accomplished what was intended. The research program does not have a central project or activity around which the subelements of research of the National laboratories and the nuclear industry can orient themselves." (Ibid, p. 84)
- "Although the administration does not propose major reductions from the fiscal year 1985 level of funding for solar and renewable energy activities, the request would continue the downward trend in these programs which have been substantially curtailed over the last four years. As in the past, the technology development would be focused on long-term [R&D]. The [Senate Appropriations] Committee agrees that the marketplace must ultimately decide the future role of solar technologies. Most solar and renewables research, however, has not been developed to the point where the private sector alone can be expected to carry forward with its development. The Committee considers it essential that a viable solar and renewable energy [R&D] program be maintained in the Department of Energy and that the staff expertise be maintained to properly manage this type of effort. Continued basic [R&D] of solar and renew-

able energy is essential to maintain a balanced energy research program. Accordingly, the Committee recommends continuation of program funds and staffing levels to carry out this basic research activity. The Committee recommendation for solar energy is $161,732,000, which is $17,079,000 below funding from this year and $14,700,000 above the level of the budget request" (S. Rpt. 99-110, July 16, 1985, pp. 99-100)

- "The House today approved the first appropriation bill for 1986, a $15.3 billion energy and water program... The House and Senate have not yet agreed on a budget target for the year, but House Speaker Thomas P. O'Neill said that in the meantime the House would work on several appropriation bills using the House target, which would reduce the projected budget deficit by $56 billion... The House appropriations bill is $7 million under what President Reagan requested and $217 million below the 1985 appropriation. About $7.59 billion in the 1986 bill is for military atomic energy activities, including the manufacture of nuclear warheads by the Energy Department" ("House Approves 1986 Water Bill," *New York Times*, July 17, 1985)
- "Spending increases made by the [House Appropriations] committee were offset by cuts in other areas, including several significant reductions in energy programs... the panel followed Reagan's lead in cutting solar and renewable energy programs to $147 million, down from $178 million in fiscal 1985. For nuclear fission [R&D], the committee cut funding to $608 million, instead of increasing it to $658 million as the president had requested... The Senate committee restored much of the funding the administration proposed to cut from solar energy [R&D]. Reagan recommended dropping the program from $178 million in 1985 to $148 million in 1986. The House reduced the funding further to $147 million, but the Senate raised the amount to $162 million" ("Energy/Water Spending Bill Is First to Clear," *CQ Almanac 1985*, 41st ed., 323-26. Washington, DC: Congressional Quarterly, 1986)

Energy R&D Appropriations for FY1987

Bill: Continuing Appropriations, 1987; Energy and Water Development Appropriations Act, 1987

Public Law: 99-591 **Enacted:** October 30, 1986 **Effective:** October 30, 1986

Function	Nominal change		Real change		Classification
	Millions ($)	YOY%	Millions ($2012)	YOY%	
Nondefense	-$436.7	-15.5%	-$748.3	-16.5%	Exogenous

Congress again appropriated significant decreases in both nominal and real funding for DOE's nondefense energy R&D functions for FY1987; atomic energy defense R&D funding, on the other hand, was held roughly in line with inflation, seeing only a slight increase in real terms. The Reagan administration continued its laissez-faire approach to energy R&D policy, which it viewed as more appropriate for the private sector, and again proposed deep cuts to solar energy R&D programs. President Reagan had again requested sizable increases in funding for atomic energy defense programs, but the Senate Appropriations Committee in particular rejected this part of the budget request and tried to reallocate funding from defense to nondefense function; the committee continued to try to blunt the requested cuts to solar energy R&D programs, a particular priority of the committee. The reduced nondefense energy R&D funding levels appear to have been motivated by ideological preferences about the role of government in relation to the energy sector and concerns about

the structural budget deficit; the policy change appears unrelated to any concerns about inflation, unemployment, or other short-run macroeconomic conditions, and as such, we classify it as exogenous. Most pertinent narrative evidence:

- "These activities, conducted by the Department of Energy, include research, development, testing, and production of nuclear weapons; production of special nuclear materials; storage of nuclear wastes from defense programs, and design of reactors for nuclear-powered Navy vessels. The accompanying table shows the funding levels for these programs. In total, budget authority of $8.2 billion is requested for 1987, compared to $7.2 billion for 1986." (Budget of the United States, FY1987, p. 5-13)
- "The science programs of the DOE continue to support basic research in nuclear and high energy physics. The goal of this research is to achieve a comprehensive understanding of the basic constituents of matter and energy, and the forces that govern their interaction. Budget authority of $773 million is requested for support of these programs in 1987, an increase of $117 million from the 1986 level." (Budget of the United States, FY1987, p. 5-27)
- "A total of $2.0 billion is proposed for energy supply [R&D] programs in 1987... The program level of $2.0 billion represents a reduction of $326 million from the level for 1986. The decrease results from refocusing the Government's energy R&D support and limiting the Federal role in such support. Private industry invests billions of dollars each year in [R&D], including R&D related to energy. The Federal Government should complement, rather than supplant, private sector R&D investment. It should limit its spending to support for basic research and other long-term R&D where the benefits do not readily accrue to individual companies but assist industry as a whole in the future commercialization of new technologies. This policy is particularly applicable to non-nuclear R&D where industry is already making significant investments. The budget authority request for nuclear fission R&D includes $332 million for nuclear technology research, an 11% reduction from the 1986 level... For nuclear fusion R&D, budget authority of $333 million is proposed, a reduction of $35 million from the level in 1986. This reduction slows the pace of fusion reactor development consistent with national energy needs and the potential contribution of fusion power. In 1987 program emphasis will continue to shift toward resolving scientific questions key to the ultimate achievement of fusion energy." (Budget of the United States, FY1987, pp. 5-31-34)
- "The [House] Committee continues to be concerned about the future of the nuclear power option in the U.S. While significant progress has been made in recent years, particularly the last two years, the direction of the nuclear research program is moving away from addressing current and long-term needs of the civilian nuclear power industry which are of vital interest to the Nation's economic and national security concerns and moving closer to dealing with the relatively narrow needs for specific power sources for limited space and defense projects" (H. Rpt. 99-670, July 15, 1986, p. 80)
- "The administration proposes major reductions from the fiscal year 1986 level of funding for solar and renewable energy activities. The budget request would accelerate the downward trend in these programs which have been substantially curtailed over the last 5 years. As in the past, the technology development would be focused on long-term [R&D]. The [Senate] Committee agrees that the marketplace must ultimately decide the future role of solar technologies. Most solar and renewables research, however, has not been developed to the point where the private sector alone can be expected to carry forward with its development" (S. Rpt. 99-441, p. 98)

- "Congress appropriated just over $15 billion for energy and water development projects in the continuing appropriations resolution ... Congress significantly trimmed President Reagan's request for nuclear weapons—which constituted nearly half the spending in the bill. The president had asked for $8.23 billion, but Congress appropriated $7.48 billion... Both the Senate and House bills overturned Reagan's budget plan to shift Energy Department research funds from civilian to military programs. For example, the Senate bill included $341 million for programs under Reagan's strategic defense initiative, or "Star Wars" program, compared with a $600 million request. In contrast, it provided $1.28 billion for energy supply research, up from Reagan's request of $1.25 billion. Solar energy [R&D] made further gains in the Senate committee bill, getting $126 million. Reagan had requested $72 million, but the House had raised it to $113 million. Fiscal 1986 appropriations were $145 million." ("$15 Billion Appropriated for Energy, Water," *CQ Almanac 1986*, 42nd ed., 183-87. Washington, DC: Congressional Quarterly, 1987)
- "In the past year, a dark shadow has fallen across America's solar energy industry... The solar industry began to blossom a decade ago when rising petroleum prices focused attention on the need to conserve fossil fuels and to develop renewable energy sources powered by wind, water, and sun... The government support for demonstration projects in renewable energy that began during the Carter administration has virtually dried up. In addition to ending residential tax credits, the Reagan administration has slashed direct spending on solar energy" ("Solar Energy Industry Slips Into the Shadows: Fall in Oil Prices, Changes in Tax Rules Hurt Sales," by Stephen Greene, *Washington Post*, November 6, 1986)

Energy R&D Appropriations for FY1988

Bill: Further Continuing Appropriations, 1988; Energy and Water Development Appropriations Act, 1988

Public Law: 100-202 **Enacted:** December 22, 1987 **Effective:** December 22, 1987

Function	Nominal change		Real change		Classification
	Millions ($)	YOY%	Millions ($2012)	YOY%	
Nondefense	$853.1	36.0%	$1,183.5	31.4%	Exogenous

Congress reversed course from recent years and appropriated significant increases in both nominal and real funding for DOE's nondefense energy R&D functions for FY1988; atomic energy defense R&D funding, on the other hand, was again held roughly in line with inflation, seeing only a slight decrease in real terms. Democrats had retaken the Senate in the 1986 midterm elections and now controlled both chambers of Congress for the first time during the Reagan administration, considerably changing the dynamics of budget negotiations and priorities. R&D for reducing emissions from coal power plants was a top priority for Senator Robert Byrd (D-WV), now chairman of the Senate Appropriations Chairman; his committee approved $500 million more for the program—which would disproportionately benefit his home state of West Virginia—than the budget request, which had been fully met in the House bill. The House Appropriations Committee also provided substantially more funding for other fossil fuel R&D programs than the administration requested. The increased nondefense energy R&D funding levels appear to have been motivated by recent election outcomes and the ideological preferences of the new Democratic majority in the

Senate, and unrelated to any concerns about inflation, unemployment, or other short-run macroeconomic conditions. As such, we classify the policy change as exogenous. Most pertinent narrative evidence:

- "The administration proposes an additional $350 million in spending over five years for new clean coal technology demonstration projects, with at least as much funding to be provided by industry. These additional demonstrations are in response to the recommendations in the Envoys' Report... The ability of the Nation to meet global competition, to provide for national security, and to improve the quality of life for all citizens depends in part upon national investments in science and technology" (Budget of the United States, FY1988, pp. 2-18-19)
- "The Energy Department's budget request would increase the share of agency funds that are spent on military programs while reducing funds for energy conservation and renewable energy programs, according to a congressional study made today. Almost two-thirds of the department's budget is for military programs, according to the report. It said part of the budget for research on civilian projects was being used to finance programs for President Reagan's proposed defense against missiles, including a nuclear reactor that would be sent into space to power part of the "Star Wars" system"... The shift reflects the general priority that the Administration has placed on buying new generations of nuclear weapons, he said, adding that it also stems from the department's decision that the Government should concentrate on "high risk" [R&D] and should not spend a lot on some types of conservation programs" ("Most Energy Funds for Military Uses," by Michael R. Gordon, *New York Times*, January 13, 1987).
- "The [House] Committee continues to be concerned about the future of the nuclear power option in the United States. The strategic plan for the nuclear reactor [R&D] program remains unfinished, and the program appears to lack focus and direction. The budget proposal for civilian nuclear research remains heavily skewed towards space and defense activities, and facility mortgages consume a significant portion of the remaining resources" (H. Rpt. 100-162, June 17, 1987, p. 73).
- "The [Senate] Committee recommends an appropriation of $2,056,207,000 for energy supply, research, and development activities [7.7% more than requested]. The purpose of these funds is to support the development of new energy technologies and improve the efficiency of existing technologies. Included are the development and demonstration of solar energy, wind, ocean systems, biomass, geothermal, nuclear fission and fusion, electric energy systems, and energy storage. Efforts associated with basic energy sciences and environmental and biological research are also included. These programs address the development of longer-term energy supply options to provide the energy resources needed for sustained national growth and to alleviate our dependence on fossil fuels and foreign oil" (S. Rpt. 100-159, September 16, 1987, p. 107)
- "The Interior Department and related agencies received $9.3 billion under the fiscal 1988 continuing appropriations resolution (H J Res 395—PL 100-202) cleared by Congress Dec. 22... it was well above President Reagan's request of $8.6 billion and well below the $10 billion the Senate voted Sept. 30. The final appropriation allotted $575 million for a federal-private program to demonstrate the commercial feasibility of technologies for burning coal in power plants with less air pollution. That program was a favorite of Senate Majority Leader Robert C. Byrd, D-W.Va., whose state depended on coal mining. The Senate gave the clean-coal program $850 million, compared with the House's $350 million... [The House Appropriations Committee] also included new

money for research on how to burn coal cleanly, and it had more money than the Reagan administration wanted to develop alternative fuels and increase energy conservation. The committee bill was $1.5 billion higher than the request of $7.9 billion... The bill included $345 million for fossil energy [R&D], $195 million more than Reagan wanted and $50 million more than in 1986" ("Interior Spending Exceeds Reagan's Request," *CQ Almanac 1987*, 43rd ed., 447-50. Washington, DC: Congressional Quarterly, 1988)

Energy R&D Appropriations for FY1989

Primary Bill: Energy and Water Development Appropriations Act, 1989

Public Law: 100-371 **Enacted:** July 19, 1988 **Effective:** October 1, 1988

Secondary: Department of the Interior and Related Agencies Appropriations Act, 1989

Public Law: 100-446 **Enacted:** September 27, 1988 **Effective:** October 1, 1988

Function	Nominal change		Real change		Classification
	Millions ($)	YOY%	Millions ($2012)	YOY%	
Defense	-$35.6	-1.4%	-$170.8	-4.4%	Exogenous
Nondefense	$330.8	10.3%	$323.5	6.5%	Exogenous

For the second year in a row, Congress appropriated significant increases in both nominal and real funding for the nondefense R&D functions of DOE for FY1989, but modestly cut nominal funding for defense energy R&D programs, leading to a more significant decline in real terms. The Reagan administration was increasingly keen on funding basic science programs on national security grounds and to "ensure U.S. strength and leadership in science and space technology," and requested a large increase in DOE science funding for the Superconducting Super Collider, intended to be the most powerful particle accelerator ever developed (the project was never completed). A sizable increase in funding for nuclear fusion R&D was also requested, in part for a magnetic fusion research collaboration with the Soviet Union. And the Democratic majority in Congress was keen to increase nondefense energy R&D funding, with the Senate Appropriations Committee continuing its advocacy and support for solar energy. The final bill funded energy supply R&D programs at $2.1 billion, roughly 8.8% above the administration's requested level for FY1989. The Reagan administration had recently signed the INF treaty with the Soviet Union on December 8, 1987, a treaty entirely banning land-based intermediate-range nuclear weapons, which was ratified by the U.S. Senate in May 1988; the administration was also refocusing diplomatic efforts on bilateral arms control talks that would eventually produce the START treaty.[25] The increased nondefense energy R&D funding levels appear to have been motivated by recent election outcomes and preferences of the new Democratic majority in the Senate, while deceased funding for nuclear weapons reflected arms control treaties and changing national security objectives of the Reagan administration; both policy changes appear unrelated to any concerns about inflation, unemployment, or other short-run macroeconomic conditions. As such, we classify these policy changes as exogenous. Most pertinent narrative evidence:

- "But the resolve of America and its NATO allies has opened the way for unprecedented achievement in arms reduction. Our recently signed INF treaty is historic because it

[25]U.S. Department of State, "Treaty Between The United States Of America And The Union Of Soviet Socialist Republics On The Elimination Of Their Intermediate-Range And Shorter-Range Missiles (INF Treaty)," https://2009-2017.state.gov/t/avc/trty/102360.htm

reduces nuclear arms and establishes the most stringent verification regime in arms control history, including several forms of short-notice, on-site inspection. I submitted the treaty today, and I urge the Senate to give its advice and consent to ratification of this landmark agreement... In addition to the INF treaty, we're within reach of an even more significant START agreement that will reduce U.S. and Soviet long-range missile—or strategic arsenals by half. But let me be clear. Our approach is not to seek agreement for agreement's sake, but to settle only for agreements that truly enhance our national security and that of our allies. We will never put our security at risk—or that of our allies—just to reach an agreement with the Soviets." Ronald Reagan, State of the Union Address, January 25, 1988 (*The American Presidency Project*, by Gerhard Peters and John T. Woolley, https://www.presidency.ucsb.edu/node/255154)

- "Real outlays for nondefense basic research by all Federal agencies have risen from $4.6 billion in 1980 to $6.5 billion in 1987, an increase of 39 percent. In contrast, real outlays for nondefense applied [R&D] have declined from $15.3 billion to $10.0 billion over the same period, a reduction of 35 percent. Much of this decrease is due to cuts in funding for new and exotic non-nuclear energy technologies. Such R&D comprised a large share of Federal research spending during the 1970s as a reaction to the energy crises in 1973 and 1979. In the 1980s, oil prices have fallen sharply, and there is little need for continued Federal support. The energy sector of U.S. industry has also scaled back its own expenditures on R&D since 1984... Federal policy has placed a special emphasis on basic research that has the potential to contribute significantly to America's long-term economic competitiveness" (Budget of the United States, FY1989, p. 2a-13)
- "The budget also requests an increase of 49 percent for the general science programs within the Department of Energy, to reach a budget authority level of $1.2 billion for 1989. This includes funding for the initial construction of the Superconducting Super Collider (SSC), the world's most powerful atom smasher. The SSC is a critical part of the administration's initiative to maintain and strengthen the Nation's scientific and technological leadership" (Ibid, p. 2b-6)
- "These [atomic energy defense] activities, conducted by the Department of Energy, include research, development, testing, and production of nuclear weapons; production of special nuclear materials; storage of nuclear wastes from defense programs; and design of reactors for nuclear-powered Navy vessels... In total, budget authority of $8.1 billion is requested for 1989, compared to $7.7 billion for 1988" (Ibid, p. 5-14)
- "The 1989 budget continues this policy of limited Federal energy spending focused on meeting appropriate Federal responsibilities. It proposes that spending be reduced on activities that are more appropriately non-Federal responsibilities, that activities be privatized that can and should be undertaken by non-Federal entities, and that remaining programs be managed on a business-like basis... A total of $2.9 billion in budget authority is requested for energy supply [R&D] programs in 1989. This program level is $0.4 billion above the level of funding in 1988. Federal spending on energy technology R&D is focused on longer-term, high-risk activities with high potential payoff. Federal support complements, rather than duplicates or competes with, R&D investments undertaken by the private sector... Budget authority of $352 million is requested for nuclear fission R&D in 1989, slightly above the level in 1988. An increase in funding is proposed for reactor concepts to meet space and military nuclear power requirements. This program serves national security interests and helps to maintain a technical and industrial base for potential commercial use of advanced

nuclear technologies in the future... For nuclear fusion R&D, budget authority of $360 million is requested for 1989, a 7.5 percent increase above the 1988 level... The budget also includes funding to support cooperation with the Soviet Union on magnetic fusion research." (Ibid, p. 5-39)

- "Due to the severe budget situation, the Committee has not included funds for any new construction starts for the Corps of Engineers or the Bureau of Reclamation. No major new construction funding is included for the Department of Energy's domestic programs" (H. Rpt. 100-618, May 11, 1988, p. 3)
- "The Committee agrees that the marketplace must ultimately decide the future role of the solar technologies. Most solar and renewables research, however, has not been developed to the point where the private sector alone can be expected to carry forward with its development. The Committee considers the continuation of activities in solar energy [R&D] to be a vital component in a balanced energy program" (S. Rpt. 100-381, June 8, 1988, p. 77)
- "It was the first time in some two decades that lawmakers took a "no-new-starts" stand on the bill for purely fiscal reasons. That made it the most austere energy and water bill in recent memory in one sense. It was more than $300 million below the president's request. However, the bill contained more funds than in any previous year, largely for nuclear weapons and locally important energy research laboratories, dams, and harbors... Each chamber included close to $8.1 billion for atomic-energy defense activities such as the construction of nuclear warheads by the Energy Department. Because spending was fixed at that level, the highest ever, by the 1987 budget-summit agreement, there was less leeway in civilian spending accounts, such as those for energy-technology research, dams, and irrigation projects." ("'No New Starts' in Energy and Water Bill," *CQ Almanac 1988*, 44th ed., 701-5. Washington, DC: Congressional Quarterly, 1989).

Energy R&D Appropriations for FY1990

Primary Bill: Energy and Water Development Appropriations Act, 1990

Public Law: 101-101 **Enacted:** September 29, 1989 **Effective:** October 1, 1989

Secondary: Department of the Interior and Related Agencies Appropriations Act, 1990

Public Law: 101-121 **Enacted:** October 23, 1989 **Effective:** October 23, 1989

Function	Nominal change		Real change		Classification
	Millions ($)	YOY%	Millions ($2012)	YOY%	
Defense	-$53.6	-2.2%	-$161.7	-4.3%	Exogenous
Nondefense	$294.2	8.3%	$295.8	5.6%	Exogenous

Congress again appropriated significant increases in both nominal and real funding for the nondefense R&D functions of DOE for FY1990, while again modestly cutting nominal funding for defense energy R&D programs, leading to a more significant decline in real terms. The outgoing Reagan administration's final budget request again proposed significant increases for the SSC along with other high physics science programs, and proposed one final cut to energy supply R&D programs. Despite skepticism regarding the total cost and competing pressure to reduce the budget deficit, Congress appropriated nearly the full budget request for the SSC. The Senate Appropriations Committee once again proposed

considerably higher funding levels for energy supply R&D programs than requested or approved by the House—an increase of nearly $100 million over FY1989 funding levels. The final conference bill appropriated 2.5% more for energy supply R&D programs than had been requested in the budget. For DOE's atomic energy defense activities, the incoming George H.W. Bush administration continued pivoting focus from weapons R&D and modernization to cleaning up "decades of environmental neglect at America's nuclear weapons plants" and development for arms control treaty verification. The new administration was also more focused on deficit reduction, and President Bush went as far as proposing a one-year freeze in the defense budget to advance deficit reduction objectives without raising taxes. Funding changes for both energy R&D functions appear to have been unrelated to any concerns about inflation, unemployment, or other short-run macroeconomic conditions. As such, we classify these policy events as exogenous. Most pertinent narrative evidence:

- "We must continue to maintain our nuclear deterrent. For 1990, the budget proposes $9.0 billion for atomic energy defense programs, a $0.9 billion increase over 1989. A total of $2.8 billion is dedicated to the modernization of the nuclear materials production complex and to increase environmental clean-up and waste management efforts" (Budget Message of the President, FY1990, January 9, 1989, p. 1-7)
- "One of our highest priorities is to strengthen U.S. technology and make America more competitive... Also included in the budget is $250 million in 1990 as the Federal share of support for initiating the construction of the Superconducting Super Collider (SSC). Non-Federal cost-sharing arrangements will be required to support one-third of the project's costs. The SSC as currently envisaged will be the largest pure science project ever undertaken. It will help keep this country on the cutting edge of high energy physics research well into the next century." (Ibid, p. 1-8)
- "The nuclear weapons program involves the design, testing, and production of nuclear warheads for the nuclear weapons stockpile, including quality control and periodic inspection of the finished devices. Budget authority proposed for 1990 and 1991 would provide for continuing warhead production for current and new weapon systems, and for production of special nuclear materials for use in these warheads. The budget provides for the conceptual design of two new production reactors to replace the aging reactors at the Savannah River Plant... The budget supports a significant increase in activities to bring existing facilities into compliance with all Federal and State environmental, safety, and health requirements and to clean up contamination from prior activities. It also provides for modernization of facilities throughout the nuclear weapons production complex." (Budget of the United States, FY1990, pp. 5-14-15)
- "The general science programs of the DOE support basic research in nuclear and high-energy physics and support the construction and operation of facilities required to carry out this research. The goal of the research is to achieve a comprehensive understanding of the basic components of matter and energy and the forces that govern their interaction. Budget authority of $1.2 billion is requested for support of these programs in 1990, an increase of $247 million or 27 percent over the 1989 level. The budget proposes continued funding for research carried out at the nuclear and particle physics accelerators supported by DOE. The budget also proposes to upgrade the linear accelerator at Fermi National Laboratory, currently the world's foremost experimental high energy physics facility. Substantial funds to increase the operations of the new accelerators at the Stanford Linear Accelerator Center and the Fermi National Laboratory are also requested. In addition, the budget proposes continued funding for advanced

accelerator and detector [R&D] related to the next generation of high energy particle accelerators." (Ibid, pp. 5-29-30)

- "[A] total of $2.7 billion in budget authority is requested for energy supply R&D programs in 1990. This is $0.1 billion below the funding level for 1989. Federal spending on energy technology R&D is focused on longer-term, high-risk activities with high potential payoff. Federal support should complement, rather than duplicate or compete with, R&D investments undertaken by the private sector... Budget authority of $114 million is requested for solar and renewable energy R&D in 1990, a reduction of $37 million from 1989." (Ibid, pp. 5-39-40)
- "We face a massive task in cleaning up the waste left from decades of environmental neglect at America's nuclear weapons plants. Clearly, we must modernize these plants and operate them safely. That's not at issue; our national security depends on it. But beyond that, we must clean up the old mess that's been left behind. And I propose in this budget to more than double our current effort to do so." George H.W. Bush, State of the Union Address, February 9, 1989 (*The American Presidency Project*, by Gerhard Peters and John T. Woolley, https://www.presidency.ucsb.edu/node/247737)
- "We must establish some very clear priorities. And we must make a very substantial cut in the Federal budget deficit... Most people don't realize that after the successful restoration of our strength, the Pentagon budget has actually been reduced in real terms for each of the last four years. We cannot tolerate continued real reduction in defense. In light of the compelling need to reduce the deficit, however, I support a 1-year freeze in the military budget, something I proposed last fall in my flexible freeze plan... This defense freeze must be a part of a comprehensive budget agreement which meets the targets spelled out in Gramm-Rudman-Hollings law without raising taxes and which incorporates reforms in the budget process." (ibid)
- "The [House Appropriations] Committee recommendation for High Energy Physics totals $611,230,000 which is $5,000,000 below the Administration's budget request and is an increase of $44,424,000 compared to FY 1989. The Committee recommendation for the Superconducting Super Collider is $200,000,000, or $50,000,000 less than the budget request... The Committee is facing the impacts of budget deficit reduction activities at the same time that other high-priority funding requirements in the energy and water development areas are pressing. Defense nuclear waste cleanup costs, flood control, navigation, and irrigation improvements as well as other important energy and science R&D all warrant increased attention... The Committee is still concerned about the cost estimates for the SSC." (H. Rpt. 101-96, June 20, 1989, p. 90)
- "The [Senate Appropriations] Committee recommends $1,364,015,000 for [weapons] [R&D] activities, an increase of $43,536,000 over the 1989 level and $19,830,000 below the budget request... The Committee recommendation for testing activities totals $568,980,000 which reflects a reduction of $30,975,000 below the budget request" (S. Rpt. 101-83, July 25, 1989, pp. 134-135)
- "The multibillion-dollar superconducting supercollider emerged not just unscathed, but $25 million better off, after the Senate approved its $18.43 billion energy and water development appropriations bill (S Rept 101–83) July 27. In approving the bill by voice vote, the Senate gave its blessing to $225 million in initial funding for the project, $25 million more than the House approved in its energy and water spending bill, passed June 28. The Bush administration sought $250 million... Though it was

viewed by detractors as a project of dubious value that would absorb funds that should go to other needs, the supercollider drew no significant opposition on the floor or in the Appropriations Committee markup, where panel members approved the bill on July 25... House and Senate conferees settled on the higher, Senate-approved funding level of $225 million for the superconducting supercollider Sept. 7, virtually assuring that construction would begin on it. The move came as the conferees approved an $18.56 billion compromise version of the fiscal 1990 energy and water development appropriations bill, which contained money for atomic weapons, energy research, and water projects. The final amount of the conference agreement represented an increase of nearly $2.1 billion over fiscal 1989 funding and provided $177 million more than the president asked for." ("Energy and Water Bill Funds Supercollider," *CQ Almanac 1989*, 45th ed., 737-41. Washington, DC: Congressional Quarterly, 1990)

Energy R&D Appropriations for FY1991

Primary Bill: Energy and Water Development Appropriations Act, 1991

Public Law: 101-514 **Enacted:** November 5, 1990 **Effective:** November 5, 1990

Secondary: Department of the Interior and Related Agencies Appropriations Act, 1991

Public Law: 101-512 **Enacted:** November 5, 1990 **Effective:** November 5, 1990

Function	Nominal change		Real change		Classification
	Millions ($)	YOY%	Millions ($2012)	YOY%	
Defense	-$43.5	-1.8%	-$159.1	-4.4%	Exogenous
Nondefense	$510.5	13.3%	$542.9	9.7%	Exogenous

Congress again appropriated significant increases in both nominal and real funding for DOE's nondefense energy R&D functions for FY1991, while again modestly cutting nominal funding for defense energy R&D programs, leading to a more significant decline in real terms. In a sharp reversal from the previous administration, renewable energy programs found a new advocate in President George H.W. Bush, who proposed significant increases in R&D for solar energy and biofuels. Congress shared the administration's concerns about developing more environmentally friendly domestic energy supplies, but cut into some other DOE science programs, including the supercollider—much to the president's frustration (the SSC project was located in his home state of Texas). Late in the appropriations cycle, Iraq's invasion of Kuwait in August 1990 renewed concerns about energy independence and reliance on oil imports, but unlike the sweeping policy responses to the 1973 OPEC shock, the increase in renewable energy funding was not intended to boost short-run domestic energy supplies and address energy price inflation. Congress also approved a significant increase for DOE's biological sciences research program, including requested funds for a new gene-mapping project, jointly funded by and conducted with NIH—the beginning of the Human Genome Project, which was launched in October 1990. The administration had proposed a substantial increase in atomic energy defense activities, again giving priority to environmental restoration and waste management for long-neglected nuclear weapons facilities; the House Appropriations Committee approved less funding for nuclear weapons R&D and testing than appropriated for FY1990, partly in line with the budget request and partly because of the subsequent cancellation of two nuclear warhead programs. Modernization and development of new nuclear weapons had lost a sense of urgency since the fall of the Soviet Union. Funding changes for both energy R&D functions appear to have been related

to long-term economic objectives and changing geopolitical realities, and unrelated to any concerns about inflation, unemployment, or other short-run macroeconomic conditions. As such, we classify these policy events as exogenous. Most pertinent narrative evidence:

- "One of the great challenges of the 1990s will be to provide the American people with ample supplies of secure, competitively priced energy while protecting the environment. The Administration is committed to expanding American knowledge of emerging technologies in solar and renewable energy, and in developing the most effective conservation technologies, in order to help accomplish these twin goals. The budget contains significant increases for new [R&D] initiatives in solar and renewable energy and energy conservation. The 1991 budget requests about $360 million for these activities—a sharp increase over the $208 million requested in the 1990 budget, and about 10 percent above 1990 enacted levels... For renewable energy research, the budget requests $28 million—an increase of $12 million above 1990—for biofuels. The majority of the increase will be devoted to new research initiatives in ethanol fuels and the development of energy from municipal waste." (Budget of the United States, FY1991, p. 131)
- "The budget requests for these [defense] purposes are: budget authority of $11.0 billion and outlays of $10.4 billion, compared to $9.7 billion and $8.9 billion, respectively, for 1990. The budget provides for the design of two new production reactors and the modernization of existing facilities. The budget requests $2.4 billion, an increase of $429 million over 1990, to implement the first year of a 5-year plan for environmental restoration and waste management at defense facilities. Included are activities to bring existing facilities into compliance with all Federal and State environmental, safety, and health requirements and to clean up contamination from prior activities." (Ibid, p. 156-157)
- "The Committee recommendation for Research and Development totals $1,164,261,000 which is less than the budget request and the fiscal year 1990 funding due to the cancellation of two nuclear warhead programs and the transfer of Nuclear Directed Energy Weapons funding to a separate account... The Committee recommendation for Testing activities totals $487,160,000, which is the same as the budget request... The Committee recommendation for Nuclear Directed Energy Weapons is $191,904,000 which is the amount of the budget request, and a decrease of $24,796,000 from fiscal year 1990" (H. Rpt. 101-563, June 13, 1990, p. 107)
- "Recent events in the Middle East have focused attention on energy, particularly the United States' growing dependence on imported oil. In addition, clean air legislation and related environmental concerns including possible global climate change have raised questions involving the use of fossil energy resources utilizing existing technologies. Criticism abounds that the Nation has no 'energy policy'" (H. Rpt. 101-789, October 2, 1990, p. 6)
- "I am concerned about the reduced funding provided for the Superconducting Super Collider and basic research programs. These reductions are especially unfortunate because they were used to finance large numbers of economically unjustified water projects in the Corps of Engineers and the Bureau of Reclamation" George H.W. Bush, Statement on Signing the Energy and Water Development Appropriations Act, 1991, November 5, 1990 (*The American Presidency Project*, by Gerhard Peters and John T. Woolley, https://www.presidency.ucsb.edu/node/265580)

- "A House-Senate conference approved a $21 billion energy and water bill that cut fiscal 1991 funding for major science programs while protecting hundreds of millions of dollars added by lawmakers for home-state public works projects... The measure incorporates significant new funding for solar- and renewable-energy programs" ("Conferees Clear Energy and Water Bill That Cuts Funding for Science Programs," by David Rogers, *The Wall Street Journal*, October 15, 1990)
- "Increases over energy and water appropriations for fiscal 1990 totaled $1.7 billion. Most of the extra money was to pay for cleaning up the Energy Department's nuclear bomb plants and civilian research facilities... In another science account, Energy Department biology programs received a healthy increase to nearly $400 million, including Bush's $46 million request for a proposed multibillion-dollar gene-mapping project. The project received $87.6 million more through the National Institutes of Health in the Labor-HHS appropriations bill" ("$20.2 Billion for Energy, Water Projects," *CQ Almanac 1990*, 46th ed., 861-66. Washington, DC: Congressional Quarterly, 1991)
- "The bill also: Cut Bush's request for the proposed superconducting super collider (SSC) by $75 million to $243 million. Both houses had approved Bush's full $318 million request for the Texas project, but conferees cut that figure as they slashed millions from domestic programs to comply with the 1990 budget agreement... [and] increased Bush's $2.1 billion request for energy supply research programs to $2.5 billion, providing a bit more for solar ($131 million) than Bush wanted and much less for nuclear ($306 million) and fusion ($275 million)." (Ibid)

Energy R&D Appropriations for FY1992

Primary Bill: Energy and Water Development Appropriations Act, 1992

Public Law: 102-104 **Enacted:** August 17, 1991 **Effective:** October 1, 1991

Secondary: Department of the Interior and Related Agencies Appropriations Act, 1992

Public Law: 102-154 **Enacted:** November 13, 1991 **Effective:** November 13, 1991

Function	Nominal change		Real change		Classification
	Millions ($)	YOY%	Millions ($2012)	YOY%	
Nondefense	$760.7	17.4%	$960.1	15.7%	Exogenous

Congress again appropriated significant increases in both nominal and real funding for the nondefense R&D functions of DOE for FY1992; funding for defense energy R&D programs, on the other hand, saw a more modest nominal increase, resulting in less of a significant increase in real terms. Despite the recently launched Iraq war, the end of the Cold War led the George H.W. Bush administration to propose a substantial pivot to domestic spending priorities, particularly for 'long-term investments for the next American century' in science, technology, and the environment. Building from the FY1991 budget, the administration continued to prioritize DOE funding for R&D work on cleaner domestic energy sources, as the Iraq war again refocused attention on long-run energy self-sufficiency. Shortly after submitting the budget, President Bush announced a National Energy Strategy in February 1991, which emphasized reducing reliance on oil imports from 'troubled parts of the world,' diversifying energy sources and developing cleaner domestic energy, and keeping America on the "cutting edge of new energy technology"; the strategy was seen as complementing the Clean Air Act, which had just been amended in 1990 to try to address acid rain. In other

interdisciplinary program areas, DOE's inter-agency work on developing supercomputing technologies was given priority along with human genomics work with the NIH. For atomic energy defense activities, the administration continued to prioritize nuclear waste management and environmental remediation at U.S. nuclear weapons facilities, but also requested modestly increased funding for nuclear weapons R&D activities. Funding changes for DOE's nondefense energy R&D functions appear to have been driven by changing political preferences about the environment and other long-term policy objectives, while unrelated to short-run concerns about inflation, unemployment, or other macroeconomic conditions. As such, we classify this policy change as exogenous. Most pertinent narrative evidence:

- "Our purpose in the Persian Gulf remains constant: to drive Iraq out of Kuwait, to restore Kuwait's legitimate government, and to ensure the stability and security of this critical region... But just as our efforts will bring economic growth now and in the future, they must also be matched by long-term investments for the next American century. That requires a forward-looking plan of action, and that's exactly what we will be sending to Congress. We've prepared a detailed series of proposals that include: a budget that promotes investment in America's future—in children, education, infrastructure, space, and high technology; ... a [R&D] agenda that includes record levels of Federal investment, and a permanent tax credit to strengthen private R&D and to create jobs; a comprehensive national energy strategy that calls for energy conservation and efficiency, increased development, and greater use of alternative fuels..." George H.W. Bush, State of the Union Address, January 29, 1991 (*The American Presidency Project*, by Gerhard Peters and John T. Woolley, https://www.presidency.ucsb.edu/node/265956)
- "The budget recommends an increase of $8.4 billion in the Federal investment in [R&D], with special emphasis on basic research, high-performance computing, and energy [R&D]" (Budget of the United States, FY1992, p. Part One-3)
- "The budget proposes an increase of $227 million, or 34 percent for investments in targeted high-payoff technologies and strategies to increase the efficiency of energy use, to develop alternatives to petroleum, and to advance new electricity technologies. This investment is guided by the National Energy Strategy." (Ibid, p. Part Two-36)
- "The budget proposes $2.8 billion for Department of Energy (DOE) Atomic Energy Defense programs, an increase of $161 million, or 6 percent over 1991. The largest component of these R&D activities is the research, development, and testing of nuclear weapons. The budget proposes $1.8 billion for that activity, including associated R&D facilities, an increase of $27 million over 1991. The DOE nuclear weapons R&D program will increase efforts to improve the safety of nuclear weapons and to develop new technology to verify arms control treaties. In addition, the DOE weapons laboratories are increasing efforts to promote the transfer of non-sensitive defense-funded technology to the private sector. The budget proposes $32 million to support for such technology transfer activities... The environmental cleanup of atomic energy defense facilities is one of the fastest-growing programs in DOE. Technology development activities play a major role in the clean-up effort, resolving major technical issues related to effective waste management and cleanup and advancing technologies to attain and maintain compliance with current laws and regulations. The budget proposes to increase this investment in technology development by 60 percent, from $206 million in 1991 to $330 million in 1992" (Ibid, p. Part Two-59)

- "Our imports of foreign oil have been climbing steadily since 1985 and now stand at 42 percent of our total consumption. Too many of those oil imports come from sources in troubled parts of the world... To minimize our vulnerability to foreign oil, and the disruptions that come from reliance on foreign oil, this strategy takes a multifaceted approach. It will help us to find more reliable sources of energy through uncompromisingly safe and environmentally sound development. Domestic oil production will rise by 3.8 million barrels a day. This strategy will also help us use energy more efficiently by encouraging new technologies, alternative-fueled vehicles, and conservation... We want to build an energy future that is based on a range of diverse sources, so that never again will this nation's energy well-being be swayed by events in a single foreign country. And finally, we are convinced that this strategy will keep America on the cutting edge of new energy technology. It promotes partnerships between industry and government for accelerated research in technologies like biomass and alternative fuels, electric vehicles, high-speed rail, renewable sources like solar and geothermal power, and nuclear technologies of unprecedented safety and security. Together with the recently passed Clean Air Act, this National Energy Strategy will maintain an uncompromising commitment to energy security and environmental protection." George H.W. Bush, Remarks at a Briefing on Energy Policy, February 20, 1991 (*The American Presidency Project*, by Gerhard Peters and John T. Woolley, https://www.presidency.ucsb.edu/node/265021)
- "The Committee continues to be concerned about the future of the nuclear power option in the United States. The strategic plan for the nuclear reactor [R&D] program remains unfinished, and the program appears to lack focus and direction. The budget proposal for civilian nuclear research remains heavily skewed towards space and defense activities" (H. Rpt. 102-75, May 22, 1991, p. 78)
- "The Committee considers the continuation of activities in solar energy [R&D] to be a vital component in a balanced energy program. With a sustained commitment of the scientific and engineering talents in Government and private sector organizations, research progress can establish the knowledge and materials base required for the effective application of a new generation of solar technologies" (S. Rpt. 102-80, June 11, 1991, p. 75)
- "The funding in this Act will help make important investments in [R&D] for general science and energy supply, environmental restoration and waste disposal, and water resources development. I am concerned, however, about the longer-term distribution of funds between scientific [R&D] of national significance and water projects of more local benefit. Funding for water projects is increased above the Administration's request by $132 million, while the Administration's request for General Science and Research Activities is reduced by $76 million," George H.W. Bush, Statement on Signing the Energy and Water Development Appropriations Act, 1992, Aug 17, 1991 (*The American Presidency Project*, by Gerhard Peters and John T. Woolley, https://www.presidency.ucsb.edu/node/265860)
- "The bill provided just under $3 billion for an array of Energy Department programs to promote energy sources, such as solar and nuclear power, and related research and environmental cleanup work at the department's non-military facilities" ... The program promoted the development of various forms of solar energy, as well as photovoltaics, wind, ocean energy and biofuels. It accounted for about half a billion dollars in 1981, but under the Reagan and early Bush administrations dwindled to less than $100 million. The oil jitters created by the Persian Gulf War focused greater attention on this

program to develop alternative energy sources. Bush requested $143 million for fiscal 1992. The account grew as it went through the appropriations process, ending at $175.5 million for fiscal 1992" ("Atom Smasher Funded in Energy Bill," *CQ Almanac 1991*, 47th ed., 569-80. Washington, DC: Congressional Quarterly, 1992).

- "The bill provided $867 million for Energy Department support for basic research in the physical, biological, and engineering sciences that could help supply energy. It supported the government's national energy laboratories and some private universities that served a variety of programs. The Energy Department was part of an interagency effort to develop high-performance computing or supercomputers. Appropriators allotted $93 million for programs related to the effort and urged that the department be given a clearer and preferably larger role in the joint effort" (Ibid)

Energy R&D Appropriations for FY1994

Primary Bill: Energy and Water Development Appropriations Act, 1994

Public Law: 103-126 **Enacted:** October 28, 1993 **Effective:** October 28, 1993

Secondary: Department of the Interior and Related Agencies Appropriations Act, 1994

Public Law: 103-138 **Enacted:** November 11, 1993 **Effective:** November 11, 1993

Function	Nominal change		Real change		Classification
	Millions ($)	YOY%	Millions ($2012)	YOY%	
Defense	-$213.7	-8.1%	-$358.3	-9.8%	Exogenous
Nondefense	$415.7	8.1%	$413.1	5.9%	Exogenous

Congress appropriated significant increases in both nominal and real funding for the nondefense R&D functions of DOE for FY1994, while nominal funding for atomic energy defense R&D functions was significantly reduced, leading to an even larger cut in real appropriations. The Clinton administration remained focused on economic and budget policy for the long term, a program based on deficit reduction and using the Cold War peace dividend to fund public investments that would pay off in the future. Deficit reduction efforts took aim at the defense budget, among other programs, as well as DOE's nuclear weapons programs. In the aftermath of the fall of the Soviet Union and environmental concerns about their Semipalatinsk Test Site, Soviet leader Mikhail Gorbachev unilaterally imposed a moratorium on nuclear testing in October 1991.[26] Congress passed a nine-month moratorium on nuclear testing in 1992, overcoming the opposition from President George H.W. Bush, and incoming President Clinton then extended the U.S. testing moratorium in July 1993. Clinton's FY1994 budget request proposed changing the U.S. nuclear posture in response to the "reduced threat of nuclear war," notably by reducing the stockpile of nuclear weapons, building no more weapons, and only maintaining the capability to resume testing if needed; the appropriations committees agreed and approved a significant decrease in funding for nuclear weapons activities, R&D functions included. Climate change and the environment were top priorities of President Clinton and Vice President Al Gore, and DOE atomic energy defense funding was redirected toward environmental cleanup of nuclear weapons facilities; the administration and U.S. Senate also continued to champion increased funding for renewable energy development, particularly for solar energy. Congress axed DOE's supercollider program and repurposed funding for higher priority investments

[26] Arms Control Association, Nuclear Testing and Comprehensive Test Ban Treaty (CTBT) Timeline

in energy supply R&D programs. The reduced funding levels for atomic energy defense R&D programs appear to have been largely motivated by broader concerns about long-run fiscal sustainability and reduced geopolitical threats as the Cold War thawed. Similarly, the increase in nondefense energy R&D funding reflected environmental concerns and new long-term economic policy preferences after the 1992 election, and appear unrelated to any concerns about inflation, unemployment, or other short-run macroeconomic prerogatives. As such, we classify these policy events as exogenous. Most pertinent narrative evidence:

- "Our plan looks beyond today's business cycle because our aspirations extend into the next century. The heart of this plan deals with the long term. It is an investment program designed to increase public and private investment in areas critical to our economic future. And it has a deficit reduction program that will increase the savings available for the private sector to invest... Over the long run, all this will bring us a higher rate of economic growth, improved productivity, more high-quality jobs, and an improved economic competitive position in the world. In order to accomplish both increased investment and deficit reduction, something no American Government has ever been called upon to do at the same time before, spending must be cut, and taxes must be raised. The spending cuts I recommend were carefully thought through in a way to minimize any adverse economic impact, capture the peace dividend for investment purposes, and switch the balance in the budget from consumption to more investment... my recommendation makes more than 150 difficult reductions to cut the Federal spending by a total of $246 billion. We are eliminating programs that are no longer needed, such as nuclear power [R&D]." William J. Clinton, State of the Union Address, January 25, 1994 (*The American Presidency Project*, by Gerhard Peters and John T. Woolley, https://www.presidency.ucsb.edu/node/219941)
- "About the defense budget, I raise a hope and a caution. As we restructure our military forces to meet the new threats of the post-cold-war world, it is true that we can responsibly reduce our defense budget." (Ibid)
- "The national security picture for the United States has continued to change dramatically in the last year. The end of the Cold War with the former Soviet Union and proposed conventional and nuclear arms agreements with the Commonwealth of Independent States have resulted in the reduced threat of nuclear war... The Committee's recommendation reflects the Nation's changing priorities. It supports a program that anticipates a reduced nuclear weapons stockpile and no new weapons build requirements" (H. Rpt. 103-135, June 17, 1993, p. 105)
- "The end of the Cold War with the former Soviet Union and proposed conventional and nuclear arms agreements with the Commonwealth of Independent States have resulted in the reduced threat of nuclear war. As a result of these proposed nuclear arms control agreements and unilateral U.S. actions, the total size of the nuclear weapons stockpile has decreased significantly and nuclear weapons are no longer being produced. Emphasis has now shifted to carrying out the ongoing landlord responsibilities in an environmentally acceptable way. Furthermore, in July the President announced that the current moratorium on weapons testing would be extended at least through September 1994, as long as no other nation tests. The Committee's recommendation reflects the Nation's changing priorities. It supports a program that anticipates a reduced nuclear weapons stockpile, no underground nuclear weapons testing, and no weapons production. While moving toward a non-testing environment, adequate resources have been provided to support the capability to resume testing, if necessary; and essential

activities of a stockpile stewardship program. In summary, the Committee recommendation for weapons activities totals $3,597,482,000, which is a decrease of $971,267,000 from the fiscal year 1993 appropriation and a decrease of $108,818,000 from the budget request of $3,709,300,000... The Committee recommendation for [R&D] totals $1,357,622,000, which is a decrease of $5,100,000 from the amended budget request of $1,362,722,000 and $178,428,000 less than the fiscal year 1993 funding level" (S. Rpt. 103-147, September 7, 1993, p. 134)

- "The budget request for fiscal year 1994 solar energy programs is $252,349,000, an increase of $74,924,000 over the fiscal year 1993 level. The Committee is strongly supportive of the solar and renewable program and notes that the administration has increased its commitment to solar programs and has proposed the largest budget increase in more than a decade." (Ibid, p. 85)
- "In a stunning upset for the scientific community—not to mention Texas lawmakers and J. Bennett Johnston, D-La., chairman of the Senate Energy and Water Development Appropriations Subcommittee—the super collider was killed in 1993 by opponents who argued that the project was over budget, behind schedule and lacking in long-promised investments by foreign countries... In 1993, however, the atom smasher fell victim to strong budget-cutting sentiment in the House and to lukewarm support from President Clinton, who, unlike avowed Texan and former President George Bush, did not visibly lobby to save the project. The final bill allotted $640 million to terminate the project, which was 20 percent complete." ("Super Collider Runs Out of Time," *CQ Almanac 1993*, 49th ed., 589-96. Washington, DC: Congressional Quarterly, 1994)
- "Decreases in the bill's overall funding were attributed to lower spending levels for nuclear weapons testing, production and design. Total nuclear energy defense activities declined by $1.26 billion from fiscal 1993" (Ibid)

Energy R&D Appropriations for FY1995

Primary Bill: Energy and Water Development Appropriations Act, 1995

Public Law: 103-316 **Enacted:** August 26, 1994 **Effective:** October 1, 1994

Secondary: Department of the Interior and Related Agencies Appropriations Act, 1995

Public Law: 103-332 **Enacted:** September 30, 1994 **Effective:** October 1, 1994

Function	Nominal change		Real change		Classification
	Millions ($)	YOY%	Millions ($2012)	YOY%	
Defense	-$224.8	-9.3%	-$415.1	-12.5%	Exogenous
Nondefense	-$436.0	-7.8%	-$804.0	-10.9%	Exogenous

Congress appropriated significant decreases in both nominal and real funding for both DOE's defense and nondefense energy R&D functions for FY1995. The Clinton administration remained fixated on fiscal consolidation and long-run fiscal sustainability, and a recent budget deal had imposed tight caps on discretionary spending. President Clinton had recently axed DOE's supercollider program, and Congress terminated the Advanced Liquid Metal Reactor, both controversial and expensive programs, contributing to the reduction in nondefense energy R&D funding. Climate change and the environment were top priorities of President Clinton and Vice President Gore, and the appropriations bill did shuffle funding toward renewable energy R&D programs, in line with the Climate Change

Action Plan the incoming administration had released in January 1993. The administration continued to pursue arms control treaties in the aftermath of the Cold War, and atomic energy defense activities remained more focused on environmental cleanup of nuclear weapons plants than weapons development, modernization, or testing; the administration had issued a total moratorium on nuclear weapons test, and Congress accordingly halved FY1995 appropriations for nuclear weapons testing relative to FY1994 funding levels. The reduced funding levels appear to have been largely motivated by broader concerns about long-run fiscal sustainability and reduced geopolitical threats following the fall of the Soviet Union, and unrelated to any concerns about inflation, unemployment, or other short-run macroeconomic prerogatives. As such, we classify these policy events as exogenous. Most pertinent narrative evidence:

- "This is a promising moment. Because of the agreements we have reached this year, last year, Russia's strategic nuclear missiles soon will no longer be pointed at the United States, nor will we point ours at them. Instead of building weapons in space, Russian scientists will help us to build the international space station... We achieved agreements with Ukraine, with Belarus, and with Kazahkstan to eliminate completely their nuclear arsenal. We are working to achieve a Korean Peninsula free of nuclear weapons. We will seek early ratification of a treaty to ban chemical weapons worldwide. And earlier today, we joined with over 30 nations to begin negotiations on a comprehensive ban to stop all nuclear testing." William J. Clinton, State of the Union Address, January 25, 1994 (*The American Presidency Project*, by Gerhard Peters and John T. Woolley, https://www.presidency.ucsb.edu/node/219941)
- "This Congress produced a budget that cut the deficit by half a trillion dollars, cut spending and raised income taxes on only the wealthiest Americans... Last year we began to put our house in order by tackling the budget deficit that was driving us toward bankruptcy. We cut $255 billion in spending, including entitlements, and over 340 separate budget items. We froze domestic spending and used honest budget numbers... Next month I will send you one of the toughest budgets ever presented to Congress. It will cut spending in more than 300 programs, eliminate 100 domestic programs, and reform the ways in which governments buy goods and services. This year we must again make the hard choices to live within the hard spending ceilings we have set." (Ibid)
- "We continue to implement the $500 billion in deficit reduction from last year's reconciliation bill. To achieve the required hard freeze in discretionary spending and make needed investments, we propose new cuts in some 300 specific non-defense programs. That includes the termination of more than 100 programs. Many of these savings will be controversial, but we have little choice if we are going to meet our budget goals. On the other side of the ledger, this budget contains no new tax increases" (Budget Message of the President, FY1995, February 7, 1994, p. 6)
- "[DOE] faces one of the Nation's most complex environmental challenges. Its Office of Environmental Restoration and Waste Management (EM) must safely manage the generation, handling, treatment, storage, transportation, and disposal of DOE nuclear and hazardous waste (including waste management, environmental restoration, facility transition, and technology development). The budget provides $6.28 billion, an increase of 2 percent over 1994, for these key programs... Technology Development (6 percent of the budget) is the applied [R&D] arm of the EM program, supporting new technologies

for environmental restoration and waste management." (Budget of the United States, FY1995, p. 146)

- "The Administration is enhancing U.S. national security through arms control—turning the promises of existing agreements into reality. ... START I's implementation will provide the basis for U.S.-Russian ratification of START II... The United States continues to observe a moratorium on nuclear testing and has begun to negotiate a Comprehensive Test Ban. Finally, the U.S. strongly supports indefinite extension of the Non-Proliferation Treaty (NPT) and is undertaking vigorous diplomatic efforts to achieve this outcome at the 1995 NPT Conference" (Ibid, p. 216)
- "During deliberations on the fiscal year 1995 Energy and Water Development Appropriations Bill, the [House Appropriations] Committee was faced with extremely difficult decisions in determining funding levels for the various programs funded in the bill. As a result of the funding ceilings agreed to in the recent Budget Resolution, the Subcommittee's funding was severely restricted. For fiscal year 1995 the Subcommittee's recommended program funding is $1,333,725,000 below the fiscal year 1994 appropriation, and $157,128,000 below the amounts contained in the President's fiscal year 1995 budget submission. The magnitude of these cuts has seriously limited the Committee's options. The Committee is also aware that severe financial pressures will continue into fiscal year 1996 and beyond. Thus, decisions on funding levels for current programs were based on the Committee's efforts not to impact current domestic programs and projects to obtain financing for new programs, initiatives, and projects with large out-year mortgages" (H. Rpt. 103-533, May 26, 1994, pp. 3-4)
- "The end of the Cold War and proposed conventional and nuclear arms agreements with the Commonwealth of Independent States have required a profound change in the nature of the Department of Energy's national security activities. As a result of these proposed nuclear arms control agreements and unilateral U.S. actions, the total size of the nuclear weapons stockpile has decreased significantly. In addition, the President has extended the underground nuclear testing moratorium through September 1995. The Committee's recommendation reflects the Nation's changing priorities. It supports a program that anticipates a reduced nuclear weapons stockpile, no new weapons build requirements, and a continuing underground nuclear testing moratorium. The Committee recommendation for Weapons Activities totals $3,164,369,000 which is a decrease of $430,829,000 from the fiscal year 1994 appropriation, and a decrease of $96,299,000 from the budget request of $3,260,668,000." (Ibid, p. 90)
- "The [House Appropriations] Committee recommendation for fossil energy [R&D] strikes a balance among coal, oil, and natural gas resources, allowing for substantial increases over fiscal year 1994 for oil and gas programs while reducing coal programs for a third consecutive year. The recommendation continues the Administration's power generation priorities in coal and gas, as well as providing increased emphasis on resource extraction techniques" (H. Rpt. 103-551, June 17, 1994, p. 90)
- "Congress repeated one of its rarest accomplishments Sept. 30 by clearing all 13 of its annual spending bills before the 12:01 a.m. beginning of the new fiscal year Oct. 1... The fact that the spending bills were passed with dispatch did not mean it was a painless process for Congress. Five years of increasingly tight spending caps dictated by the 1990 budget deal produced a phenomenon lawmakers had not seen in nearly three decades: the first year-to-year drop in actual discretionary spending (outlays) since 1969. Not counting "emergency spending" outside the budget caps,

discretionary outlays were projected to fall from $543.3 billion in fiscal 1994 to $540.1 billion in 1995, according to the Senate Appropriations Committee. In addition to tight spending caps, appropriators had to cope with an activist president with an aggressive "investment" agenda President Clinton's budget called for widespread cutbacks and program eliminations to make way for his own spending priorities, which did not always match those long favored by Congress. The result was the sort of zero-sum game that deficit hawks had long advocated, in which most moves to spend money on new programs required scaling back or killing old ones." ("Congress Clears All 13 Bills In Near-Record Time," *CQ Almanac 1994*, 50th ed., 475. Washington, DC: Congressional Quarterly, 1995)

- "The Senate on Aug. 11 cleared a $20.5 billion energy and water development spending bill (HR 4506) that reduced funding for civilian and military nuclear research and provided no additional funds to shut down the superconducting super collider. Roughly three-quarters of the money in the bill – $15.9 billion – went to the Energy Department for [R&D] programs, and for the massive task of cleaning up mothballed nuclear weapons production facilities. The fiscal 1995 energy and water bill provided about $1.3 billion less than the amount appropriated for fiscal 1994. Most of the difference was the result of a decision to provide no new funds to close down the superconducting super collider, the elaborate $11 billion physics experiment that Congress had terminated the previous October... The bill provided for the termination of the Advanced Liquid Metal Reactor, a controversial nuclear power reactor designed to use weapons-grade plutonium as fuel" ("No Sparks Over Energy, Water Funds," *CQ Almanac 1994*, 50th ed., 502-4. Washington, DC: Congressional Quarterly, 1995)
- "The $15.9 billion in the bill for Energy Department programs was roughly $1 billion less than the fiscal 1994 funding level. Of that amount, $3.3 billion was for energy [R&D] programs – including solar energy ($289 million), fusion energy ($373 million), and basic energy sciences ($747 million). Funding for nuclear power was reduced to $293 million from $341 million in fiscal 1994" (Ibid)
- "The bill provided $1.5 billion for research, development, and testing of nuclear weapons, programs that were the responsibility of the Energy Department. Of that amount, $203 million was appropriated for weapons testing, compared with $403 million the previous year. The amount was considered sufficient to preserve the option of conducting underground nuclear tests; Clinton had instituted a moratorium on actual testing. The bill also provided $152.4 million to fund a program to ensure the performance and reliability of U.S. nuclear weapons in the absence of tests." (Ibid)
- "Subcommittee Chairman Byrd reordered some of the bill's priorities, cutting $263.5 million from Energy Department programs on alternative energy sources and conservation, for example, to be able to increase by nearly $150 million funding for the Indian Health Service. Byrd said tight budget caps made it impossible to fund all the 1,600 projects members had sought" ("Interior Bill Wins Easy Passage," *CQ Almanac 1994*, 50th ed., 513-18. Washington, DC: Congressional Quarterly, 1995)
- "Today I have signed into law H.R. 4506... I am pleased that the Act substantially funds most of my budget requests for priority investment programs within the Departments of Energy and the Interior and the Army Corps of Engineers, including full funding for the renewable energy portions of the Climate Change Action Plan" William J. Clinton, Statement on Signing the Energy and Water Development Appropriations Act, 1995,

August 26, 1994 (*The American Presidency Project*, by Gerhard Peters and John T. Woolley, https://www.presidency.ucsb.edu/node/218359)

Energy R&D Appropriations for FY1996

Primary Bill: Energy and Water Development Appropriations Act, 1996

Public Law: 104-46 **Enacted:** November 13, 1995 **Effective:** November 13, 1995

Secondary: Omnibus Appropriations Act, 1996; Department of the Interior and Related Agencies Appropriations Act, 1996

Public Law: 104-134 **Enacted:** April 26, 1996 **Effective:** April 26, 1996

Function	Nominal change		Real change		Classification
	Millions ($)	YOY%	Millions ($2012)	YOY%	
Nondefense	-$641.0	-12.5%	-$911.1	-13.8%	Exogenous

Congress appropriated significant decreases in both nominal and real funding for the nondefense R&D functions of DOE for FY1996, while atomic energy defense R&D programs were held roughly flat in nominal terms and only fell slightly in real terms. The Clinton administration remained fixated on fiscal consolidation while trying to prioritize long-run public investments, but the midterm elections in November 1994 had significantly altered the political landscape and policy priorities; Republicans retook majorities in both the House and Senate. The newly elected House Republican majority was particularly intent on cutting nondefense government spending alone, and wildly different policy priorities between the parties set the stage for ugly fights over appropriations. The FY1996 Energy and Water Development Appropriation Bill was enacted shortly before two back-to-back government shutdowns in late 1995 and early 1996, one of only three appropriations bills unaffected. Even so, the energy bill passed by the House Appropriations Committee approved significant reductions to DOE's applied energy supply research programs, notably for nuclear fusion and fission, fossil fuels, and solar and other renewable energy sources; some members of the House Freshman class were even going as far to resurrect Ronald Reagan's call to abolish DOE entirely. The Senate Appropriations Committee approved much higher funding of nondefense energy programs, in part because Subcommittee Chairman Pete V. Domenici (R-NM) was an ardent advocate for the Sandia and Los Alamos national laboratories in his home state, but cuts to many DOE programs prevailed in conference. The reduced nondefense energy R&D funding levels appear to have been largely motivated by broader concerns about long-run fiscal sustainability and partisan budget fights, and unrelated to any concerns about inflation, unemployment, or other short-run macroeconomic prerogatives. As such, we classify this policy change as exogenous. The Energy and Water Development Appropriations Act, of 1996 resulted in a significant decrease in nondefense energy R&D funding well before the Omnibus Appropriations Act, of 1996 further pared back fossil energy R&D funding from FY1995 levels, so this policy event is dated to 1995Q4. Most pertinent narrative evidence:

- "Thanks to the courage of the people who were here then, many of whom didn't return, we did cut the deficit. We began to do what others said would not be done. We cut the deficit by over $600 billion, about $10,000 for every family in this country. It's coming down 3 years in a row for the first time since Mr. Truman was President, and I don't think anybody in America wants us to let it explode again. We propose

to cut $130 billion in spending by shrinking departments, extending our freeze on domestic spending, cutting 60 public housing programs down to 3, getting rid of over 100 programs we do not need" William J. Clinton, State of the Union Address, January 24, 1995 (*The American Presidency Project*, by Gerhard Peters and John T. Woolley, https://www.presidency.ucsb.edu/node/221902)

- "You know, tonight, this is the first State of the Union Address ever delivered since the beginning of the Cold War when not a single Russian missile is pointed at the children of America. And along with the Russians, we're on our way to destroying the missiles and the bombers that carry 9,000 nuclear warheads. We've come so far so fast in this post-Cold War world that it's easy to take the decline of the nuclear threat for granted. But it's still there, and we aren't finished yet. This year I'll ask the Senate to approve START II to eliminate weapons that carry 5,000 more warheads. The United States will lead the charge to extend indefinitely the Nuclear Non-Proliferation Treaty, to enact a comprehensive nuclear test ban, and to eliminate chemical weapons." (Ibid)
- "Our economic plan helped bring the deficit down to $290 billion in 1992, to $203 billion in 1994, to a projected $193 billion this year–providing three straight years of deficit reduction for the first time since Harry Truman was President... By reassuring the financial markets that we were serious about getting our fiscal house in order, our plan also lowered interest rates while holding inflation in check. That helped to stimulate private investment and exports, and sparked the creation of 5.6 million new jobs—more than twice the number in the previous four years. Now that we have brought the deficit down, we have no intention of turning back. My budget keeps us on the course of fiscal discipline by proposing $81 billion in additional deficit reduction..." (Budget Message of the President, FY1996, February 6, 1995, p. 3)
- "Solar and Renewable Energy: The DOE solar and renewable energy activities, funded at $423 million, represent a nine-percent increase over 1995. This level maintains the recent growth in photovoltaics and other solar energy research, including photovoltaics manufacturing improvements, and construction of the Solar Two central power prototype in California." (Budget of the United States, FY1996, p. 89)
- "Although nuclear forces no longer play as prominent a role in our defense capability as they once did, they remain an important part of our overall defense posture. The Energy Department's (DOE) primary post-Cold War defense mission is to maintain the safety and reliability of the nuclear weapons stockpile and ensure that our research base in nuclear technology remains advanced. The Stockpile Management Program addresses the ongoing requirements of the mission, while the Stockpile Stewardship Program seeks to improve the scientific and technical base needed to assure the long-term safety and reliability of the stockpile, without nuclear testing." (Ibid, p. 126)
- "DOE conducts applied research on a wide array of energy technologies for fossil fuels, nuclear fusion and fission, solar and renewable energy, and conservation technologies—much of it in DOE's laboratories, often in conjunction with the private sector. The Administration proposes to require more non-Federal cost-sharing of applied R&D, to better target DOE's spending on efforts for which the private sector predicts the highest potential payoffs. DOE also will curtail or eliminate lower-priority programs or those thought to have achieved their program objectives. In the latter category, DOE will not commit to more new starts for clean coal projects. This proposal would save an estimated $1.2 billion in outlays over five years." (Ibid, p. 149)

- "Funding recommendations for Department of Energy programs in fiscal year 1996 are significantly below the Department's fiscal year 1996 budget request in many areas. Absorbing these reductions will require much effort on the part of the Department to prioritize activities and seek the most cost-effective means for accomplishing program goals. The Department must focus on specific program missions and reduce the number of activities currently being performed which may be nice to do but are not possible in a severely constrained funding environment... The [House Appropriations] Committee recommendation for fiscal year 1996 supports to the extent possible the role of Federal participation in basic [R&D] programs in energy supply activities. Due to budget constraints, significant reductions in certain of the Department's programs were necessary" (H. Rpt. 104-149, June 20, 1995, pp. 69, 72)
- "A House Appropriations subcommittee yesterday proposed deep reductions in 1996 federal support for fusion energy and solar power research while protecting the nation's nuclear weapons laboratories as they adjust to the post-Cold War era. The $18.7 billion spending bill for the Energy Department and other agencies provided the first test of how appropriators will reconcile budget-cutting with the Republican leadership's support for science. The result did not please Democrats, who warned that in reducing spending by $1.5 billion compared to this year, the appropriators were accelerating the trend toward a smaller federal role in promoting U.S. scientific preeminence... Republicans responded that the bill protects overall Energy Department spending on basic research while cutting projects that mainly provide what Science Committee Chairman Robert S. Walker (R-Pa) called a 'life-support system' for private companies and universities" ("House Panel Backs Big Cuts For Some Energy Research," by Dan Morgan, *The Washington Post*, June 14, 1995)
- "The biggest difference between the two chambers was over the Energy Department, which had some strong support in the Senate but was under sharp attack from House GOP freshmen and a number of senior Republicans who were hoping to abolish it. The [conference] bill provided $15.4 billion for the department, nearly $173 million less than in fiscal 1995 spending but nearly $650 million more than the House had proposed" ("Energy Bill Spreads Cuts Evenly," *CQ Almanac 1995*, 51st ed., 11-34-11-39. Washington, DC: Congressional Quarterly, 1996)
- "The [House] bill recommended $14.8 billion for the Energy Department, down more than $800 million from fiscal 1995 spending. The bulk of the reductions came from [R&D] for alternative fuels. The bill proposed to reduce funding for research into solar and renewable energy from $388 million in fiscal 1995 to $202 million. A handful of programs were to be eliminated, including research on water-generated power, international solar research, and solar building research. Dan Schaefer, R-Colo., chairman of the Commerce Subcommittee on Energy and Power, which was responsible for oversight of the Energy Department, criticized the research cuts, saying they could lead to the programs' elimination in the future. 'I think it makes no sense to discontinue the development of renewables,' said Schaefer. 'Anybody with any brains at all has to know that the days of fossil fuel are numbered'... Although GOP freshmen had unveiled a proposal on June 8 to eliminate the Energy Department over three years, they decided to hold their fire because they had not had enough time to work out the details of what to do with programs that should move to other agencies." (Ibid)
- "A major reason why Energy fared better in the Senate was the fact that Subcommittee Chairman Pete V. Domenici, R-N.M., was given much more breathing room

in drawing up his bill than was his House counterpart. When the Senate Appropriations Committee allocated spending, Domenici's subcommittee got $20.2 billion to work with; the House subcommittee had an $18.7 billion cap. Moreover, the Energy Department had a number of well-placed allies in the Senate. Domenici had long been protective of the Sandia and Los Alamos national laboratories run by the department in his home state. Appropriations Chairman Mark O. Hatfield, R-Ore., had taken a strong interest in Energy Department spending on cleaning up the nuclear waste from Cold War weapons production" (Ibid)

- "Today I have signed into law H.R. 1905, the "Energy and Water Development Appropriations Act, 1996... While the bill does not fully fund my budget requests in a number of programs, the bill provides important funding for many major programs in these agencies. The bill provides $6.1 billion for a critical environmental mission to continue working cooperatively with States and all other interested stakeholders to clean up the Department's former weapons production facilities. The bill also fully funds my request for the Department of Energy's Stockpile Stewardship and Management program, assuring the safety and reliability of the nuclear weapons stockpile without nuclear testing. In addition, the bill provides full funding for one of my key science initiatives to enhance the operation and availability of the Department of Energy's science facilities, giving more researchers access to these facilities to conduct more basic and applied research. This is a modest investment that will leverage a significant return from the scientific community." William J. Clinton, Statement on Signing the Energy and Water Development Appropriations Act, 1996, November 13, 1995 (*The American Presidency Project*, by Gerhard Peters and John T. Woolley, https://www.presidency.ucsb.edu/node/220776)

Energy R&D Appropriations for FY1997

Primary Bill: Energy and Water Development Appropriations Act, 1997

Public Law: 104-206 **Enacted:** September 30, 1996 **Effective:** October 1, 1996

Secondary: Omnibus Consolidated Appropriations Act, 1997; Department of the Interior and Related Agencies Appropriations Act, 1997

Public Law: 104-208 **Enacted:** September 30, 1996 **Effective:** October 1, 1996

Function	Nominal change		Real change		Classification
	Millions ($)	YOY%	Millions ($2012)	YOY%	
Nondefense	-$128.0	-2.8%	-$216.7	-3.8%	Exogenous

Congress again appropriated significant decreases in both nominal and real funding for DOE's nondefense energy R&D functions for FY1997, while atomic energy defense R&D programs again saw an increase in nominal funding but a less significant increase in real terms. President Clinton's FY1997 budget request continued to prioritize cutting spending and turning budget deficits into surpluses while protecting and promoting long-term investments in science and technology, but threading that needle was proving increasingly difficult. The Clinton administration remained at loggerheads with the House Republican majority on a myriad of policy issues, including federal funding for solar and renewable energy research, which conservative members of Congress were intent on cutting. The House Appropriations Committee approved more funding than requested for atomic energy defense activities—the Clinton administration was trying to finish negotiation in the CTBT and more interested in

safely maintaining existing stockpiles than developing new weapons—and significantly less for applied research and other energy supply R&D programs than requested. The Senate Appropriations Committee had also grown frustrated once more with DOE's management and administration and wanted to reduce employment at the agency, although Senate Energy and Water Development Appropriations Subcommittee Chair Pete V. Domenici (R-NM) continued to advocate for DOE's basic and applied and managed to restore some funding cut by their House counterparts. On signing the conference bill, President Clinton expressed frustration that the appropriators had approved more funds for nuclear weapons activities than requested while cutting requested funding for solar and renewable energy, undermining objectives regarding climate change and the environment. The reduced nondefense energy R&D funding levels appear to have been largely motivated by broader concerns about long-run fiscal sustainability and partisan budget fights, and unrelated to any concerns about inflation, unemployment, or other short-run macroeconomic prerogatives. As such, we classify this policy change as exogenous. Most pertinent narrative evidence:

- "There is now broad bipartisan agreement that permanent deficit spending must come to an end. I compliment the Republican leadership and the membership for the energy and determination you have brought to this task of balancing the budget. And I thank the Democrats for passing the largest deficit reduction plan in history in 1993, which has already cut the deficit nearly in half in 3 years." William J. Clinton, State of the Union Address, January 23, 1996 (*The American Presidency Project*, by Gerhard Peters and John T. Woolley, https://www.presidency.ucsb.edu/node/223046)
- "The START II treaty with Russia will cut our nuclear stockpiles by another 25 percent. I urge the Senate to ratify it now. We must end the race to create new nuclear weapons by signing a truly comprehensive nuclear test ban treaty this year." (Ibid)
- "The 1997 Budget, which I am transmitting to you with this message, builds on our strong economic record by balancing the budget in seven years while continuing to invest in the American people. The budget cuts unnecessary and lower-priority spending... I am committed to finishing the job that we began in 1993 and finally bringing the budget into balance. In our negotiations with congressional leaders, we have made great progress toward reaching an agreement... My budget does that... it cuts deeply into discretionary spending. But while cutting overall discretionary spending, my budget invests in education and training, the environment, science and technology, law enforcement, and other priorities to help build a brighter future for all Americans." (Budget Message of the President, FY1997, March 1996, pp. 3-4)
- "The budget proposes $10.9 billion for DOE spending on defense activities, a $230 million increase from the 1996 enacted level. Funding for stewardship and management of the nuclear weapons stockpile would rise by $250 million, to $3.7 billion, reflecting the President's commitment to provide sufficient funding for this program next year and over the next decade. The increase is designed to help maintain the safety and reliability of the nuclear weapons stockpile under a comprehensive test ban treaty, which the Administration hopes to complete and sign in 1996." (Budget of the United States, FY1997, p. 50)
- "The budget funds DOE solar and renewable energy activities at $363 million, 32 percent above 1996. This funding continues the Administration's strong support for [R&D] to reduce manufacturing costs in photovoltaics and solar thermal technologies, promote wind power, and spur a wider use of biofuels... The budget proposes increases for research on technologies that use natural gas and electricity more efficiently; new

manufacturing processes that offer higher productivity as well as lower energy and environmental costs; and innovative transportation and energy conversion processes. The budget proposes $548 million, $131 million more than in 1996... DOE continues to support basic research and experimentation in plasma and fusion sciences, with the long-term goal of harnessing fusion as a viable energy source. The budget proposes $264 million, roughly an eight percent increase over 1996, and provides for increased basic research activities" (Ibid, pp. 92, 100)

- "With the Energy and Water Development Appropriations Bill, 1997, the [House Appropriations] Committee continues to deliver on its commitment to effect substantial cost savings, structural deficit reduction, and significant governmental reforms. At $19.4 billion in new budget authority, new spending in the bill is more than $1 billion below that of the Energy and Water Development Bill passed by Congress just two years ago. Because the Committee has made the substantial investments necessary to protect, improve and reconfigure our atomic energy defense infrastructure, savings in domestic discretionary programs are particularly pronounced. Total funding for these programs has been reduced by over sixteen percent in just two years. Furthermore, the Committee has achieved these savings without gimmicks, accounting tricks or one-time devices" (H. Rpt. 104-679, July 16, 1996, p. 4)
- "Five years ago, in fiscal year 1991, the appropriation for solar and renewable energy programs was $196,437,000. Just four years later, in fiscal year 1995, $388,108,000 was appropriated, representing a 98% increase. Last year, Congress passed, and the President approved, $275,213,000 for solar and renewable energy, a 29% reduction from fiscal year 1995. Last year's reduction was consistent with the effort to reverse the unsustainable increases of prior years and to direct scarce resources to basic research rather than technology development. This year, the Committee continues this direction with a 16% reduction from the fiscal year 1996 level" (Ibid, p. 77)
- "As was the case with the Committee's recommendation for fiscal year 1996, funding recommendations for Department of Energy programs in fiscal year 1997 are significantly below the Department's fiscal year 1997 budget request in many areas. Because this trend can be expected to continue, the Department should not delay efforts to reduce the scope of certain programs and the number of Federal employees at headquarters and in the field. Any delay, as occurred in fiscal year 1996, will simply increase reductions that will have to be made at a later date... The Department's missions in energy supply and research, the environment, and national security are compelling and justify a significant Federal commitment. Unfortunately, the Department's system of administration has increased costs and reduced output. If this trend is not reversed it will seriously jeopardize the future of the Department and may lead to its replacement with an organization better suited to the management of the Department's resources" (S. Rpt. 104-320, July 16, 1996, p. 83)
- "The [House] bill included $2.6 billion for energy research, about $80 million less than in fiscal 1996. The Clinton administration requested $3 billion. House appropriators strove to protect spending for so-called basic or pure science, which financed cutting-edge research at national laboratories and universities... they focused the proposed cuts on applied research, which more directly benefited the private sector—money that some Republicans derided as "corporate welfare." The bill included about $220 million for solar and renewable energy programs, compared with $363 million requested by the administration. The programs conducted research into the development of photovoltaic

systems, biofuels, wind, and geothermal energy. Appropriators eliminated funding for research into wind energy, which had received $33 million in fiscal 1996. For nuclear energy programs, the House included $183 million. For the Energy Department's restructured nuclear fusion program, the House provided $225 million, compared with the $256 million requested" ("Energy Bill Boosts Weapons Funding," *CQ Almanac 1996*, 52nd ed., 10-42-10-47. Washington, DC: Congressional Quarterly, 1997)

- "Senate appropriators approved $2.75 billion in overall spending for energy [R&D] programs, close to the fiscal 1996 level. Within that total, they agreed to fully fund the administration's $654 million request for basic science and research, while providing $247 million for solar and renewable energy programs, $116 million less than requested. The Senate was more generous than the House in funding nuclear energy programs, proposing $230 million, $47 million more than the House. For the Energy Department's restructured nuclear fusion program, the Senate proposed $240 million, compared with $225 million in the House bill. 'We have done our best to protect the basic science and research capabilities of the Department of Energy,' Domenici said. 'While we have reduced popular programs, such as solar and renewables, we have held the line for high-energy physics, nuclear physics, biological and environmental research'" (Ibid)
- "House and Senate conferees agreed on a final $20.4 billion version of the bill Sept. 11 (H Rept 104–782). Differences over spending and priorities had made it impossible to reach a compromise before the August recess. In the end, however, House conferees yielded to their more generous Senate counterparts on virtually every front. House members added $423 million to their original nuclear weapons funding, $63 million for energy [R&D], and $20 million for the Energy Department's administrative costs. The House agreed to $3.9 billion—close to the Senate level—for nuclear weapons activities, the category most dear to Domenici." (Ibid)
- "Today I have signed into law H.R. 3816, the "Energy and Water Development Appropriations Act, 1997... The Act provides $11.4 billion for atomic energy defense programs, $0.3 billion above my request. I am disappointed that Congress has funded unrequested increases for nuclear weapons management and related programs while curtailing investments in important civilian activities. Nevertheless, I am pleased that the Act will provide for a significantly enhanced Science-Based Stockpile Stewardship and Management program that will continue DOE's strong commitment to ensuring the safety and reliability of the nuclear weapons stockpile... I am disappointed that the Act cuts $93 million from my request for solar and renewable energy research programs. Investments in the development of advanced renewable energy technologies, which have a large potential export market, will create new jobs and reduce pollution, thereby addressing climate change and protecting human health and the environment" William J. Clinton, Statement on Signing the Energy and Water Development Appropriations Act, 1997, September 30, 1996 (*The American Presidency Project*, by Gerhard Peters and John T. Woolley, https://www.presidency.ucsb.edu/node/221652)

Energy R&D Appropriations for FY1998

Primary Bill: Energy and Water Development Appropriations Act, 1998

Public Law: 105-62 **Enacted:** October 13, 1997 **Effective:** October 13, 1997

Secondary: Department of the Interior and Related Agencies Appropriations Act, 1998

Public Law: 105-83 **Enacted:** November 14, 1997 **Effective:** November 14, 1997

Function	Nominal change		Real change		Classification
	Millions ($)	YOY%	Millions ($2012)	YOY%	
Defense	$189.0	8.1%	$209.1	7.0%	Exogenous
Nondefense	-$509.0	-11.6%	-$675.7	-12.4%	Exogenous

Congress appropriated significant increases in nominal and real funding for DOE's atomic energy defense R&D programs in FY1998, while once again cutting nominal and real funding for their nondefense energy R&D functions. The Clinton administration was trying to secure Senate ratification of the CTBT and, to garner support, proposed increased funding for the nuclear stockpile stewardship and management programs, including funding for computer modeling and simulated testing without actual weapons tests. And Senate Energy and Water Development Appropriations Subcommittee Chair Pete V. Domenici (R-NM) again successfully advocated for more nuclear weapons funding, benefiting the Sandia and Los Alamos national labs in his home state. The administration remained focused on deficit reduction, proposing an FY1998 budget that would hit balance in FY2002, and House Republicans were only too happy to oblige when it came to cutting DOE's nondefense energy R&D programs; the House Appropriations Committee framed their FY1998 bill as "another installment payment on the national obligation to balance the budget," and accused DOE of "mission creep and management disorder" in justifying budget cuts to the agency's applied energy research programs. The changes in defense and nondefense energy R&D funding levels appear to have been largely motivated by concerns about long-run fiscal sustainability, partisan budget fights, and securing support for nonproliferation treaties, and unrelated to any concerns about inflation, unemployment, or other short-run macroeconomic prerogatives. As such, we classify these policy changes as exogenous. Most pertinent narrative evidence:

- "In two days I will propose a detailed plan to balance the budget by 2002... To prepare America for the 21st century, we must harness the powerful forces of science and technology to benefit all Americans. This is the first State of the Union carried live in video over the Internet... We must build the second generation of the Internet so that our leading universities and national laboratories can communicate in speeds 1,000 times faster than today, to develop new medical treatments, new sources of energy, and new ways of working together." William J. Clinton, State of the Union Address, February 4, 1997 (*The American Presidency Project*, by Gerhard Peters and John T. Woolley, https://www.presidency.ucsb.edu/node/223396)
- "In the past four years, we agreed to ban—we led the way to a worldwide agreement to ban nuclear testing. With Russia, we dramatically cut nuclear arsenals, and we stopped targeting each other's citizens." (Ibid)
- "My budget reaches balance in 2002 the right way—cutting unnecessary and lower priority spending while protecting our values... It invests in education and training, the environment, science and technology, and law enforcement to raise living standards and the quality of life for average Americans... I am proposing the funds to speed up toxic waste clean-ups, to redevelop abandoned and contaminated sites known as 'brownfields,' to improve the facilities at our national parks, to advance our salmon recovery efforts, to invest in energy efficiency and renewable energy... we must maintain our leadership in research, the results of which have so greatly improved our health and well-being" (Budget Message of the President, FY1998, pp. 3, 5).

- "The budget proposes $688 million for energy conservation and efficiency programs, and $330 million for solar and renewable energy programs, increases of 25 percent and 22 percent, respectively. These Energy Department (DOE) programs reduce greenhouse gases and other pollutants by increasing energy efficiency and expanding the use of non-fossil-based energy sources" (Budget of the United States, FY1998, p. 75)
- "The President's commitment to a Comprehensive Test Ban Treaty (CTBT) is closely linked to the Administration's plan to maintain the safety and reliability of the nuclear weapons stockpile through scientific experiments and computer modeling (i.e., no explosive testing of nuclear weapons). The budget proposes $1.4 billion for Stockpile Stewardship activities in 1998, plus $1.3 billion for related construction projects. Among these projects, $900 million would go to build the National Ignition Facility at the Lawrence Livermore National Laboratory. The President, who plans to submit the CTBT for Senate ratification in 1997, also is committed to funding a comprehensive R&D program over the next decade to improve treaty monitoring capabilities and operations." (Ibid, p. 82)
- "The [House] Energy and Water Development Appropriations Bill, 1998, represents another installment payment on the national obligation to balance the budget. At the same time, the bill advances initiatives to make government more efficient, and it preserves funding for important domestic priorities. As funding in the Energy and Water Bill declines in fiscal year 1998 relative to CBO's baseline, the bill continues to deliver on the promise of deficit reduction... Unfortunately, the counterweight to the budget's inattention to water resource needs is the unjustifiably high priority it accords to the Department of Energy, a sprawling bureaucratic enterprise whose present activities bear faint relation to the mission the Department was created to pursue. The Department, characterized by continuing mission creep and management disorder, lacks a clear focus and invests far too much of its limited resources in a relevance-seeking and turf-protecting effort to perpetuate itself" (H. Rpt. 105-190, July 21, 1997, pp. 4-5)
- "Senate appropriators agreed to a total of $11.8 billion for defense-related nuclear activities, up from $11.3 billion the previous year. Domenici said that still fell short of the amount needed to ensure the safety and reliability of the nuclear arsenal. Of the $11.8 billion, $4.3 billion was designated for nuclear weapons research, development, and production, an increase of $300 million above Clinton's request and about $390 million more than was provided in fiscal 1997. Nuclear stockpile stewardship programs, the primary source of funds for nuclear weapons research, accounted for about $1.3 billion of that. Nuclear stockpile management, which paid for nuclear weapons production, was slated to receive $1.9 billion. The $4.3 billion exceeded the annual average during the Cold War by $600 million, according to the Brookings Institution's Nuclear Weapons Cost Study Project. Much of the money was directed to the two nuclear weapons laboratories in New Mexico..." ("Water, Weapons Get More Funds," CQ Almanac 1997, 53rd ed., 9-31-9-36. Washington, DC: Congressional Quarterly, 1998)
- "Conferees allocated $4.1 billion of the Energy Department money for core nuclear weapons research, development and production activities. That was $203 million more than the House figure, but $156 million less than approved by the Senate. Domenici accepted the lower figure only after private negotiations with the White House, where administration officials promised to request $4.5 billion for nuclear weapons activities

in fiscal 1999... Conferees also split the difference on the Energy Department's energy supply, [R&D] accounts, allocating $907 million, more than the House's $881 million and less than the Senate's $954 million. The accounts covered programs for solar and renewable energy; nuclear energy; fusion energy; and environment, safety, and health programs. Solar and renewable energy, once a bête noire for budget hawks, received $346 million under the conference agreement, up from the House's $329 million allotment, the Senate's $301 million, and even the Clinton administration's request for $345 million." (Ibid)

- "I have today signed into law H.R. 2203, the "Energy and Water Development Appropriations Act, 1998," which provides $20.7 billion in discretionary budget authority... The Act provides necessary funding to continue DOE's commitment to ensuring the safety and reliability of the nuclear weapons stockpile and DOE's investment in developing advanced renewable energy technologies. The Act also provides essential funding to develop and protect the Nation's environmental resources." William J. Clinton, Statement on Signing the Energy and Water Development Appropriations Act, 1998, October 13, 1997 (*The American Presidency Project*, by Gerhard Peters and John T. Woolley, https://www.presidency.ucsb.edu/node/223553)

Energy R&D Appropriations for FY1999

Primary Bill: Energy and Water Development Appropriations Act, 1999

Public Law: 105-245 **Enacted:** October 7, 1998 **Effective:** October 7, 1998

Secondary: Omnibus Consolidated and Emergency Supplemental Appropriations Act, 1999; Department of the Interior and Related Agencies Appropriations Act, 1999

Public Law: 105–277 **Enacted:** October 21, 1998 **Effective:** October 21, 1998

Function	Nominal change		Real change		Classification
	Millions ($)	YOY%	Millions ($2012)	YOY%	
Defense	$240.0	9.5%	$241.0	7.5%	Exogenous
Nondefense	$381.0	9.9%	$392.8	8.2%	Exogenous

Congress appropriated significant increases in nominal and real funding for both DOE's atomic energy defense R&D and nondefense R&D functions for FY1999. The Clinton administration was increasingly concerned about climate change and global warming and was keen to help maintain U.S. leadership in wind energy technologies, and again proposed large increases in federal funding for solar and renewable energy R&D; these requests were made in the broader context of Research Fund for America, which proposed substantial increases for long-term investments in basic and applied research funded by DOE, NIH, and NSF. The House Appropriations Committee maintained their staunch opposition to increasing funding for solar and other renewable energy development programs, paring back funding relative to the administration's request, as Clinton bemoaned in his signing statement for the bill; nonetheless, nondefense energy R&D funding was increased for the year, with particular emphasis on basic physical and biological sciences research. The Senate Appropriations Committee continued to push for higher funding for atomic energy defense R&D programs, along with "defense-related environmental management." The changes in defense and nondefense energy R&D funding levels appear to have been largely motivated by increasing concerns about global warming, easing concerns about long-run deficit reduction, and powerful political constituencies favoring nuclear weapons programs, and unrelated to any

concerns about inflation, unemployment, or other short-run macroeconomic prerogatives. As such, we classify these policy events as exogenous. Most pertinent narrative evidence:

- "Our overriding environmental challenge tonight is the worldwide problem of climate change, global warming, the gathering crisis that requires worldwide action. The vast majority of scientists have concluded unequivocally that if we don't reduce the emission of greenhouse gases, at some point in the next century, we'll disrupt our climate and put our children and grandchildren at risk. This past December, America led the world to reach a historic agreement committing our Nation to reduce greenhouse gas emissions through market forces, new technologies, and energy efficiency. We have it in our power to act right here, right now. I propose $6 billion in tax cuts and [R&D] to encourage innovation, renewable energy, fuel-efficient cars, energy-efficient homes." William J. Clinton, State of the Union Address, January 27, 1998 (*The American Presidency Project*, by Gerhard Peters and John T. Woolley, https://www.presidency.ucsb.edu/node/226032)
- "Last year was a remarkable one for the environment, and I am determined to build on our progress. Led by the Vice President, the Administration reached a historic international agreement in Kyoto that calls for cuts in greenhouse gas emissions... My budget also includes a new, five-year, $6 billion program to prevent global warming, and more resources to protect endangered species, control pollution, and preserve the global environment." (Budget Message of the President, FY1999, pp. 5-6)
- "The budget proposes a Research Fund for America—reflecting the President's commitment to ensuring long-term stability and growth for non-defense research programs—that will support a wide range of Federal science and technology activities. The budget proposes $31 billion for the Fund, representing an eight-percent increase for these programs over the 1998 level and a 32-percent increase by 2003... The budget proposes $17 billion for basic research and $16.4 billion for applied research— increases of $1.2 billion and $848 million, respectively, over 1998. These investments, which include increases of nine percent for NIH, 11 percent for NSF, and 11 percent for DOE, reflect the Administration's commitment to obtaining knowledge that will provide future economic and social benefits and improve our ability to meet economic needs without adversely affecting health and the environment" (Budget of the United States, FY1999, pp. 94, 98)
- "Solar and renewable energy programs, for which the budget proposes $372 million, focus on technologies that will help the Nation use its abundant renewable resources such as wind, solar, and biomass to produce low-cost, clean energy that contributes no net carbon dioxide to the atmosphere. The United States is the world's technology leader in wind energy, with a growing export market... In addition, photovoltaics are becoming more useful in remote power applications, and construction is beginning on the first large-scale facilities to produce ethanol from cellulosic agricultural waste." (Ibid, pp. 168-169)
- "Funding recommendations for Department of Energy programs in fiscal year 1999 are significantly below the Department's fiscal year 1999 budget request but are generally consistent with the fiscal year 1998 funding levels. The Administration's proposed budget requests for [DOE] continue to be unrealistically high, resulting in much-wasted effort by the Department in preparing these inflated budgets and the [House Appropriations] Committee in reviewing them" (H. Rpt. 105-581, June 16, 1998, p. 77)

- "While the [House] Committee has eliminated many Department of Energy programs and substantially reduced funding for others, the Committee has provided generous increases for physics programs and other basic research activities funded under this account. The Committee has taken extraordinary steps to provide the increases included in this recommendation. This year, the Committee was forced to reduce net funding for domestic programs by over four hundred million dollars... Nevertheless, the Committee continues its strong support for basic [R&D] activities funded in this account" (Ibid, p. 93)
- "The [Senate Appropriations] Committee has modified the request for low emission energy technologies; including solar and renewable and nuclear, with the view toward post-2010 application of new technologies. As a result, with few exceptions, the Committee recommends basic research that will provide significant improvements over existing technologies rather than on the deployment or incremental improvement of commercial or near commercial technologies" (S. Rpt. 105-206, June 5, 1998, p. 94)
- "Weapons activities support the Nation's national security mission of nuclear deterrence by preserving nuclear weapons technology and competence in the laboratories and maintaining the reliability and safety of the weapons in the enduring nuclear stockpile... In the past, confidence in the nuclear weapons stockpile was assured through a combination of underground nuclear and laboratory testing. Since October 1992 the United States has maintained a moratorium on underground nuclear testing and has explored other means to assure confidence in the safety, reliability, and performance of nuclear weapons... The [Senate] Committee has serious concerns that projected budget profiles for Defense missions of the Nation are insufficient to sustain the important stockpile stewardship and management initiatives of DOE... With programs constrained by budget ceilings, aggressive management at all levels is mandatory. The Committee is aware of instances at DOE laboratories where projects have not been well defined and there has been a lack of management attention. This situation has resulted in scope creep, extended project completion schedules, and cost growth far in excess of what is acceptable. If the capability of the national laboratories to provide the certification, required by the President, is to be maintained under a severely restricted budget environment, it is mandatory that DOE and the national laboratories take whatever steps are necessary to ensure the proper focus. It is essential that critical, centerpiece missions not be impacted because of poor management attention. The Committee's recommendation for weapons activities is $4,445,700,000, a decrease of $54,300,000 below the budget request for fiscal year 1999 [and an increase of $299 million relative to FY1998]" (Ibid, p. 103)
- "In spite of tight budget caps from the 1997 balanced-budget agreement (PL 105-33), lawmakers still found a way to allocate money to their favorite programs—water projects popular in the House, as well as nuclear weapons programs dear to the Senate... Atomic energy defense programs of the Energy Department, meanwhile, received appropriations of $11.9 billion—nearly 60 percent of the bill's total funding. About $5.6 billion of that was for defense-related environmental management. The bill provided a total of $727 million for energy supply programs, including solar and renewable energy, nuclear energy, fusion energy, and environment, safety, and health programs. The measure also appropriated $2.7 billion for Energy Department research programs, $212 million more than requested" ("Energy-Water Spending Bill Not Last Word in Dispute Over Funding the Tennessee Valley Authority (TVA)," *CQ Almanac 1998*,

54th ed., 2-36-2-44. Washington, DC: Congressional Quarterly, 1999)

- "Alternative energy research is a cornerstone of the administration's effort to reduce the effects of global warming. Many scientists contend that an increasing buildup of carbon dioxide and other greenhouse gases in the atmosphere is causing the Earth to warm. Greenhouse gases are produced by fossil fuels such as oil, gas, and coal. The development of alternative power sources, such as solar and wind, could help slow their production, according to the administration... In the Senate, cutting renewable energy research was opposed by a coalition led by James M. Jeffords, R-Vt., who contended that energy research is crucial to developing alternatives to fossil fuels and breaking the nation's dependence on foreign oil." (Ibid)
- "Today I have signed into law H.R. 4060, the "Energy and Water Development Appropriations Act, 1999," which provides $20.8 billion in discretionary budget authority for the programs of the Department of Energy (DOE)... The Act provides necessary funding to maintain my Administration's commitment to ensuring the safety and reliability of our Nation's nuclear weapons stockpile without nuclear testing. It also supports DOE's basic science programs... I am disappointed that the Congress did not include my funding request for valuable [R&D] investments in renewable energy sources, and I will work with the Congress to explore options for funding these important investments" William J. Clinton, Statement on Signing the Energy and Water Development Appropriations Act, 1999, October 7, 1998 (*The American Presidency Project*, by Gerhard Peters and John T. Woolley, https://www.presidency.ucsb.edu/node/224819)

Energy R&D Appropriations for FY2001

Primary Bill: Departments of Veterans Affairs and Housing and Urban Development, and Independent Agencies Appropriations Act, 2001

Public Law: 106-377 **Enacted:** October 27, 2000 **Effective:** October 27, 2000

Secondary: Department of the Interior and Related Agencies Appropriations Act, 2001

Public Law: 106-291 **Enacted:** October 11, 2000 **Effective:** October 11, 2000

Function	Nominal change		Real change		Classification
	Millions ($)	YOY%	Millions ($2012)	YOY%	
Defense	$745.0	25.7%	$843.5	24.1%	Exogenous
Nondefense	$488.0	11.3%	$488.0	9.5%	Exogenous

Congress appropriated significant increases in nominal and real funding for both the atomic energy defense R&D and nondefense R&D functions of DOE for FY2001. The Clinton administration was increasingly concerned about climate change and global warming, and again proposed large increases in federal funding for solar and renewable energy R&D. The administration also proposed significant funding increases for DOE's science programs under the broader umbrella of their 21st Century Research Fund, principally for DOE, NASA, NIH, and NSF. In keeping with the budget dynamics of recent years, the House Appropriations Committee, citing "severe funding constraints," approved substantially less funding than the administration's request, particularly for nondefense energy supply R&D programs. But Senate Appropriations subcommittee chairman Pete V. Domenici (R-NM) again proved effective in steering funding toward the atomic energy defense programs, which saw an increase in funding well above that requested by the agency, again benefiting the

Sandia and Los Alamos national labs in his home state. Senator Harry Reid (D-NV), the ranking Democrat on the subcommittee, successfully fought to ensure that the administration's requested increase in funding for solar and renewable energy R&D programs was met, despite decreases in many areas of nondefense discretionary spending. The changes in defense and nondefense energy R&D funding levels appear to have been largely motivated by growing concerns about global warming, easing concerns about long-run deficit reduction, and powerful political constituencies favoring nuclear weapons programs, and unrelated to any concerns about inflation, unemployment, or other short-run macroeconomic prerogatives. As such, we classify these policy events as exogenous. Most pertinent narrative evidence:

- "We will reverse the course of climate change and leave a safer, cleaner planet. America will lead the world toward shared peace and prosperity and the far frontiers of science and technology... The greatest environmental challenge of the new century is global warming... Many people in the United States, some people in this Chamber, and lots of folks around the world still believe you cannot cut greenhouse gas emissions without slowing economic growth. In the industrial age, that may well have been true. But in this digital economy, it is not true anymore. New technologies make it possible to cut harmful emissions and provide even more growth... To accelerate the march of discovery across all these disciplines in science and technology, I ask you to support my recommendation of an unprecedented $3 billion in the 21st-century research fund, the largest increase in civilian research in a generation. We owe it to our future" William J. Clinton, State of the Union Address, January 27, 2000 (*The American Presidency Project*, by Gerhard Peters and John T. Woolley, https://www.presidency.ucsb.edu/node/227524)
- "The budget proposes $1.6 billion for the third year of this effort to promote energy efficiency, develop low-carbon energy sources, and demonstrate technologies to reduce greenhouse gas emissions. Of the amount proposed, $1.4 billion is for R&D on energy efficiency and renewable energy technologies, carbon sequestration, extension of the useful life of existing nuclear plants, and development of highly efficient fossil fuel technologies." (Budget of the United States, FY2001, p. 102)
- "The budget provides $3.15 billion, a 13-percent increase over 2000, for DOE's research programs in physics, chemistry, biology, materials, environmental, and computer sciences. The budget provides for the construction of new scientific facilities, including the Spallation Neutron Source and the Large Hadron Collider... During this Administration, DOE-funded research has produced more than 5,000 new Ph.D. scientists. In 1995, researchers at Fermilab announced their discovery of the top quark, the last fundamental particle to be discovered. In the last seven years, 10 scientists have won Nobel Prizes in Chemistry or Physics for their DOE-supported research. In 2001, the budget will further strengthen the DOE research community by increasing support for research in materials science, the life sciences, and computational sciences, along with increased support for the scientific user facilities that serve the entire community supported by the 21st Century Research Fund." (Ibid, pp. 103-104)
- "America must continue to lead against the spread of weapons of mass destruction. The Comprehensive Nuclear Test Ban Treaty (CTBT) remains an important element of the global nuclear nonproliferation regime. The Administration is committed to working to create the conditions for a successful vote to approve the CTBT in the

Senate at the earliest possible date. We will continue to adhere to our long-standing moratorium on nuclear tests and urge other Nations to do the same." (Ibid, p. 142)

- "In October 1999, Congress reorganized DOE, creating the [NNSA] to administer the Department's national security functions. The budget adopts a new account structure to reflect this reorganization. However, much work remains to transfer specific projects, programs, and assets to the new NNSA, and the Administration will continue to work on this implementation and will inform the public and Congress of progress in this area in accordance with the 2000 National Defense Authorization Act." (Ibid, p. 153)
- "Due to severe funding constraints, [the House's] funding recommendations for many of the Department of Energy programs in fiscal year 2001 are significantly below the Department's fiscal year 2001 budget request" (H. Rpt. 106-693, June 23, 2000, p. 83)
- "The [Senate] Committee recommendation provides $444,117,000, for renewable energy resources, an increase of $81,877,000 over the current year appropriation. The Committee is unable to draw conclusions regarding the full extent or effects of global climate change. However, in the face of uncertainty regarding global climate change and the human health effects of atmospheric pollution, prudence merits consideration be given to energy production technologies that reduce the emission of pollutants that accumulate in the atmosphere" (S. Rpt. 106-395, August 30, 2000, pp. 101-102)
- "Severely constrained spending limits for fiscal year 2001 have forced the Committee into very difficult decisions regarding many otherwise outstanding programs and initiatives under the Office of Science. In order to adhere to the subcommittee's allocation, address critical ongoing [R&D] efforts, and balance congressional priorities with those of the administration, the Committee regrets that it is not able to recommend many of the substantial increases requested for programs, and in some cases, had to cut programs below current year levels. Furthermore, the Committee regrets that it cannot recommend funding for many worthwhile new initiatives... Due to severe budget restraints, the Committee recommendation provides $677,030,000 for high energy physics, a reduction of $30,860,000 from the current year" (Ibid, p. 111)
- "Democrats and Republicans alike expressed unhappiness over the [House] bill's tight spending constraints... The Energy Department would receive $17.3 billion—$687 million more than fiscal year 2000, but $853 million less than requested. The department's atomic energy defense programs would be funded at $12.8 billion, an increase of $850 million, but $190 million less than Clinton sought... The Clinton administration has criticized the House version for significantly reducing programs in science, energy research and other areas but has not threatened a veto." ("Congress Rewrites Energy-Water Bill After Missouri River Dispute Draws Veto," *CQ Almanac 2000*, 56th ed., 2-59-2-69. Washington, DC: Congressional Quarterly, 2001)
- "As he has done in previous years, Domenici included hefty increases in the department's stockpile stewardship program, which uses computers to assess the reliability and safety of nuclear weapons without actual explosions. Much of the work is conducted at the Los Alamos and Sandia National Laboratories in Domenici's home state... Despite the proposed reductions in non-defense spending, the Senate bill would not cut solar and renewable energy programs. At the behest of Nevada's Harry Reid, the subcommittee's ranking Democrat, the bill would increase funding for those programs from $360 million this year to $445 million... 'Clean, renewable energy sources such as the sun, wind, biomass and geothermal heat are healthy alternatives to America's debilitating reliance on fossil fuels,' Reid said" (Ibid)

- "As in previous years, the energy and water bill bore Domenici's imprint with billions of dollars for various Energy Department programs in his state. The conference agreement includes $5 billion for the department's nuclear weapons activities, a $376 million increase over Clinton's request. That money finances the department's stockpile stewardship program, which assesses the safety and reliability of warheads without conducting explosive tests." (Ibid)

Energy R&D Appropriations for FY2004

Bill: Energy and Water Development Appropriations Act, 2004

Public Law: 108-137 **Enacted:** December 1, 2003 **Effective:** December 1, 2003

Function	Nominal change		Real change		Classification
	Millions ($)	YOY%	Millions ($2012)	YOY%	
Defense	$381.0	9.6%	$345.9	7.3%	Exogenous
Nondefense	$396.0	7.7%	$361.4	6.1%	Exogenous

Congress appropriated significant increases in nominal and real funding for both the atomic energy defense R&D and nondefense R&D functions of DOE for FY2004. The administration was concerned about America's reliance on foreign oil imports and proposed substantial increases in clean and renewable energy R&D programs, particularly for hydrogen energy, in a step toward energy independence and environmental stewardship. The Bush administration also requested substantial increases in funding for nuclear weapons programs, in line with their recent Nuclear Posture Review and concerns that the U.S. nuclear weapons program had "atrophied." Senate Appropriations Subcommittee chairman Pete V. Domenici (R-NM) remained focused on increasing funding for the atomic energy defense programs, and his committee proposed even more funding than requested by the administration. House Appropriations subcommittee chairman David L. Hobson (R-OH) was more intent on funding nuclear waste disposal at Yucca Mountain, NM—recently designated as the national repository to secure waste from over 50 years of research, development, and production of nuclear weapons, naval reactor fuels, and other spent nuclear reactor fuel—and more skeptical of nuclear weapons funding. The House Appropriations Committee also approved substantially more funding for DOE's science programs than requested by the administration. The changes in defense and nondefense energy R&D funding levels appear to have been motivated by growing long-run concerns about energy independence and the environment, national security prerogatives, and powerful political constituencies favoring nuclear weapons programs, and unrelated to any concerns about inflation, unemployment, or other short-run macroeconomic prerogatives. As such, we classify these policy events as exogenous. Most pertinent narrative evidence:

- "Our third goal is to promote energy independence for our country while dramatically improving the environment. I have sent you a comprehensive energy plan to promote energy efficiency and conservation, to develop cleaner technology, and to produce more energy at home." George W. Bush, State of the Union Address, January 28, 2003 (*The American Presidency Project*, by Gerhard Peters and John T. Woolley, https://www.presidency.ucsb.edu/node/211931)
- "Americans import over 50 percent of their oil and are expected to import nearly 70 percent by 2025. If the nation is to liberate itself from dependence on imported oil, it must achieve scientific breakthroughs on alternative fuels and technologies. The most

promising long-term revolution in energy use is the expansion of hydrogen energy. Transportation accounts for 70 percent of total U.S. oil consumption. Widespread use of hydrogen fuel cell vehicles would reduce U.S. oil imports and increase energy independence... This budget proposes to spend over $1.5 billion on FreedomFuel and FreedomCAR over the next five years, including more than doubling DOE's spending on hydrogen [R&D] in 2004 alone. This funding will accelerate achieving the national energy security and environmental benefits from widespread use of hydrogen vehicles." (Budget of the United States, FY2004, p. 105)

- "DOE is charged with disposing of spent nuclear fuel from civilian nuclear power plants and high-level waste from the nation's defense activities. Commercial electric power generation, nuclear weapons production, the operation of naval reactors, and federal [R&D] activities over the past half century have produced spent nuclear fuel and high-level radioactive waste that have accumulated across the country at commercial reactor sites and storage facilities. For the past 20 years, DOE has investigated Yucca Mountain, Nevada, to determine whether it would be suitable for a geologic repository to dispose of those wastes. In February 2002, the President recommended Yucca Mountain to Congress as qualified for a construction permit application to the [NRC] as a nuclear waste repository. And in July 2002, the Congress approved that recommendation. The budget includes $591 million for the Department's radioactive waste program." (Ibid, p. 107)
- "In January 2002, the Administration released the second Nuclear Posture Review (NPR), which laid out the direction for America's nuclear forces over the next decade. The NPR noted that since the end of the Cold War, the nation's nuclear infrastructure had atrophied. Furthermore, an evolving security environment required a flexible and responsive weapons complex infrastructure. To address these concerns, the 2004 Budget reflects a significant increase over the 2003 Budget in the stockpile stewardship program. This increase, along with a multiyear plan supported by sustained, stable funding, will enable NNSA to fulfill the nation's needs for a safe, secure, reliable, and effective nuclear stockpile. The 2004 Budget proposes $6.4 billion for activities related to maintaining the nuclear weapons stockpile, $533 million above the 2003 Budget." (Ibid, p. 112)
- "The Science account funds the Department's work on high energy physics, nuclear physics, biological and environmental sciences, basic energy sciences, advanced scientific computing, maintenance of the laboratories' physical infrastructure, fusion energy sciences, safeguards and security, science workforce development, and science program direction. The Committee recommendation is $3,480,180,000, an increase of $169,245,000 compared to the budget" (H. Rpt. 108-212, July 16, 2003, p. 125)
- "Congress cleared a $27.3 billion fiscal 2004 energy and water spending bill Nov. 18. The measure... was stalled for most of the fall by conflicts over developing nuclear weapons and disposing of nuclear waste... The bill increased funding by $1.1 billion, or 4.3 percent, over fiscal 2003 and provided $382 million more than Bush requested. Sen. Pete V. Domenici, R-N.M., and Rep. David L. Hobson, R-Ohio—chairmen of the Senate and House Appropriations subcommittees on energy and water—differed significantly over where the extra money should be spent. In the end, they roughly split their differences. The final bill provided $6.3 billion for Energy Department nuclear weapons activities—a top priority for Domenici, whose state was home to two of the nation's principal nuclear weapons laboratories, Los Alamos and Sandia. Hobson, by

contrast, argued that hefty increases for nuclear weapons could not be justified in such a tight budget. The compromise figure was less than the Senate wanted but more than the House had passed. The bill included $580 million for Hobson's top priority, a national nuclear waste disposal facility at Yucca Mountain, Nev. The amount was roughly midway between the $765 million voted by the House and the $425 million endorsed in the Senate, where Minority Whip Harry Reid, D-Nev., opposed the project and sought to minimize the funding." ("Deal Reached on Energy-Water Bill," *CQ Almanac 2003*, 59th ed., 2-49-2-51. Washington, DC: Congressional Quarterly, 2004)

- "Of the $16.4 billion for defense activities, $6.3 billion was for nuclear weapons. It included $7.5 million, half what Bush wanted, to study a "robust nuclear earth penetrator," essentially a nuclear version of the "bunker buster" used by U.S. bombers to blow open caves and bunkers in places such as Afghanistan. It included $6 million, as requested, for research into other advanced nuclear weapons concepts such as low-yield "mini-nukes," which would be about five kilotons, one-third as powerful as the atomic bomb dropped on Hiroshima in 1945. Democratic critics said those projects would open the door for a new generation of nuclear weapons; the Bush administration and its supporters said the money was for research, not development. The repeal of a decade-old ban on such weapons (PL 103-160) was included in the defense authorization bill enacted Nov. 24 (PL 108-136)." (Ibid)
- "[The final bill included] $3.5 billion, 6 percent more than in fiscal 2003 and 4 percent above Bush's request, for research on nuclear physics, biological and environmental sciences, fusion and related fields... [and] $738 million for energy supply programs, including renewable energy resources and nuclear power. The amount was 6 percent above the fiscal 2003 level and only about 1 percent below Bush's request." (Ibid)

Energy R&D Appropriations for FY2006

Bill: Energy and Water Development Appropriations Act, 2006

Public Law: 109-103 **Enacted:** November 19, 2005 **Effective:** November 19, 2005

Function	Nominal change		Real change		Classification
	Millions ($)	YOY%	Millions ($2012)	YOY%	
Defense	-$140.0	-3.2%	-$261.1	-5.2%	Exogenous

Congress appropriated a significant decrease in nominal and real funding for DOE's atomic energy defense R&D programs for FY2006; funding for nondefense energy R&D programs were held roughly flat in nominal terms. The Bush administration had requested funds for R&D work on a controversial "bunker-buster" tactical nuclear weapon, which was feared because it might actually be used in combat, undermining arms control efforts and potentially risking nuclear escalation; the program was a sticking point between House and Senate, but the administration dropped the request late in the appropriations cycle. Another controversial part of the bill was funding for nuclear waste disposal and safekeeping at Yucca Mountain, Nevada, which was fiercely opposed by Senate Minority Leader Harry Reid (D-NV); the FY2006 bill appropriated only one-third of the requested funds for developing Yucca Mountain, which was to house waste from over 50 years of development and production of nuclear weapons as well as other spent nuclear fuel. The House Appropriations Committee cut back funding for the Directed Stockpile Activities, which funded nuclear weapons R&D among other programs, because it was waiting for the recently created

NNSA to develop a long-term plan for how to "maintain a safe secure and reliable nuclear deterrent with a much smaller stockpile," per recent commitments under the Strategic Offensive Reductions Treaty (SORT) with the Russian Federation. The conference bill ended up providing substantially less funding for atomic energy defense activities than the administration had initially requested for FY2006. The decrease in defense energy R&D funding appears to have been related to nonproliferation treaty commitments and skepticism regarding the development of tactical "bunker busting" nuclear weapons, and unrelated to any concerns about inflation, unemployment, or other short-run macroeconomic prerogatives; as such, we classify this policy event as exogenous. Most pertinent narrative evidence:

- "The long-term viability of nuclear power requires the Nation to provide environmentally sound management of nuclear waste. More than 20 years ago, Congress assigned DOE responsibility for disposing of the spent nuclear fuel generated by civilian nuclear power plants and the high-level waste generated over the past 50 years by defense activities of the U.S. military, the clean-up of World War II-era weapons plants, and the reduction of the Nation's nuclear arsenal... After carefully considering over 20 years of scientific research, in 2002, the President recommended, and Congress approved, the designation of a site at Yucca Mountain, Nevada for the safe storage and disposal of this waste in a mined geologic repository. Successful completion of a repository at Yucca Mountain will ensure that the Nation has a single underground facility, secure from potential terrorist threats, where nuclear waste is disposed in a manner that protects the environment and our citizens." (Budget of the United States, FY2006, p. 112)
- "The Nation's nuclear deterrent remains a critical component of our defense strategy. NNSA manages this asset to ensure that the Nation is capable of responding to whatever challenges it may be called upon to address. Since 1992 and the establishment of a moratorium on nuclear testing, DOE has maintained the safety, security, reliability, and effectiveness of the U.S. nuclear weapons stockpile through its science-based stockpile stewardship program. The program ensures the operational readiness of the Nation's nuclear weapons using science and technology to detect and predict problems in the stockpile. NNSA also relies on advanced engineering methods to develop and apply solutions to extend the life of aging warheads... The 2006 Budget of $6.6 billion for Weapons Activities strongly supports the science-based stockpile stewardship work that is the backbone of these programs. The 2006 funding levels will enable NNSA to fulfill the Nation's needs for a safe, secure, reliable, and effective nuclear force... The NNSA uses the unique capabilities of the National Laboratories and many years of experience managing international nonproliferation programs to detect, prevent, and reverse nuclear proliferation." (Ibid, pp. 117-118)
- "Directed Stockpile Work (DSW) includes all activities that directly support weapons in the nuclear stockpile, including maintenance, research, development, engineering, certification, and dismantlement and disposal activities... The Committee notes that the Directed Stockpile Work Life Extension activities are being reduced in anticipation of a revised out-year baseline plan from the NNSA that integrates all the elements of a long-term sustainable stockpile plan that supports the ability to maintain a safe secure and reliable nuclear deterrent with a much smaller stockpile... The Committee's recommendation for Directed Stockpile Activities is $1,283,682,000 a decrease of $137,349,000 from the budget request." (H. Rpt. 109-86, May 18, 2005, p. 131)
- "Most of the [bill's] funding—$24.3 billion—was for Energy Department defense and nuclear activities, energy research and renewable energy and conservation programs...

The totals are after scorekeeping; they do not reflect a 1 percent across-the-board cut in most discretionary spending enacted as part of the fiscal 2006 Defense spending bill... [DOE's funding was] virtually the same as requested and slightly less than fiscal 2005 funding" ("Bill Cuts Back Yucca Mountain Funding," *CQ Almanac 2005*, 61st ed., 2-22-2-24. Washington, DC: Congressional Quarterly, 2006)

- "A House-Senate dispute over whether to provide funds for research into a nuclear "bunker-buster"—a low-yield weapon known as the Robust Nuclear Earth Penetrator designed to destroy underground bunkers—was averted in the fall when the administration abandoned plans for a nuclear version of the weapon" (Ibid)
- "The bill provided $450 million for construction at Yucca Mountain, only about a third of what the Energy Department had said in the past that it needed each year to keep the project on track... Minority Leader Harry Reid of Nevada, a staunch opponent of Yucca Mountain and ranking Democrat on the subcommittee, said, "A far more serious effort than the half-baked approach taken by the House is required to address the mounting failures of the Yucca Mountain program." (Ibid)
- "[The conference committee approved] $9.2 billion for the National Nuclear Security Administration, roughly halfway between the House and Senate amounts. Domenici announced on Oct. 25 that conferees had dropped the $4 million for the nuclear bunker buster at the request of the Energy Department. The administration had argued that it was seeking funds for a study, not a weapon, but the plan had stirred vociferous objections from members who said it could be the start of a new round of nuclear weapons and could undercut non-proliferation efforts." (Ibid)

Energy R&D Appropriations for FY2007

Bill: Revised Continuing Appropriations Resolution, 2007

Public Law: 110-5 **Enacted:** February 15, 2007 **Effective:** February 15, 2007

Function	Nominal change		Real change		Classification
	Millions ($)	YOY%	Millions ($2012)	YOY%	
Defense	-$118.0	-2.7%	-$219.0	-4.6%	Exogenous
Nondefense	$573.0	10.0%	$523.5	8.3%	Exogenous

Congress appropriated a significant increase in both nominal and real funding for DOE's nondefense energy R&D programs for FY2007, while nominal appropriations were cut for the NNSA's atomic energy defense R&D programs, resulting in an even steeper decline in real terms. The Bush administration was again trying to freeze nondefense discretionary spending to address re-emergent chronic budget deficits, but the FY2007 budget request proposed an American Competitiveness Initiative to boost investments in 'long-run economic strength,' including increased funding for DOE's physical sciences programs and basic research at the national labs; the House Appropriations Committee saw eye-to-eye with the administration on this front and approved the entire increase in DOE funding for the American Competitiveness Initiative. The Bush administration also remained focused on reducing American reliance on foreign oil imports and expanding domestic production of clean energy; in his State of the Union Address, President Bush proposed an Advanced Energy Initiative that would increase funding for DOE's clean-energy research by 22%, and the budget request proposed substantial increases in funding for nuclear energy development and hydrogen energy research. The House Appropriations Committee was less keen

on the administration's request for atomic energy defense programs, paring back the requested funding and taking the NNSA to task for implementing recommended reforms "in only a very limited manner" to date. The U.S. was still in the process of decreasing the number of operationally deployed nuclear warheads, in line with recent arms control agreements, and the Bush administration had dropped requests for controversial tactical nuclear weapons development and was more focused on preventing nuclear terrorism. The appropriations process broke down in FY2007, and the Senate failed to even consider the bill approved by the Senate Appropriations Committee; continuing resolutions funded energy programs through Feb. 15, 2007, at levels approved in the House-passed bill or FY2006 levels, whichever was lower, before the new Democratic majorities in the House and Senate pushed through a full-year CR providing funds for the rest of the year. The Senate Appropriations Committee had been the staunchest advocate for NNSA funding of late, but this influence broke down in FY2007 along with the appropriation process, leaving the more NNSA-skeptical House in the driver's seat. The increase in nondefense energy R&D funding appears to have been related to long-term concerns about domestic energy production and economic competitiveness, while the decrease in defense energy R&D funding appears to have been motivated by concerns about NNSA's internal management and the changing posture of U.S. nuclear weapons policy. Both policy changes appear unrelated to any concerns about inflation, unemployment, or other short-run macroeconomic prerogatives; as such, we classify these policy events as exogenous. Most pertinent narrative evidence:

- "Keeping America competitive requires affordable energy. And here we have a serious problem: America is addicted to oil, which is often imported from unstable parts of the world. The best way to break this addiction is through technology. Since 2001, we have spent nearly $10 billion to develop cleaner, cheaper, and more reliable alternative energy sources. And we are on the threshold of incredible advances. So tonight I announce the Advanced Energy Initiative—a 22-percent increase in clean-energy research at the Department of Energy—to push for breakthroughs in two vital areas. To change how we power our homes and offices, we will invest more in zero-emission coal-fired plants, revolutionary solar and wind technologies, and clean, safe nuclear energy." George W. Bush, State of the Union Address, January 31, 2006 (*The American Presidency Project*, by Gerhard Peters and John T. Woolley, https://www.presidency.ucsb.edu/node/214381)
- "America's economic strength depends in part on our Nation's rich tradition of scientific and technological innovation and leadership. Because investment in fundamental research in the physical sciences provides the foundation for such innovation, the President's American Competitiveness Initiative proposes a significant, sustained investment in the areas of the basic research portfolio of the Department of Energy (DOE) that promises to deliver the scientific breakthroughs that will transform our future... The 2007 Budget proposes $4.1 billion for DOE's Office of Science—a $505 million increase over 2006 funding. These additional funds, which represent the first installment of a 10-year doubling plan under the American Competitiveness Initiative, will be focused on the areas of research most likely to sustain and enhance U.S. economic competitiveness." (Budget of the United States, FY2007, p. 90)
- "Nuclear power offers an emissions-free, safe, and reliable source of energy and is an essential element in the Nation's energy mix. Recognizing these benefits, the President's National Energy Policy emphasized the appropriate development of nuclear energy systems. The 2007 Budget continues strong support for nuclear power in several areas. The Budget provides $54 million in 2007 for the Nuclear Power 2010 (NP 2010) ini-

tiative to make it feasible to build new nuclear power plants in the United States for the first time in three decades... The 2007 Budget is also looking ahead to the next generation of nuclear power plants. The Budget provides $32 million for [R&D] to support Generation IV nuclear energy systems. Generation IV technology offers the promise of a safe, economic, and proliferation-resistant source of clean nuclear power and possibly hydrogen." (Ibid, p. 91)

- "The 2007 Budget proposal of $6.4 billion for Weapons Activities strongly supports the implementation of the responsive infrastructure and the ongoing program of work that forms the backbone of the nuclear weapons deterrent... A total of $426 million in 2007 supports the Science and Engineering programs that develop the tools and capabilities needed to certify the continued effectiveness of the nuclear stockpile well into the future. This work will remain critical as the United States reduces the number of operationally deployed warheads to between 1,700 and 2,200 over the next 10 years." (Ibid, p. 96)
- "The overall DOE budget is essentially flat compared to the fiscal year 2006 enacted level, but the four mission areas fare quite differently under the Department's budget proposal. Science research would increase by 14 percent, and the budget for the National Nuclear Security Administration would increase by 2.3 percent. However, the budget for applied energy research is actually down by 4.8 percent, and the environmental cleanup budget sees a reduction of 11.6 percent compared to fiscal year 2006. The [House] Committee makes a number of changes to the fiscal year 2007 budget request to reflect specific Congressional priorities and interests. The Committee recommendation fully funds the request for the American Competitiveness Initiative under the Office of Science, but makes significant adjustments to funding for the NNSA, applied energy research, and environmental cleanup. Total funding for the Department of Energy is $24,373,489,000, an increase of $326,717,000 over fiscal year 2006 and $298,772,000 over the budget request." (H. Rpt. 109-474, May 19, 2006, p. 65).
- "The Committee provides $9,199,811,000, for the NNSA, a reduction of $116,000,000 under the budget request... This Committee tasked the previous Secretary of Energy in March 2004 with conducting an independent assessment of the Department of Energy's infrastructure requirements for the nuclear weapons complex over the next twenty-five years. The Secretary established a Task Force within the Secretary of Energy's Advisory Board (SEAB) on reform of the nuclear weapons complex infrastructure. This task force released its recommendations in July 2005, and they were formally presented by the SEAB to the Secretary in October 2005... The fiscal year 2007 budget request for the NNSA, and its subsequent testimony to the Committee, reveals that the Department has embraced the recommended reforms in only a very limited manner. While the SEAB Task Force developed their recommendations with an integrated perspective on the future of the nuclear weapons complex, the NNSA continues to propose modernization plans that maximize the physical size and the cost of the weapons complex... The Committee expects the Government Accountability Office (GAO) to assist the Committee with the Committee's oversight of NNSA's transformation process. In particular, the Committee will expect the GAO to evaluate, among other things, the cost-effectiveness of NNSA's proposal" (Ibid, pp. 107-108)
- "The House passed a fiscal 2007 energy-water appropriations bill in May, but the Senate never considered its version. In November, Republican leaders decided to forward all the unfinished spending bills to the 110th Congress. A stopgap spending bill signed

Dec. 9 (PL 109-383) funded energy and water programs through Feb. 15, 2007, at the lower of the House-passed or fiscal 2006 levels... The following are major components of the two bills:... $9.2 billion (House) and $9.3 billion (Senate)—increases of less than 2 percent—for the National Nuclear Security Administration... [and] $4.1 billion (House) and $4.2 billion (Senate) for research in areas such as high energy physics, nuclear physics, and basic energy sciences. The amounts were increases of 15 percent and 18 percent, respectively, over the fiscal 2006 level. Bush requested a 14 percent increase" ("Chambers Split on Nuclear Programs," *CQ Almanac 2006*, 62nd ed., edited by Jan Austin, 2-17-2-19. Washington, DC: Congressional Quarterly, 2007)

- "[The House provided] $4.1 billion, as requested, for Bush's American Competitiveness Initiative. The money was to go to the department's Office of Science for programs such as the Advanced Energy Initiative, aimed at increasing funding for a variety of clean energy technologies including biomass, hydrogen, solar, wind and clean coal" (Ibid)
- "With one day to go, the new Democratic-controlled Congress cleared a yearlong continuing resolution that wrapped together the nine unfinished bills. President Bush signed the measure into law on Feb. 1... A series of three continuing resolutions had kept the government operating since the start of fiscal 2007, with funding provided at the lowest of the House-passed, Senate-passed, or fiscal 2006 spending level... the continuing resolution kept most programs going at fiscal 2006 levels, but with numerous additions for Democratic priorities such as veterans' health care and education. Most programs also got additional funds to cover the cost of pay increases and to maintain staffing levels." ("Cleaning Up the Leftovers of FY 2007" *CQ Almanac 2007*, 63rd ed., edited by Jan Austin, 2-5-2-6. Washington, DC: Congressional Quarterly, 2008)

Energy R&D Appropriations for FY2008

Bill: Consolidated Appropriations Act, 2008; Energy and Water Development And Related Agencies Appropriations Act, 2008

Public Law: 110-161 **Enacted:** December 26, 2007 **Effective:** December 26, 2007

Function	Nominal change		Real change		Classification
	Millions ($)	YOY%	Millions ($2012)	YOY%	
Defense	-$129.0	-3.1%	-$263.8	-5.8%	Endogenous
Nondefense	$1,044.0	16.6%	$921.3	13.5%	Endogenous

Congress again appropriated a significant increase in both nominal and real funding for DOE's nondefense energy R&D programs for FY2008, while nominal appropriations were cut for the NNSA's atomic energy defense R&D programs, which saw an even steeper decline in real terms. The price of crude oil had shot up to "high and unstable" levels, and Congress and the Bush administration found a new sense of urgency about reducing American reliance on foreign oil imports and quickly expanding domestic production of clean energy. The House Appropriations Committee's report described the U.S. as being "in the midst of a multifaceted energy crisis" and declared that "the Administration request for energy research, development, demonstration, and deployment is woefully inadequate." The House committee was frustrated that the administration was focused so heavily on developing nuclear energy and not other alternative energy supplies, and reallocated a significant amount of funding away from nuclear weapons programs and toward energy supply R&D budgets;

President Bush, in turn, threatened to veto the House bill for running $1.3 billion over his budget request. The House committee, now led by Democrats, railed against DOE's project management and rebuked the administration and NNSA for failing to deliver an "updated strategic assessment that articulates the role of nuclear weapons in a post-Cold War world," and substantially "scaled back or rejected White House nuclear initiatives" in their bill; their Senate counterparts once again proved the stronger advocate for atomic energy defense programs, but the compromise bill did kill development of the Reliable Replacement Warhead program the administration was pursuing. The increase in nondefense energy R&D funding appears to have been largely driven by short-run concerns about the "energy crisis" and prices in oil markets, in addition to concerns about the environment and global warming. The decrease in defense energy R&D funding levels appears in part related to concerns about NNSA's cost and the changing post-9/11 posture of U.S. nuclear weapons policy, but also to some extent reflected the prioritization of budgetary resources toward the energy crisis and funding sizable increases in energy supply R&D programs. As such, we classify both policy changes as endogenous. Most pertinent narrative evidence:

- "For too long, our Nation has been dependent on foreign oil. And this dependence leaves us more vulnerable to hostile regimes and to terrorists who could cause huge disruptions of oil shipments and raise the price of oil and do great harm to our economy. It's in our vital interest to diversify America's energy supply. The way forward is through technology. We must continue changing the way America generates electric power by even greater use of clean coal technology, solar and wind energy, and clean, safe nuclear power. We need to press on with battery research for plug-in and hybrid vehicles and expand the use of clean diesel vehicles and biodiesel fuel. We must continue investing in new methods of producing ethanol, using everything from wood chips to grasses to agricultural wastes... America is on the verge of technological breakthroughs that will enable us to live our lives less dependent on oil. And these technologies will help us be better stewards of the environment, and they will help us to confront the serious challenge of global climate change" George W. Bush, State of the Union Address, January 23, 2007 (*The American Presidency Project*, by Gerhard Peters and John T. Woolley, https://www.presidency.ucsb.edu/node/269307)
- "The U.S. economy is strong... Unemployment is low. Wages are growing. Productivity is strong. Inflation and interest rates are low. And we have seen tremendous progress despite a series of challenges, including recession, the terrorist attacks of 2001, corporate scandals, the costliest natural disaster in our Nation's history, energy price spikes, and a temporary slowdown in the housing sector." (Budget Message of the President, FY2008, February 5, 2007, p. 1)
- "The 2008 Budget proposes $4.4 billion, a seven-percent increase over the 2007 Budget, for the contribution of [DOE's] Office of Science to the second year of the American Competitiveness Initiative (ACI). The 2008 Budget increases funding for cutting-edge basic research, helping to enhance American competitiveness through world-leading initiatives in supercomputing; bio-energy research centers; new materials investigation facilities, including the world's first x-ray-free electron laser; and nanotechnology. Energy and environmental research will include basic research in support of the Advanced Energy Initiative..." (Budget of the United States, FY2008, p. 58)
- "Compared to fiscal year 2007 (adjusted for one-time emergency spending), the fiscal year 2008 budget request for applied energy research is actually down by 0.9 percent in the midst of an ongoing energy crisis with increased, volatile costs for petroleum

and natural gas, over-reliance on imported oil, and growing emissions of greenhouse gases. The Administration is proposing a 75.4 percent increase for nuclear energy and decreases for all other energy technologies. This increase is driven by the studies of potential nuclear fuel recycling facilities and fast reactors that comprise most of the Global Nuclear Energy Partnership proposal. The [House Appropriations] Committee recommendation substantively funds the request for the Office of Science and supports the projected doubling of this area of [R&D] funding over the decade from 2006 to 2016. Significant adjustments to funding for nuclear nonproliferation, applied energy research, development, demonstration, and deployment, environmental cleanup, and weapons programs are recommended. In the current, constrained budget environment, total funding for the Department of Energy is $25,243,119,000, an increase of $1,149,925,000 over fiscal year 2007 and $480,406,000 over the budget request." (H. Rpt. 110-185, June 11, 2007, pp. 49-50)

- "The United States is in the midst of a multifaceted energy crisis that threatens our economy, our independence, and the environment. Reliance on imported petroleum makes the U.S. dependent on several politically unstable regions of the world. Growth in world demand for petroleum has created tight markets where prices are high and unstable. High prices for imported oil are major contributors to the U.S. trade deficit. Burning fossil fuels with current technologies leads to emission of carbon dioxide in amounts that cannot be absorbed by the environment fast enough to prevent significant increases in its atmospheric concentration... Given this threat to the well-being of the United States, the Administration's request for energy research, development, demonstration, and deployment is woefully inadequate. The Committee has added significant funding for renewable energy sources and improvements to energy efficiency while providing additional funding for fossil energy technologies" (Ibid, p. 52)
- "[DOE] has established a pattern of rushing into the latest new initiative with unbridled enthusiasm, neglecting the completion of ongoing work, and letting haste make waste. Most major DOE projects have long time scales, longer than those of political change. This means that it is essential to take time up-front to establish the reliability of new technologies that will be used, to complete end-to-end system engineering and include all mission requirements, and to build bipartisan political support for long-term missions that is broad rather than local. Project management is the [House] Committee's number one concern at the Department of Energy." (Ibid, p. 50)
- "Currently, the Administration has not provided to Congress an updated strategic assessment that articulates the role of nuclear weapons in a post-Cold War world. The national security environment for the United States has changed dramatically since the fall of the Soviet Union; however, the policy objectives that continue to require a large Cold War-era nuclear stockpile have not been updated to reflect the changed international security environment. The [House Appropriations] Committee directs the Administration to develop a comprehensive nuclear defense strategy that defines the future mission, global threats, and the specific characteristics of the U.S. nuclear stockpile necessary to address the nation's nuclear deterrent requirements before proceeding with the Reliable Replacement Warhead proposal or significant nuclear complex modernization plans... The Cold War has left DOE with an eight-site weapons complex. The Department appears determined to retain this expensive complex and modernize it in place. The Committee rejects any such proposal. The nuclear weapons complex modernization plan needs to focus on the near-term milestones within five-year sched-

ule windows with the intention of reducing the number, size, and cost of the NNSA sites and facilities while also requiring the minimum number of personnel for the mission." (Ibid, p. 53)

- "The Committee provides $8,786,881,000 for the NNSA, a reduction of $599,952,000 below the budget request and a reduction of $294,132,000 below the current year level... The Committee's recommendation provides $5,879,137,000, for Weapons Activities, a reduction of $632,175,000 below the budget request and a reduction of $396,446,000 below the current year level... The [DOE] and [DOD] are proposing to develop a new nuclear warhead under the Reliable Replacement Warhead (RRW) program and begin a nuclear weapons complex modernization proposal called Complex 2030. These multi-billion dollar initiatives are being proposed in a policy vacuum without any Administration statement on the national security environment that the future nuclear deterrent is designed to address... there have been no clear policy statements that articulate the role of nuclear weapons in a post-Cold War and post– 9/11 world." (Ibid, p. 93)
- "The prospect of a comprehensive energy package emerging from Congress this fall is rapidly receding, held up by technical hurdles and policy disputes between the House and the Senate and within the parties. This summer, both houses passed major bills meant to promote energy efficiency and wean industry from fossil fuels. The bills have gaping differences that are supposed to be resolved in a conference committee. Although Democratic leaders proclaimed energy a top legislative priority last January, the issue competes with Iraq, appropriations, financial market turmoil, and product safety for room on Congress's fall calendar... President Bush has threatened to veto the House bill, which he says does not have enough incentives for domestic energy production, and the Senate bill because it has penalties for price gouging by the oil industry" ("Hopes Dim For Measures To Conserve Energy," by John M. Broder, *New York Times*, September 13, 2007)
- "The House passed a fiscal 2008 Energy-Water bill in July, but the Senate version never reached the floor. A slightly altered bill, still more costly than the Bush administration wanted, was included in the omnibus appropriations package that cleared at the end of the year... The House originally passed a $32.1 billion version of the bill (HR 2641) in July that drew a veto threat because it exceeded Bush's request by $1.3 billion. The Senate Appropriations Committee approved a costlier $32.8 billion measure (S 1751) in June, but that bill faced a potential filibuster over an offshore oil provision and never reached the floor. Both chambers proposed significantly higher spending on energy [R&D], but they diverged on nuclear energy and weapons programs. The House-passed bill would have scaled back or rejected White House nuclear initiatives. The Senate version generally gave them better treatment. The final bill was closer to the Senate plan for nuclear weapons programs, although it prohibited the government from developing a "reliable replacement warhead." Supporters of the nuclear warhead said it was essential because it could be disabled if intercepted by terrorists." ("Energy-Water Programs Get $31.5 Billion," *CQ Almanac 2007*, 63rd ed., edited by Jan Austin, 2-18-2-21. Washington, DC: Congressional Quarterly, 2008).
- "The following are major components of the Energy and Water section of the omnibus: ... $8.8 billion for the National Nuclear Security Administration, a semi-autonomous Energy Department agency that maintained and refurbished the country's nuclear weapons and carried out non-proliferation activities. The amount in the bill was about

$405 million or 4 percent less than fiscal 2007 funding, and $575 million, or 6 percent less than Bush requested. Of the total, $6.3 billion was for weapons activities, about $215 million or 3 percent less than requested; an additional $1.3 billion was for nuclear nonproliferation activities, $14 million less than Bush requested, although Congress paid some of the cost by rescinding previously appropriated money... $4 billion for research in areas such as high- energy physics, nuclear physics, and basic energy sciences. The amount was $220 million or 6 percent above fiscal 2007 spending but $380 million or 9 percent less than Bush sought... [and for energy efficiency and renewable energy] $1.7 billion, an increase of about $250 million or 17 percent over the previous year's spending; Bush requested a 16 percent cut from fiscal 2007" (Ibid)

- "The [House Appropriations] committee took aim at the Bush administration's nuclear agenda, proposing to scale back or reject some of the president's nuclear weapons and fuel reprocessing initiatives, using that money instead for clean-energy and nonproliferation programs... The [Senate Appropriations] committee bill included: $25.9 billion for the Energy Department, about $655 million more than in the House bill. The biggest difference was in defense nuclear programs, to which the Senate bill devoted $16.3 billion, about $815 million more than in the House bill. Senate appropriators provided $1.7 billion for energy efficiency and renewable energy, about $160 million less than the House had approved... [Subcommittee Chairman] Domenici, a supporter of nuclear energy and the Energy Department's nuclear weapons laboratories in his state, managed to preserve funding for some nuclear weapons and energy initiatives that were cut back or eliminated in the House bill" (Ibid)

Energy R&D Appropriations for FY2009

Primary Bill: Omnibus Appropriations Act, 2009; Energy and Water Development and Related Agencies Appropriations Act, 2009

Public Law: 111-8 **Enacted:** March 11, 2009 **Effective:** March 11, 2009

Secondary: American Recovery and Reinvestment Act of 2009

Public Law: 111-5 **Enacted:** February 17, 2009 **Effective:** February 17, 2009

Function	Nominal change		Real change		Classification
	Millions ($)	YOY%	Millions ($2012)	YOY%	
Nondefense	$18,265.0	249.5%	$19,127.3	246.7%	Endogenous

Congress again appropriated a significant increase in both nominal and real funding for DOE's nondefense energy R&D programs for FY2009, both through the regular appropriations process and via the American Recovery and Reinvestment Act of 2009 (ARRA), the largest fiscal stimulus bill enacted in response to the Great Recession. In its last budget request, the outgoing Bush administration again proposed significant increases in DOE's science programs as part of its American Competitiveness Initiative, policies aimed at long-run economic competitiveness. But the administration also secured a bipartisan agreement for fiscal stimulus early in 2008, as the economy was sliding into the recession, in part to help families "pay rising energy bills," and the budget proposed increased energy R&D funding to help "reduce our dependence on oil" in the midst of the energy crisis of 2008. The House Appropriations Committee approved substantial increases in funding above and beyond the budget request for energy supply R&D programs, particularly for clean and renewable energy sources; they also approved significant increases for R&D intended "to

address the impacts of high gas prices," notably for advanced car battery technologies and hybrid and electric vehicles. The appropriations process again broke down during the lame-duck period of the Bush administration, and a continuing resolution extended funding at FY2008 levels through March 2009; early in the Obama administration, an omnibus appropriations bill for the remainder of FY2009 approved further increases for DOE's nondefense energy R&D programs in March 2009, notably for science programs. ARRA appropriated significant increases in DOE's renewable energy and science programs, intended as a form of fiscal stimulus promoting other objectives of the Obama administration and congressional democrats, notably climate change; the legislation provided the first funding for a new agency that had been authorized by the America COMPETES Act of 2007 (Pub. L.110-69), the Advanced Research Projects Agency-Energy (ARPA-E), which was modeled after DARPA but focused on high-risk, high-reward energy projects unlikely to secure private funding. Nominal and real funding for DOE's atomic energy defense R&D programs fell slightly for the year. The increase in nondefense energy R&D funding levels appears to have been partly a response to the recent increase in oil prices and largely intended as a form of fiscal stimulus in response to the Great Recession. As such, we classify this policy event as endogenous. Most pertinent narrative evidence:

- "In the long run, Americans can be confident about our economic growth. But in the short run, we can all see that that growth is slowing. So last week, my administration reached an agreement with Speaker Pelosi and Republican Leader Boehner on a robust growth package that includes tax relief for individuals and families and incentives for business investment... To build a future of energy security, we must trust in the creative genius of American researchers and entrepreneurs and empower them to pioneer a new generation of clean energy technology. Our security, our prosperity, and our environment all require reducing our dependence on oil... To keep America competitive into the future, we must trust in the skills of our scientists and engineers and empower them to pursue the breakthroughs of tomorrow. Last year, Congress passed legislation supporting the American Competitiveness Initiative, but never followed through with the funding. This funding is essential to keeping our scientific edge. So I ask Congress to double Federal support for critical basic research in the physical sciences and ensure America remains the most dynamic nation on Earth." George W. Bush, State of the Union Address, January 28, 2008 (*The American Presidency Project*, by Gerhard Peters and John T. Woolley, https://www.presidency.ucsb.edu/node/277182)
- "To insure against the risk of an economic downturn, I will work with Congress to pass a growth plan that will provide immediate, meaningful, and temporary help to our economy. Americans have real concerns about their ability to afford healthcare coverage, pay rising energy bills, and meet monthly mortgage payments. They expect their elected leaders in Washington to address these pressures on our economy. So my Budget puts forth proposals to make health care more affordable and accessible, reduce our dependence on oil, and help Americans struggling to keep their homes." (Budget Message of the President, FY2009, February 4, 2008)
- "[The House Appropriations bill] provides $27,204,820,000 for the Department of Energy, $1,286,932,000 over the budget request, and $2,715,718,000 above the fiscal year 2008 enacted level (excluding emergency spending). The Committee recommends funding for renewable energy and energy efficiency programs at $2,519,152,000, an increase of $1,263,759,000 above the request... Across the Nation, families already stung by an economic downturn have seen their energy bills skyrocket over the last year, and their

homes and lives endangered by floods, tornadoes, and hurricanes. With the price of gasoline now exceeding $4.00 a gallon, and the potential costs of adverse consequences of global warming, such as an increase in the frequency of severe weather, becoming painfully clear, the urgency to address energy and climate change has never been greater and the consequences of inaction more dire. Unfortunately, there are no easy or quick solutions to these problems... Funding provided in this bill supports a substantial expansion of research, development, demonstration, and deployment programs focused on efficiently utilizing our domestic natural resources to fulfill our energy needs while addressing global climate change... The Energy and Water Development appropriation includes $901,438,000 for research, development, demonstration, and deployment of improved vehicle technology and production of biofuels, $400,215,000 above the fiscal year enacted funding level and $326,414,000 more than requested by the President. This substantial increase includes funding for many new initiatives to address the impacts of high gas prices..." (H. Rpt. 110-921, December 10, 2008, pp. 5-7)

- "The House and Senate Appropriations committees approved separate versions of the fiscal 2009 Energy-Water spending bill, but the legislation became caught in a broader collapse of the appropriations process and went no further. Instead, funding for the Department of Energy, the Army Corps of Engineers, and the Interior Department's Bureau of Reclamation was extended at fiscal 2008 levels through March 6, 2009, under a continuing appropriations resolution signed into law Sept. 30 (PL 110-329)... The discretionary total was $2.4 billion, or 8 percent, more than the agencies covered by the bill got the previous year. President Bush requested $31.2 billion in discretionary funds, an increase of about 1 percent over fiscal 2008. Senate appropriators rejected the House's proposal for cuts and vowed to fight for the nuclear labs. Their prospects for winning the battle were diminished, however, by the fact that the most vocal supporter of the labs in the Senate—Republican Pete V. Domenici of New Mexico—was retiring at the end of 110th Congress and would not be present when the final decisions were made in 2009" ("Chambers Split on Nuclear Programs," *CQ Almanac 2008*, 64th ed., edited by Jan Austin, 2-12-2-14. Washington, DC: Congressional Quarterly, 2009
- "Today I have signed into law H.R. 1, the "American Recovery and Reinvestment Act of 2009." The Act provides a direct fiscal boost to help lift our Nation from the greatest economic crisis in our lifetimes and lay the foundation for further growth. This recovery plan will help to save or create as many as three to four million jobs by the end of 2010, the vast majority of them in the private sector. It will make the most significant investment in America's roads, bridges, mass transit, and other infrastructure since the construction of the Interstate Highway System. It will make investments to foster reform in education, and double renewable energy while fostering efficiency in the use of our energy... We have inherited an economic crisis as deep and as dire as any since the Great Depression. Economists from across the spectrum have warned that failure to act quickly would lead to the disappearance of millions of more jobs and national unemployment rates that could be in the double digits" Barack H. Obama, Statement on Signing the American Recovery and Reinvestment Act of 2009, February 17, 2009 (*The American Presidency Project*, by Gerhard Peters and John T. Woolley, https://www.presidency.ucsb.edu/node/286325)
- Congressional Democrats handed President Obama his first significant legislative victory less than a month after his inauguration by agreeing to pump an estimated $787.2 billion into the economy to keep it from sinking further into recession... The [Senate]

measure included funding for a broad array of initiatives, including highway and transit projects and renewable energy and energy efficiency incentives." ("Stimulus Enacted to Pump Economy with $575.3 Billion in New Spending," *CQ Almanac 2009*, 65th ed., edited by Jan Austin, 7-3-7-7. Washington, DC: CQ-Roll Call Group, 2010)

- "Now is the time to act boldly and wisely to not only revive this economy but to build a new foundation for lasting prosperity. Now is the time to jump-start job creation, restart lending, and invest in areas like energy, health care, and education that will grow our economy, even as we make hard choices to bring our deficit down... As soon as I took office, I asked this Congress to send me a recovery plan by President's Day that would put people back to work and put money in their pockets" Barack H. Obama, State of the Union Address, February 24, 2009 (*The American Presidency Project*, by Gerhard Peters and John T. Woolley, https://www.presidency.ucsb.edu/node/286218)
- "The budget I submit will invest in the three areas that are absolutely critical to our economic future: ... It begins with energy. We know the country that harnesses the power of clean, renewable energy will lead the 21st century. And yet, it is China that has launched the largest effort in history to make their economy energy efficient. We invented solar technology, but we've fallen behind countries like Germany and Japan in producing it... Thanks to our recovery plan, we will double this Nation's supply of renewable energy in the next three years. We've also made the largest investment in basic research funding in American history, an investment that will spur not only new discoveries in energy but breakthroughs in medicine and science and technology." (Ibid)
- "Congress closed the books on fiscal 2009 in March with an omnibus spending package that wrapped together nine appropriations measures left unfinished at the end of the 110th Congress. President Obama signed the measure into law on March 11 (HR 1105—PL 111-8). The omnibus appropriations package provided a total of $1.05 trillion—$410 billion of it for discretionary programs—and included many of the domestic spending increases congressional Democrats were unable to get enacted while George W. Bush was president. In delaying the spending bills until 2009, Democrats gambled that they would come out of the November 2008 elections with increased majorities in both chambers and a Democrat in the White House who would agree to the spending boosts they wanted... [The House bill] increased funding for the Energy Department's Office of Science to $4.8 billion." ("Nine Bills Wrapped into Omnibus," *CQ Almanac 2009*, 65th ed., edited by Jan Austin, 2-5-2-9. Washington, DC: CQ-Roll Call Group, 2010)

Energy R&D Appropriations for FY2010

Bill: Energy and Water Development and Related Agencies Appropriations Act, 2010

Public Law: 111-85 **Enacted:** October 28, 2009 **Effective:** October 28, 2009

Function	Nominal change		Real change		Classification
	Millions ($)	YOY%	Millions ($2012)	YOY%	
Nondefense	-$17,109.0	-66.9%	-$18,121.2	-67.4%	Endogenous

Congress appropriated a significant decrease in both nominal and real funding for DOE's nondefense energy R&D programs for FY2010, largely driven by the reversal of a surge in

emergency ARRA stimulus funding provided for DOE in FY2009. But Congress appropriated roughly 1% more for the Energy and Water appropriations bill for FY2010 than for regular order appropriations for FY2009, excluding emergency stimulus spending, albeit still less than the 3% increase requested in the president's budget. President Obama had promised to double funding for key science and technology programs of a number of agencies, including DOE, and viewed ARRA as just providing "a significant down-payment" on that objective; the FY2010 budget proposed double-digit percentage increases for DOE's Office of Science programs and the administration remained focused on energy supply R&D programs to 'wean' the nation off of fossil fuels and reduce greenhouse gas emissions. Nominal appropriations for DOE's atomic energy defense R&D programs were increased slightly for the year, mostly keeping in pace with modest inflation, resulting in a negligible increase in real funding for the year. The decrease in nondefense energy R&D funding for FY2010 appears to have been largely driven by the reversal of a one-off fiscal stimulus appropriated for FY2009 to combat the recession, and as such, we classify this policy event as endogenous. Most pertinent narrative evidence:

- "Investments in science and technology foster economic growth; create millions of high-tech, high-wage jobs that allow American workers to lead the global economy; improve the quality of life for all Americans; and strengthen our national security. The Recovery Act included a $5 billion investment in key science programs, which is by itself an almost 50-percent increase for these programs over 2008 and represents a significant down-payment toward the President's plan to double the funding for these agencies over ten years. Under the President's doubling plan, the Budget provides a 16-percent increase over 2008 funding levels for the National Science Foundation and similarly large increases for the [DOE's] Office of Science... The Budget also increases support for promising, but exploratory and high-risk research proposals that could fundamentally improve our understanding of climate, revolutionize fields of science, and lead to radically new technologies... The high gas prices of last summer only underscored what we have known for decades: we cannot afford to depend so heavily on foreign oil and other fossil fuels to power our economy. While the national security implications have been clear for some time, the more we learn about global warming, the more we see that failure to wean ourselves off of fossil fuels also jeopardizes our economy and our entire planet" (Budget of the United States, FY2010, pp. 20-21)
- "The Energy and Water Development Appropriations bill for fiscal year 2010 totals $33,307,000,000, a decrease of $1,086,709,000 from the President's budget request, and $46,000,000 above the amount appropriated in fiscal year 2009, excluding emergency appropriations. Title III provides $26,878,850,000 for the Department of Energy, a decrease of $1,527,856,000 from the budget request, and $85,849,000 above the fiscal year 2009 enacted level, excluding emergency spending. The Committee recommends funding for renewable energy and energy efficiency programs at $2,250,000,000; nuclear energy programs at $812,000,000; and $4,943,587,000 for the Office of Science, an increase of $170,951,000 over the current year" (H. Rpt. 111-203, July 13, 2009, p. 5)
- "The Committee is pleased that the Administration has fully engaged to confront the energy challenges facing this nation and has made energy policy a top priority of its agenda... The energy crisis is not just about energy independence from the Middle East and foreign suppliers, it is about reducing the economic costs energy dependence inflicts on hardworking Americans, the national security threat it poses, and the havoc it wreaks on the environment. A balanced energy mix that introduces competition into

the system will ensure future generations are not held captive by one source of energy" (Ibid, pp. 79-80)

- "The discretionary total of $33.5 billion [in the Energy and Water Development bill] was an increase of less than 1 percent over the amount in the regular fiscal 2009 law (PL 111-8) but about 3 percent, or $929 million, less than Obama requested. However, programs funded by the Energy-Water bill had received an additional $57.8 billion in emergency fiscal 2009 appropriations, mainly under the economic stimulus law (PL 111-5) signed in February. The emergency funding consisted of $46.6 billion for the Energy Department, $11.2 billion for the Army Corps of Engineers and $1 billion for the Interior Department" ("Popular Water Projects Ease Passage," *CQ Almanac 2009*, 65th ed., edited by Jan Austin, 2-24-2-26. Washington, DC: CQ-Roll Call Group, 201)
- "Lawmakers warned, however, that a fight could be brewing for fiscal 2011. The White House envisioned funding in the economic stimulus law as a down payment on a decade of robust new spending on energy research. That meant energy appropriators could have to confront the difficult question of whether and how to sustain the spending levels" (Ibid)
- "Major components of the fiscal 2010 bill included: $4.9 billion, just slightly less than requested, for the Energy Department's work on basic energy research, nuclear physics, biological and environmental sciences, fusion, and other related endeavors. Within this account, the measure appropriated $1.6 billion for basic energy research, mainly to operate federal laboratories; $810 million for high-energy physics; and $604 million for biological and environmental research, including climate change... $2.2 billion, virtually the same as Obama's request, for energy assistance programs and for [R&D] of alternative energy sources such as biomass fuels, hydrogen technologies, and solar power" (Ibid)

Energy R&D Appropriations for FY2011

Bill: Department of Defense and Full-Year Continuing Appropriations Act, 2011; Title IV—Energy and Water Development and Related Agencies

Public Law: 112-10 **Enacted:** April 15, 2011 **Effective:** April 15, 2011

Function	Nominal change		Real change		Classification
	Millions ($)	YOY%	Millions ($2012)	YOY%	
Defense	$477.0	11.7%	$368.9	8.6%	Exogenous
Nondefense	-$573.0	-6.8%	-$805.4	-9.2%	Exogenous

Congress appropriated a significant decrease in nominal and real funding for DOE's nondefense energy R&D programs for FY2011, as the regular order budget process broke down in late 2010 and the newly elected House Republican majority demanded sharp cuts to nondefense discretionary spending in early 2011. Conservatives were particularly loathe to fund DOE's energy supply R&D and science and technology programs in the wake of large funding increases from ARRA, contrary to the intentions of the Obama administration. House Republicans' starting point in negotiations with the administration was cutting nondefense discretionary spending by $100 billion relative to FY2010 levels, a nonstarter for congressional democrats and the administration; Congress nearly avoided a series of government shutdowns and limped along with a series of CRs, each incrementally cutting spending, until a bipartisan agreement was struck in April 2011 that resulted in a net reduction of $40

billion for FY2011. In the end, FY2011 funding for the Energy and Water appropriations bill was cut $1.7 billion, or roughly 5%, below FY2010 levels. While the eventual budget agreement reduced funding for nearly every agency and appropriations bill, DOD and NNSA received deferential treatment; the atomic energy defense R&D programs saw a significant increase in both nominal and real appropriations, despite the newfound fixation on cutting government spending. Preventing nuclear weapons proliferation, securing vulnerable fissile materials, and reducing nuclear weapons stockpiles were major national security priorities of the administration, and the FY2011 budget request proposed a sizable increase in funding for the NNSA; the Senate Appropriations Committee was generally quite supportive of the increased funding request for atomic energy defense science and technology programs, and approved even more for weapons activities than requested. The decrease in nondefense energy R&D funding appears to have been related to concerns about long-term deficit reduction and partisan disagreement about the appropriate size and role of the federal budget, and unrelated to any concerns about inflation, unemployment, or other short-run macroeconomic prerogatives. The significant increase in funding for defense energy R&D programs appears to have been motivated by national security and geopolitical concerns, which were exempted from broader fiscal restraint, and also appears unrelated to any cyclical motives. As such, we classify both policy changes as exogenous. Most pertinent narrative evidence:

- "To help put our country on a fiscally sustainable path, we will freeze non-security discretionary funding for 3 years..." (Budget Message of the President, FY2011, February 1, 2010, p. 4)
- "Investment in science and basic research is critical to long-term economic growth. That's why the Budget invests $61.6 billion in civilian [R&D], an increase of $3.7 billion, a 6.4 percent increase, and an amount that continues the commitment to double funding for three key basic research agencies—the [NSF], the [DOE's] Office of Science, and the National Institute of Standards and Technology. This funding includes $1.8 billion for research in basic energy sciences to discover novel ways to produce, store, and use energy to address energy independence and climate change and $300 million for the Advanced Research Projects Agency-Energy, to accelerate game-changing energy technologies in need of rapid and flexible experimentation or engineering." (Ibid, p. 21)
- "The Budget provides $2.7 billion, an increase of $550 million over the 2010 appropriation, to prevent the proliferation of nuclear weapons. This increase supports the strategy to move toward a world without nuclear weapons that the President announced in his April 2009, speech in Prague. This investment fully funds efforts to: secure nuclear material; develop technology to detect and deter nuclear testing and smuggling; and support international nonproliferation treaties, regulatory controls, and safeguards. Development work on the reliable replacement warhead has ceased. The 2011 Budget funds $8.1 billion, $750 million over the 2010 Budget, to improve the nuclear stockpile's safety, security, and effectiveness with more extensive life extension programs, upgrades to the infrastructure supporting the life extension programs, and new initiatives in naval reactors work. Funding for the stockpile and naval reactors work increases by about 10 percent over 2010 funding." (Budget of the United States, FY2011, p. 70)
- "The [Senate Appropriations] Committee recommends $7,018,835,000 for National Nuclear Security Administration [NNSA] Weapons Activities, an increase of $10,000,000 above the budget request. This level of funding will allow NNSA to modernize aging infrastructure and maintain the scientific, technological, and engineering capabilities

needed to assess the safety, security, and reliability of nuclear weapons." (S. Rpt. 111-228, July 22, 2010, p. 105)

- "Congress completed none of the 12 appropriations bills for fiscal 2011, which began on Oct. 1, 2010. To avoid a government shutdown, lawmakers cleared a series of short-term continuing resolutions that froze most government spending at fiscal 2010 levels... Like most of the fiscal 2011 appropriations bills, the Energy-Water measure stopped moving once it had been approved in different forms by the full Senate Appropriations Committee and by a House subcommittee. Programs under the bill were funded mostly at fiscal 2010 levels through March 4, 2011, under the continuing resolution signed into law on Dec. 22... Republicans voiced general opposition to the overall spending levels for fiscal 2011, noting, in particular, that the Energy Department had received more than $30 billion in extra funds under the 2009 economic stimulus law (PL 111-5)... Much of the increase over fiscal 2010 in both bills went to boost funds for nuclear weapons programs—by $526 million in the House draft and $634 million in the Senate committee-approved bill. The continuing resolution retained increased funding for the weapons programs related to the New START agreement" ("Action Aborted on all FY 2011 Bills," *CQ Almanac 2010*, 66th ed., edited by Jan Austin, 2-5-2-14. Washington, DC: CQ-Roll Call Group, 2011)
- "As pressure mounted to reduce the deficits, Democratic lawmakers began planning last summer to trim the Pentagon's request for 2011. The Republicans have added to the proposed cuts since they took control of the House last month. Under the latest proposal, which could be voted on this week, House Republicans would cut about $15 billion from the Pentagon's main operating accounts... Other cuts would come in military construction and energy projects" (As Talk Turns to 2012 Military Budget, Gates Sees Crisis in Current Spending, by Thom Shanker and Christopher Drew, *New York Times*, February 11, 2011)
- "Deep differences over federal spending priorities and deficit reduction kept the two parties from completing the 2011 appropriations process until the fiscal year was more than halfway over. Congress cleared a package of fiscal 2011 bills on April 14, and President Obama signed the measure into law the following day... The bill provided $1.05 trillion in discretionary budget authority, a $39.9 billion reduction from existing law, including $12 billion in cuts that had been made in three earlier stopgap measures. Democrats, who controlled both chambers in the 111th Congress, had left all 12 of the fiscal 2011 spending bills on the table when they adjourned in December 2010. Before leaving, they cleared a measure that gave the next Congress until March 4, 2011... The March 4 deadline came and went, with the GOP-controlled House and the Democratic-run Senate at loggerheads over spending cuts. Lawmakers kept the government limping along with a series of three short-term spending bills known as continuing resolutions or CRs. Federal agencies became increasingly critical of the stopgap approach to funding... The conservative House Republican Study Committee (RSC), buttressed by a sizable class of freshmen swept into office on promises to slash spending, demanded deep cuts. That set up a conflict with the Senate and the White House, both of which had initially balked at any trimming." ("Parties Face Off Over Fiscal 2011 Bills," *CQ Almanac 2011*, 67th ed., edited by Jan Austin, 2-5-2-7. Washington, DC: CQ-Roll Call Group, 2012)
- "Propelled by conservative Republicans, the House passed a bill (HR 1) on Feb. 19 to fund the government for the remainder of fiscal 2011. It would have provided

$1.029 trillion in discretionary budget authority, $100 billion below Obama's fiscal 2011 request—a GOP goal set in the 2010 campaign—and $61.5 billion below the existing spending rate based on the December CR. The reductions were to come almost entirely from non-defense discretionary spending... With a government shutdown looking more likely by the day, negotiators alternated between closed-door bargaining and public posturing. Finally, with a midnight deadline a little more than an hour away and federal workers prepared for furloughs, a deal was finally announced on April 8... The $39.9 billion in budget authority cuts was a compromise between Boehner's last offer of $40 billion, down from an earlier plan to offer $61.5 billion, and Reid and Obama's figure of $38 billion, up from an earlier plan for $33 billion... Few big departments or agencies were spared in the legislation (HR 1473) that trimmed nearly $40 billion in discretionary spending for fiscal 2011... The Pentagon was the only department to get an increase" (Ibid)

Energy R&D Appropriations for FY2013

Bill: Consolidated and Further Continuing Appropriations Act, 2013; Further Continuing Appropriations Act, 2013; Title II—Energy and Water Development

Public Law: 113-6 **Enacted:** March 26, 2013 **Effective:** March 26, 2013

Function	Nominal change		Real change		Classification
	Millions ($)	YOY%	Millions ($2012)	YOY%	
Defense	-$195.0	-4.2%	-$222.4	-4.8%	Exogenous
Nondefense	-$315.0	-3.9%	-$369.7	-4.6%	Exogenous

Congress enacted deep cuts in both nominal and real appropriations for both DOE's defense and nondefense energy R&D programs for FY2013, as a recently enacted deficit reduction package triggered automatic spending cuts. The legislative resolution to the 2011 debt ceiling crisis had capped defense and nondefense discretionary spending, and further automatic "sequestration" discretionary spending cuts took effect starting in FY2013 because the parties failed to negotiate a deficit reduction package; see "Department of Defense R&D Appropriations for FY2012-2013" for more details. President Obama's FY2013 budget request had included its own version of a long-term deficit reduction package to deactivate sequestration, which it described as 'not good policy' by design and 'devastating' if triggered, but the budget request for DOE ended up bearing little resemblance to actually enacted funding levels post-sequestration. The regular appropriations process had completely fallen apart, and an initial CR held funding at levels prescribed by the BCA's discretionary spending caps for FY2013 for the first six months, intended to avoid a government shutdown near the 2012 presidential elections, and a second hybrid CR-omnibus appropriations bill was enacted in March, which held most funding at or near FY2012 levels for the remainder of FY2013—that is, before the sequester kicked in, cutting funding by roughly 7–8% for most budget accounts. The decreases in both defense and nondefense energy R&D funding levels appear to have been driven by concerns about long-term deficit reduction, a breakdown in the regular appropriations process, and partisan disagreement about the appropriate size and role of the federal budget, and do not seem to have been influenced by any concerns about inflation, unemployment, or other short-run macroeconomic prerogatives. As such, we classify both policy changes as exogenous. Most pertinent narrative evidence:

- "In a rare instance of bipartisan unity, congressional Democrats and Republicans agreed to punt the fiscal 2013 appropriations process past the November elections and into the

following year. President Barack Obama signed the resulting bill into law on Sept. 28 (H J Res 117—PL 112-175). The measure continued appropriations at a level slightly above fiscal 2012 through March 31, 2013. The agreement had been negotiated by the White House and a bipartisan congressional leadership team in August. Neither party wanted the threat of a government shutdown hanging over the elections, a likely problem if they had tried to reach a yearlong agreement... Democrats signed off on the six-month measure, known as a continuing resolution, or CR, only after it was agreed that it would reflect the $1.047 trillion fiscal 2013 discretionary spending cap set in the 2011 Budget Control Act (PL 112-25)" ("Congress Delays Spending Bills, Extends Funds Through March 2013," *CQ Almanac 2012*, 68th ed., 2-3-2-5. Washington, DC: CQ-Roll Call Group, 2013)

- "Congress in March cleared a broad appropriations measure to finance government activities for the balance of fiscal 2013, after having completed work on none of the 12 regular appropriations bills for the year... The year-end 2013 measure followed the enactment of a six-month continuing resolution (PL 112-175) in September 2012 to keep the government operating at fiscal 2012 levels through March 27, 2013. That measure was intended to buy time for lawmakers to complete work on individual spending bills, but the effort proved to be unsuccessful. It took place at the same time lawmakers were grappling with what was known in Washington as the fiscal cliff—the combination of a host of expiring tax provisions, the need to raise the debt limit, and the widely disliked spending sequester that had been put in place by the 2011 debt limit law... The fiscal cliff was partly resolved in the final days of the 112th Congress, although many issues were merely postponed until later in 2013... After the appropriations measure was enacted, the scheduled across-the-board sequester was still applied to appropriated amounts for 2013, reducing the aggregate discretionary total to an estimated $984 billion. Under the terms of the fiscal-cliff law, President Barack Obama ordered the sequester to take effect on March 1, before the final bill for 2013 was complete. Most of the sequestered money was taken from discretionary spending, and half of it came from Defense, under the terms of the 2011 debt limit law" ("Bipartisan Hybrid Bill Finances 2013," *CQ Almanac 2013*, 69th ed., 2-34-2-35: 2014)
- "For the Defense title, which includes nuclear-weapons programs run by the Energy Department, the omnibus provided an aggregate of $605.3 billion before the sequester is taken into account... [OMB] estimated that the sequester would cut most defense accounts by 7.8 percent in fiscal 2013, while spending on military personnel and most war operations was exempt... For the remainder of the government, the measure continued appropriations at fiscal 2012 levels for most accounts in the seven other regular appropriations bills: Energy-Water, Financial Services, Interior-Environment, Labor-Health and Human Services-Education, Legislative Branch, State-Foreign Operations, and Transportation-Housing and Urban Development" (Ibid).

Energy R&D Appropriations for FY2014

Bill: Consolidated Appropriations Act, 2014; Energy and Water Development and Related Agencies Appropriations Act, 2014

Public Law: 113-76 **Enacted:** January 17, 2014 **Effective:** January 17, 2014

Function	Nominal change		Real change		Classification
	Millions ($)	YOY%	Millions ($2012)	YOY%	
Defense	$723.0	16.3%	$618.6	14.0%	Exogenous
Nondefense	$796.0	10.2%	$638.8	8.2%	Exogenous

Congress appropriated significant increases in both nominal and real funding for both DOE's defense and nondefense energy R&D programs in FY2014, as Congress quickly grew weary of the automatic sequestration cuts and discretionary spending caps set by the BCA, and moved to ease both fiscal restraints. The breakdown of the regular appropriations process persisted and intensified in FY2014, with a government shutdown kicking off the first 16 days of the fiscal year as the two parties failed to negotiate a stopgap appropriation measure; House Republicans were trying to delay and defund implementation of the Affordable Care Act, which was anathema to the Obama administration and congressional Democrats. The Treasury Department was approaching the statutory debt ceiling that had been set two years early by the BCA, and another debt ceiling crisis standoff ensued between the two parties in 2013. On October 16, Congress passed the Continuing Appropriations Act, 2014, which ended both the government shutdown and the debt ceiling crisis of 2013; the bill provided bridge funding and a temporary suspension of the debt ceiling into early 2014 and kicked off House-Senate conference to negotiate a longer-term budget agreement. The negotiated Consolidated Appropriations Act, 2014 was enacted in January 2014, easing sequestration cuts and discretionary spending caps for FY2014. The Obama administration had prioritized significant funding increases for DOE's renewable energy R&D programs and NNSA's nuclear weapons activities, describing them as "a testament to the importance of clean energy and innovation to the country's economic future, and the importance of nuclear security to the Nation's safety" given the current constrained fiscal environment; climate change, energy independence, and nuclear nonproliferation all remained top administration priorities. Unlike recent years, the President's FY2014 budget request did shape the conference committee's funding decisions for DOE, which saw significant increases as the BCA spending limitations were eased. The increases in both defense and nondefense energy R&D funding levels appear to have been driven by easing concerns about long-term deficit reduction and frustration with the BCA, a breakdown in the regular appropriations process, national security objectives, and long-run concerns about climate change. Both policy changes appear unrelated to any concerns about inflation, unemployment, or other short-run macroeconomic prerogatives; as such, we classify both policy changes as exogenous. Most pertinent narrative evidence:

- "In 2011, Congress passed a law saying that if both parties couldn't agree on a plan to reach our deficit goal, about a trillion dollars' worth of budget cuts would automatically go into effect this year. These sudden, harsh, arbitrary cuts would jeopardize our military readiness. They'd devastate priorities like education and energy and medical research. They would certainly slow our recovery and cost us hundreds of thousands of jobs. And that's why Democrats, Republicans, business leaders, and economists have already said that these cuts—known here in Washington as the sequester—are a really bad idea." Barack H. Obama, State of the Union Address, February 12, 2013 (*The American Presidency Project*, by Gerhard Peters and John T. Woolley, https://www.presidency.ucsb.edu/node/303424)
- "Today, no area holds more promise than our investments in American energy. After years of talking about it, we're finally poised to control our own energy future. We produce more oil at home than we have in 15 years. We have doubled the distance our

cars will go on a gallon of gas and the amount of renewable energy we generate from sources like wind and solar, with tens of thousands of good American jobs to show for it... But for the sake of our children and our future, we must do more to combat climate change" (Ibid)

- "To ensure our energy security and combat global climate change, we must continue to focus on energy production, the development of clean energy alternatives, and the promotion of energy efficiency efforts in both the public and private sectors... The Budget continues to place a priority on funding for the [DOE's] Office of Energy Efficiency and Renewable Energy to accelerate R&D and further increase the cost-competitiveness and deployment of renewable power, electric vehicles, next-generation biofuels, advanced energy-efficient manufacturing, and energy efficiency in homes and commercial buildings. The Budget also proposes increasing support in 2014 for the [DOE's] [ARPA-E] to support breakthrough research in clean energy technologies" (Budget of the United States, FY2014, pp. 8, 10)
- "The Administration remains committed to reducing the number and role of nuclear weapons in support of our national security strategy, to modernizing the Nation's nuclear weapons complex, and to supporting the goals of the Nuclear Posture Review as the United States and Russia implement the New [START]." (Ibid, p. 72)
- "the President's 2014 Budget provides $28.4 billion in discretionary funds for DOE to support its mission, an eight percent increase over the 2012 enacted level. It includes $11.7 billion for nuclear security, a six percent increase over the 2012 enacted level. In light of the current discretionary caps, these increases in funding are significant and a testament to the importance of clean energy and innovation to the country's economic future, and the importance of nuclear security to the Nation's safety." (Ibid, p. 86)
- "The Budget proposes $7.87 billion for Weapons Activities, an increase of $654 million, or nine percent above the 2012 enacted level, to maintain a safe, secure, and effective nuclear deterrent as described in the Administration's Nuclear Posture Review (NPR) of 2010... The Budget meets the goals of the NPR by funding cost increases for nuclear weapon life extension programs, such as: upgrades to the W76 and B61 nuclear weapons; initiating new upgrades for the W78 and W88 nuclear weapons; improving or replacing aging facilities, such as the Uranium Processing Facility; adding funds for tritium production and plutonium manufacturing and experimentation; and sustaining the existing stockpile by maintaining the underlying science, surveillance, and other support programs." (Ibid, pp. 89-90)
- "The Energy-Water bill was one of 12 regular appropriations measures, all of which were wrapped into the omnibus... Enactment ended a protracted appropriations process that had extended more than three months beyond the Oct. 1 start of the fiscal year and included a 16-day government shutdown. House and Senate appropriators assembled the omnibus under the terms of a bipartisan, two-year budget agreement (H J Res 59—PL 113-67) negotiated in December 2013 that pared back cuts imposed by the sequester and raised the caps on discretionary spending first set in the 2011 debt limit law" ("Fossil Fuel, Renewable Spending Up," *CQ Almanac 2013*, 69th ed., 2-16-2-17, 2014)
- "The Energy and Water development section of the fiscal 2014 omnibus provided an increase of almost $800 million above the pre-sequester fiscal 2013 spending level... Still, the measure fell almost $1 billion short of the administration's request. The

omnibus appropriated $34.1 billion in fiscal 2014 discretionary budget authority for programs covered by the Energy-Water title. The measure boosted spending on fossil fuel development, including $562 million for research on coal, natural gas, oil, and other fossil energy technology, a figure $28 million larger than the fiscal 2013 enacted level and $141 million higher than the administration's request. As enacted, it provided more money than in fiscal 2013, but not as much as the administration wanted, for energy efficiency and renewable-energy programs." (Ibid)

- "During their deliberations in the summer, House and Senate appropriators approved very different versions of the fiscal 2014 Energy-Water bill, exemplified by a $4.4 billion gap between the two bills' spending totals that resulted in part from sharp divisions over approaches to renewable and conventional energy sources. The House passed its version (HR 2609—H Rept 113-135) on a near-party-line 227-198 vote on July 10, ignoring a presidential veto threat. The Republican-backed bill would have provided $30.4 billion in discretionary budget authority, roughly $2.9 billion less than the amount enacted for fiscal 2013 and $4.1 billion less than the administration requested... The Senate Appropriations Committee approved its bill (S 1245—S Rept 113-47) on a bipartisan 24-6 vote on June 27, but the measure never made it to the floor. As approved in committee, it would have provided $34.8 billion for Energy-Water programs, close to the White House request, and roughly $1.5 billion more than enacted for fiscal 2013. Conflicts between the two bills began with spending on renewable energy and science research. The House bill would have financed renewable-energy programs under the Energy Department at $983 million, roughly half the fiscal 2013 amount. The House bill also would have limited spending by the Advanced Research Projects Agency-Energy (ARPA-E), a program that paid for high-risk energy research, to $50 million, compared with $265 million appropriated for 2013. At the same time, it would have provided $450 million for the development of coal, natural gas and oil energy technologies. The House Appropriations panel rejected two amendments that would have set spending for renewable energy and ARPA-E at the higher levels Obama requested." (Ibid)
- "Negotiators on the omnibus agreed to provide $562 million for research on coal, natural gas, oil, and other fossil energy technology, an amount roughly $28 million greater than the fiscal 2013 level and $141 million more than the administration wanted. The omnibus increased spending on renewable energy and efficiency by $95 million above the 2013 level, but that figure remained $896 million short of the administration's request. The measure provided $889 million for nuclear energy [R&D], an increase of $36 million over the 2013 level and $154 million more than the administration requested... The National Nuclear Security Administration received $11.2 billion to maintain nuclear weapons. The appropriation included $537 million sought by the administration to extend the life of 400 B61 nuclear bombs. Senate Energy-Water Appropriations Subcommittee Chairwoman Dianne Feinstein, D-Calif., had hoped to cut $168 million from the White House request, arguing that it was squeezing out money needed elsewhere." (Ibid)

Energy R&D Appropriations for FY2015

Primary Bill: Consolidated and Further Continuing Appropriations Act, 2015; Energy and Water Development and Related Agencies Appropriations Act, 2015

Public Law: 113-235 **Enacted:** December 16, 2014 **Effective:** December 16, 2014

Function	Nominal change		Real change		Classification
	Millions ($)	YOY%	Millions ($2012)	YOY%	
Defense	$410.0	8.0%	$352.4	7.0%	Exogenous

Congress appropriated a significant increase in nominal and real funding for DOE's atomic energy defense R&D programs for FY2015, again garnering bipartisan support; funding for nondefense energy R&D programs were cut slightly nominal terms, as renewable energy R&D programs again proved polarizing. As in recent years, both DOE functions continued to be top priorities of the Obama administration, with the FY2015 budget request reflecting as much. The regular appropriations process remained stymied for the fifth consecutive year during the Obama administration, and the fiscal year 2015 Energy and Water appropriations bill was bundled into an omnibus bill negotiated after the midterm elections. Environmental issues and climate change had become a political flash point between the parties, particularly ahead of the 2014 midterms, and President Obama had issued related veto threats for both the varied Energy and Water appropriations bills drafted by the House and Senate; the Senate Appropriations Committee did not even bother to mark up their bill because of the veto threat. But the omnibus appropriations bill included nearly the entire increase in FY2015 funding for atomic energy defense activities and weapons programs requested by the Obama administration, which had substantially more support from the Republican-led House Appropriations Committee than for nondefense energy R&D programs. In addition to increases for nuclear weapons activities, the administration had proposed a sizable increase in naval nuclear reactor funding to develop a new class of ballistic missile submarines. The increase in funding for atomic energy defense R&D programs appears to have been motivated by easing concerns about long-term deficit reduction and frustration with the BCA, a breakdown in the regular appropriations process, and bipartisan national security concerns. The policy change appears unrelated to any concerns about inflation, unemployment, or other short-run macroeconomic prerogatives; as such, we classify it as exogenous. Most pertinent narrative evidence:

- "The Budget proposes $8.3 billion for Weapons Activities, an increase of $533 million, or 6.9 percent above the 2014 enacted level, to maintain a safe, secure, and effective nuclear deterrent as described in the Administration's Nuclear Posture Review (NPR) of 2010. Building on last year's jointly conducted cooperative analysis and planning process, [NNSA and DOD] agreed on a prioritized plan and associated budget to meet the key NPR goals within the fiscal constraints of the Bipartisan Budget Act. Key nuclear stockpile programs, like the W76 and B61 life extensions, are sustained... The Budget also includes funds to increase nuclear science and engineering [R&D] found in the Campaigns. The Budget also proposes $1.4 billion to fund naval reactors. This funding continues operational support to nuclear-powered submarines and aircraft carriers, and development of the reactor for the replacement to the OHIO class ballistic missile submarine..." (Budget of the United States, FY2015, p. 76)
- "Due to the limitation on defense funding contained in the Bipartisan Budget Act of 2013 (Division A of Public Law 113–67), the [House Appropriations] Committee is unable to provide adequate support for all priorities within the National Nuclear Security Administration and other security-related programs funded by this recommendation. The Committee therefore continues its strong emphasis on maintaining the nuclear deterrent, including the nuclear weapons and naval reactors programs... The Committee strongly supports the strategic protection afforded by our country's nuclear fleet, which is supported through the Naval Reactors account. The recommendation

prioritizes strategic activities, such as the Ohio-class ballistic submarine replacement reactor program, while delaying infrastructure and technology development needs that, while also important, can be slightly deferred with no strategic repercussions" (H. Rpt. 113-486, June 20, 2014, pp. 6-7)

- "The [House] Committee recommendation is $27,305,845,000 for the Department of Energy, $24,799,000 above fiscal year 2014 and $667,583,000 below the budget request... The Committee's recommendation recognizes the difficult budgetary realities faced for fiscal year 2015. It restructures the balance of the bill to ensure inherently federal responsibilities, such as national security, basic science activities, and environmental cleanup, are supported, while investing in long-term research to improve the efficiency of existing forms of energy production and to develop new and innovative forms of energy for the nation's long-term energy independence and prosperity... The Committee recommends $1,789,000,000 for Energy Efficiency and Renewable Energy, $112,686,000 below fiscal year 2014 and $527,749,000 below the budget request" (Ibid, p. 89, 95)
- "the Obama administration's efforts to beef up the Energy Department's role in renewable-energy research and financing was resisted by appropriators from states producing coal, oil, and natural gas—and turned the spending bill into a vehicle for contentious policy fights over clean-energy loans, the Yucca Mountain nuclear waste disposal site, and light bulb efficiency standards... President Barack Obama proposed a 2.6 percent increase in spending for the Energy Department in fiscal 2015 that would have dramatically increased federal investments in [R&D] of renewable-energy technologies while cutting subsidies for fossil fuels research. House Budget Chairman Paul D. Ryan, the 2012 GOP vice presidential nominee, countered with a budget blueprint to slash Energy Department renewable-energy research and loan programs. House appropriators came up with a $34 billion bill calling for cutting spending on renewable energy to $1.8 billion and increasing fossil-fuel research to $593 million... President Obama already had threatened to veto the bill—the administration objected to restrictions on cooperation with Russia on nonproliferation programs and cuts in funding for renewable energy programs..." ("Fossil Fuel, Renewable Spending Up," *CQ Almanac 2014*, 70th ed., 2-16-2-17. Washington, DC: CQ-Roll Call, Inc., 2015)
- "The Senate Energy and Water Development Appropriations subcommittee approved its draft version of a $34.2 billion bill on June 17. The bill included $28.36 billion for the Energy Department, a 4 percent increase from 2014 levels, including $5.09 billion for the Office of Science, $2.1 billion for energy efficiency and renewable energy programs, and $280 million for the Advanced Research Projects Agency-Energy. Subcommittee Chairwoman Dianne Feinstein, D-Calif., objected to the high level of defense-related spending in the measure, which, she said, accounts for 54 percent of the funding in the bill." (Ibid)
- "The sweeping fiscal 2015 omnibus spending bill, which included 11 of the 12 regular appropriations means, included $34.7 billion for energy and water funding, bumping up expenditures on fossil fuel and nuclear programs... The bill would increase spending for research on advanced coal, natural gas, oil, and other fossil energy technologies to $571 million, a 1.5 percent increase from fiscal 2014 levels, while maintaining renewable energy development at $1.9 billion and science research at $5.1 billion, according to the summary. Funding for nuclear energy [R&D] increased by 2.7 percent to $914 million." (Ibid)
- "[Senate Appropriations Committee Chair Barbara] Mikulski put off a markup of

the Energy-Water appropriations measure in consultation with Reid and subcommittee Chairwoman Dianne Feinstein, D-Calif., because the White House was going to threaten to veto the measure. That was because of an expected amendment from Minority Leader Mitch McConnell, R-Ky., that would have effectively blocked the EPA's recently announced carbon standards for existing power plants. "We're not here to debate global warming" on an appropriations bill, Mikulski had said. In fact, the EPA had become such a flashpoint, ahead of the midterm elections, that environmental issues became one of the single biggest obstacles to passing appropriations bills in the Senate at all before the end of the fiscal year." ("High Hopes for 'Regular Order' End in Yet Another Midwinter Omnibus," *CQ Almanac 2014*, 70th ed., 2-3-2-8. Washington, DC: CQ-Roll Call, Inc., 2015)

- "In 2014, for the fifth year in a row, Congress was unable to complete a single one of its 12 regular appropriations bills and had to shovel everything into a midwinter omnibus that finally reached President Barack Obama nine days before Christmas... As they have each year, House and Senate leaders and leading appropriators began 2014 optimistically—at least in public—holding hearings, marking up bills and even passing some of them. By summer, though, the reality of an election year and intractable differences on fiscal policy had set in, and work on the individual appropriations bills slowed to a halt. Several months and an election would pass before the process began to move again, and then only in desperation that the government might run out of cash... After an off-year election in which Republicans won control of the Senate for the first time since 2006 and strengthened their hold on the House by 14 seats, Congress got down to negotiating an omnibus spending bill... Overall, the omnibus measure set regular discretionary spending at $1.013 trillion, meeting the defense and nondefense spending limits set under the 2013 budget deal (PL 113-67)" (Ibid)

Energy R&D Appropriations for FY2016

Primary Bill: Consolidated Appropriations Act, 2016; Energy and Water Development and Related Agencies Appropriations Act, 2016

Public Law: 114-113 **Enacted:** December 18, 2015 **Effective:** December 18, 2015

Function	Nominal change		Real change		Classification
	Millions ($)	YOY%	Millions ($2012)	YOY%	
Defense	$870.0	15.6%	$883.1	16.4%	Exogenous
Nondefense	$757.0	8.9%	$782.6	9.4%	Exogenous

Congress appropriated significant increases in nominal and real funding for both DOE's nondefense energy R&D programs and NNSA's atomic energy defense R&D programs for FY2016. As in recent years, both research areas continued to be top priorities of the Obama administration, particularly in developing renewable energy sources to address climate change, and the FY2016 budget request again proposed sizable increases for these programs. The Republican-led House Appropriations Committee remained more supportive of DOE's science and basic research programs and less keen on funding renewable energy R&D programs, perennially in the cross-hairs of members representing coal, oil, and gas interests; the House Appropriations Committee was, however, much more supportive of NNSA's atomic energy defense programs—particularly for nuclear weapons modernization—and approved most of the requested increase over FY2015 levels, unlike the requested increase in

energy science and research funding. President Obama again threatened to veto the House bill, citing budget cuts to renewable energy R&D programs as chief among his concerns, but did not have to act on a standalone bill, as the appropriations process broke down for a sixth consecutive year, exacerbated by the ever unpopular BCA limits on spending. Congressional Republicans were trying to circumvent BCA spending caps for defense spending using budget gimmicks, and Congressional Democrats responded by refusing any budget deal adhering to the caps; with FY2016 funding limping along on a CR, negotiators eventually agreed upon a deal significantly easing the spending caps for FY2016-17 and avoiding another government shutdown. The omnibus FY2016 appropriations bill came much closer to meeting the administration's budget request for DOE, providing more funding than approved by either the House or Senate, with notable increases for the renewable energy R&D programs sought by President Obama. The budget deal also provided a substantial increase for the NNSA, meeting the administration's request for weapons activities, including science and technology programs. The increases in both defense and nondefense energy R&D funding appear to have been driven by easing concerns about long-term deficit reduction and frustration with the BCA, a breakdown in the regular appropriations process, and longer-term concerns about national security and climate change. Both policy changes appear unrelated to any concerns about inflation, unemployment, or other short-run macroeconomic prerogatives; as such, we classify both as exogenous. Most pertinent narrative evidence:

- "Our Nation thrives when we are leading the world with cutting-edge technology in manufacturing, infrastructure, clean energy, and other growing fields... No challenge poses a greater threat to future generations than climate change... The Pentagon says that climate change poses immediate risks to our national security" (Budget Message of the President, FY2016, February 2, 2015, p. 3)
- "The Budget provides $146 billion for R&D overall, a 5.5 percent increase from 2015, targeting resources to areas most likely to directly contribute to the creation of transformational knowledge and technologies that can benefit society and create the businesses and jobs of the future... To continue the cutting-edge R&D that is essential to U.S. innovation and economic competitiveness, the Budget provides DOE's Office of Science with over $5.3 billion and NSF with over $7.7 billion. These investments support ground-breaking research and world-leading facilities across fields of science and engineering, including advanced manufacturing, clean energy, climate science, information technology, and life sciences." (Budget of the United States, FY2016, p. 18)
- "Cutting carbon pollution is essential to reducing the threat of climate change and represents one of the greatest economic opportunities... To support the development of pollution-cutting technologies, the Budget invests approximately $7.4 billion in clean energy technology programs, advancing American clean energy leadership, supporting job creation, and increasing energy security. These programs conduct research, development, and deployment efforts that stimulate the evolution and use of clean energy sources such as solar, wind, and low-carbon fossil fuels, as well as energy-efficient technologies, products, and process improvements... DOE provides about 75 percent of the clean energy technology funding and supports a wide array of efforts across the clean energy spectrum that will further reduce costs and increase the use of clean energy technologies... DOE is also developing technologies that reduce the costs of carbon capture from fossil fuels, undertaking research to ensure the safe, permanent storage of carbon dioxide in underground geologic formations, and conducting R&D to measure and mitigate fugitive methane emissions from natural gas infrastructure. DOE is also

supporting R&D in advanced nuclear reactor technologies, life extension for existing power plants, and innovative fuel-cycle concepts." (Ibid, pp. 20-21)

- "Funding for the National Nuclear Security Administration (NNSA), which includes nuclear weapons activities, defense nuclear nonproliferation, naval reactors, and federal salaries and expenses, is $12,329,000,000, $921,705,000 above fiscal year 2015 and $236,400,000 below the budget request. Funding for energy programs within the Department of Energy, which includes basic science research and applied energy programs, is $10,324,007,000, $91,265,000 above fiscal year 2015 and $1,230,957,000 below the budget request." (H. Rpt. 114-91, April 24, 2015, p. 5)
- "As in previous years, the [House Appropriations] Committee considers the national defense programs run by the National Nuclear Security Administration (NNSA) to be the [DOE's] top priority. The recommendation strongly supports the Department's proposals to modernize the nuclear weapons stockpile, increase investment in the NNSA's infrastructure, prevent the proliferation of nuclear materials, and provide for the needs of the naval nuclear propulsion program. Within funding for the NNSA's Weapons Activities, the recommendation continues support of the multi-year modernization plans for the nation's nuclear weapons stockpile and its supporting infrastructure... The Committee also strongly supports the activities to maintain our country's nuclear naval fleet, which is funded through the Naval Reactors account. The recommendation continues to prioritize the multi-year development needs of the Ohio-class ballistic missile submarine replacement reactor program" (Ibid, pp. 6-7)
- "The regular appropriations process for fiscal 2016 broke down early in the summer when Senate Democrats vowed to block consideration of any spending bills that adhered to discretionary spending limits set by the 2011 Budget Control Act (PL 112-25). Democrats argued for negotiations toward a bipartisan budget deal similar to the bargain struck in 2013... that would provide more money for both defense and nondefense programs. Republicans in 2015 had sought to circumvent the defense spending limit by adding $38 billion to a Pentagon account for Overseas Contingency Operations not subject to spending limits, without offering a similar boost to nondefense spending. Democrats decried the maneuver as a budgetary gimmick. To avoid a government shutdown when fiscal 2015 appropriations expired on Sept. 30, Congress passed a 10-week continuing resolution... on Oct. 26, 2015, congressional leaders and the White House reached an agreement to raise discretionary spending caps by $80 billion over two years and suspend the debt limit until March 2017. The increases in spending limits—$50 billion in fiscal 2016 and $30 billion in fiscal 2017—were split evenly between defense and nondefense accounts. That parity was a victory for Democrats, who had long maintained that any boost in defense spending should be accompanied by an equal increase in domestic spending... The talks resulted in a $1.15 trillion omnibus appropriations bill" ("Budget Agreement with White House Sets the Stage for December Omnibus," *CQ Almanac 2015*, 71st ed., edited by CQ-Roll Call, 2-3-2-6. Washington, DC: CQ-Roll Call, Inc., 2016)
- "The fiscal 2016 omnibus spending bill (HR 2029) gave a robust $37.2 billion for energy and water programs, a $3 billion boost from fiscal 2015 levels and about $2 billion more than House and Senate appropriators originally allocated. The omnibus provided $29.7 billion for the Energy Department, including the restoration of $40 million in climate change research that was initially cut by House appropriators... The administration declared energy efficiency and renewable energy to be a high priority and sought to beef

up spending in this area in his budget request. However, this funding was resisted by appropriations from states that produce coal, oil, and natural gas." ("Energy, Water Spending is Increased," *CQ Almanac 2015*, 71st ed., edited by CQ-Roll Call, 2-14-2-15. Washington, DC: CQ-Roll Call, Inc., 2016)

- "President Obama proposed a 3.6 percent budget increase for the Energy Department in fiscal 2016 that would have markedly raised federal investments in the [R&D] of renewable-energy technologies while cutting subsidies for fossil fuel research. House Budget Chairman Tom Price, R-Ga., countered with a budget blueprint to slash Energy Department renewable-energy research and loan programs. House appropriators came up with a $36.1 billion bill calling for cutting spending on renewable energy to $1.7 billion and increasing fossil fuel research to $605 million... President Obama already had threatened to veto the bill, criticizing its reductions from his proposed budget request for energy efficiency and renewable energy..." (Ibid)
- "The measure appropriated a total of $12.5 billion for the National Nuclear Security Administration, a semiautonomous agency within the Energy Department that is responsible for the development, maintenance, and disposal of U.S. nuclear weapons and for preventing the proliferation of weapons of mass destruction. The total is 10 percent more than fiscal 2015 levels. The total includes the administration's requested $8.8 billion for programs that maintain and refurbish nuclear weapons to ensure the safety, security, reliability, and performance of the nation's nuclear stockpile." (Ibid)
- "The sweeping [omnibus] deal was the product of a convergence of forces: Speaker Paul D. Ryan's deftness in pacifying rebellious conservatives, the recognition by Republicans that a government shutdown could cripple them in the races for the White House and Senate and a recovering economy that helped end an era of austerity. The relatively swift passage of the prodigious year-end package—by wide margins in the House and in the Senate—in many respects showed lawmakers bowing to the hard realities of a divided government... After a period of belt-tightening in Washington—including automatic budget cuts imposed in 2013—the spending measure for 2016 provides a notable $66 billion increase in federal outlays above previously agreed-upon limits, divided equally between military and nonmilitary programs" ("Congress Passes $1.8 Trillion Spending Measure," by David M. Herszenhorn, *New York Times*, December 18, 2015)

Energy R&D Appropriations for FY2018

Primary Bill: Consolidated Appropriations Act, 2018; Energy and Water Development and Related Agencies Appropriations Act, 2018

Public Law: 115-141 **Enacted:** March 23, 2018 **Effective:** March 23, 2018

Function	Nominal change		Real change		Classification
	Millions ($)	YOY%	Millions ($2012)	YOY%	
Defense	$1,098.0	17.0%	$888.4	14.3%	Exogenous
Nondefense	$1,729.0	18.8%	$1,466.1	16.4%	Exogenous

Congress appropriated significant increases in nominal and real funding for both DOE's nondefense energy R&D programs and NNSA's atomic energy defense R&D programs for FY2018, facilitated by Congress once again overruling the fiscal restraint set in place by the BCA in 2011. In his first State of the Union address and budget, President Trump proposed

eliminating the defense sequester and increasing defense spending to "rebuild" America's military. The FY2018 budget request proposed sizable increases in atomic energy defense activities, particularly for modernizing nuclear weapons, and cut deeply into DOE's renewable energy R&D and science programs, eliminating the popular ARPA-E program. The House Appropriations Committee's Energy and Water bill was supportive of the requested increase in funding for NNSA and somewhat cushioned energy research programs from the administration's proposals, but still would have cut nondefense energy R&D funding for FY2018 well below FY2017 levels; a $1 billion increase in weapons activities funding was effectively offset by roughly equivalent cuts in renewable energy research. More tellingly, a group of Republican Senators publicly wrote to President Trump imploring him to reconsider and "continue to invest in the [DOE's] [R&D] program." Congressional Democrats were also opposed to deep cuts to DOE's energy supply research programs and refused to eliminate the defense sequester without also easing spending limitations on nondefense discretionary spending. For the third time in five years, Congress coalesced around bipartisan frustration with the spending limits imposed by the BCA, and negotiated an agreement—the Bipartisan Budget Act of 2018—lifting both the defense and nondefense discretionary spending limits for FY2018 and FY2019. That budget deal in turn opened the door for much higher levels of DOE funding in the FY2018 omnibus appropriations bill, which was enacted in March 2018, yet again narrowly avoiding another government shutdown; the regular order appropriations process remained thoroughly broken, and Congress had kept the lights running with a series of short-term CRs for the first half of the fiscal year. The omnibus bill secured the increases in defense and nuclear weapons funding the administration was prioritizing in exchange for increased funding for a myriad of Congressional Democrats' policy priorities, including renewable energy R&D, increasingly supported by Senate Republicans as well. The eventually enacted increases in funding for defense and nondefense energy R&D programs appear to have been driven by concerns about long-term deficit reduction and frustration with the BCA, a continued breakdown in the regular appropriations process, and longer-term national security and climate change concerns. Both policy changes appear unrelated to any concerns about inflation, unemployment, or other short-run macroeconomic prerogatives, and as such, we classify them as exogenous. Most pertinent narrative evidence:

- "I am sending Congress a budget that rebuilds the military, eliminates the defense sequester, and calls for one of the largest increases in national defense spending in American history." Donald J. Trump, State of the Union Address, February 28, 2017 (*The American Presidency Project*, https://www.presidency.ucsb.edu/node/323680)
- "President Trump submitted his FY2018 budget proposal to Congress on May 23, 2017. The budget requests for agencies included in the Energy and Water Development appropriations bill total $34.189 billion (including offsets)—$4.261 billion (11.1%) below the FY2017 level. The largest proposed increase would go toward DOE nuclear weapons activities, up by $994 million (10.7%)... Under the FY2018 budget request, appropriations for DOE [R&D] on energy efficiency and renewable energy (EERE), nuclear energy, and fossil energy would be cut by a total of 53.7%. The House panel approved most of the reductions in EERE R&D (54.4% from FY2017 enacted) but largely rejected the proposed nuclear and fossil energy reductions (4.7% and 5.0%, respectively). The Senate subcommittee largely rejected reductions in EERE approving funding at $153 million below fiscal year 2017 enacted level (7.3% reduction)... The Trump Administration proposes to eliminate funds for new research projects by ARPA-E, and

terminate the program after currently funded projects are completed. The ARPA-E termination was approved by the House committee. The Senate subcommittee rejected the termination and approved an increase in funding for ARPA-E above the FY2017 enacted level" ("Energy and Water Development: FY2018 Appropriations," by Mark Holt and Corrie E. Clark, *Congressional Research Service*, R44895, July 19, 2017)

- "Funding for energy programs within the Department of Energy, which includes basic science research and the applied energy programs, is $9,609,001,000, $1,674,689,000 below fiscal year 2017 and $2,098,102,000 above the budget request... Strong support is included for basic science programs, which provide the foundation for the new energy technologies that are vital to maintaining our global competitiveness and ensuring our country's long-term prosperity, but that are often too high-risk to receive the attention of the private sector. In contrast, the recommendation provides limited resources for the applied energy [R&D] activities with the greatest opportunity for private sector backing... As in previous years, the [House Appropriations] Committee considers the national defense programs run by the National Nuclear Security Administration (NNSA) to be the [DOE's] top priority. The recommendation strongly supports the Department's proposals to modernize the nuclear weapons stockpile, increase investment in the NNSA's infrastructure, prevent the proliferation of nuclear materials, and provide for the needs of the naval nuclear propulsion program." (H. Rpt. 115-230, July 17, 2017, pp. 5-6)
- "Dear President Trump: We write today to express our continued support for the [DOE's] research programs and urge you to maintain funding for these critical programs... [DOE]'s research programs have made the United States a world leader in science and technology, and will help the United States maintain its brainpower advantage and remain competitive with countries like China and India... We cannot lose the technological advantages we have gained through our country's investment in [R&D]. Governing is about setting priorities, and the federal debt is not the result of Congress overspending on science and energy research each year. We urge you to continue to invest in the [DOE's] [R&D] programs in fiscal year 2018" (Letter to President Trump, by Senators Lamar Alexander, Susan Collins, Lindsey Graham, Lisa Murkowski, Cory Gardner, and M. Michael Rounds, May 18, 2017)
- "The House Appropriations Committee approved a $37.6 billion Energy-Water spending bill by voice vote on July 12... [which] would provide $203 million less than fiscal 2017 funding (PL 115-31), a cut of less than 1 percent, but $3.3 billion—or almost 10 percent—more than Trump sought. The boost largely avoided drastic proposed cuts to energy-related [R&D]. But not every program escaped intact. In order to fund an almost $1 billion increase in Department of Energy nuclear weapon activities, the House bill would slash renewable and energy efficiency research funding by about the same amount... The bill also still would deny funding for ARPA-E. The administration argued that the cut would align with the broader effort to move DOE's responsibilities away from commercializing technology in favor of the basic, or the beginning phases, of scientific research... The [Senate Energy-Water Appropriations] subcommittee proposed $31.5 billion for the Energy Department, a $700 million increase from fiscal 2017 and $3.5 billion more than the request. "[DOE's] research programs and 17 national laboratories have made the United States a world leader in science technology, which is why we must continue to prioritize spending on these efforts so the United States remains competitive at a time when other countries are investing heavily in research,"

Energy-Water Chairman Lamar Alexander, R-Tenn., said... The bill would continue funding for the politically popular ARPA-E program, which the House proposed defunding to match the administration's request. The program funds high-potential energy projects that are deemed too experimental for private investment."("Energy-Water: Energy Research Program Is Targeted," *CQ Almanac 2017*, 73rd ed., edited by CQ-Roll Call, 2-29-2-30. Washington, DC: CQ-Roll Call, Inc., 2018)

- "For FY2018, funding for energy and water development programs was provided by Division D of the Consolidated Appropriations Act, 2018 (P.L. 115-141), an omnibus funding measure passed by Congress on March 23, 2018, and signed into law the same day. Total funding for Division D was $43.212 billion. That total was $9.030 billion above the FY2018 Administration request and $4.768 billion over the FY2017 level. The BCA's statutory discretionary spending limits were increased for FY2018 and FY2019 by the Bipartisan Budget Act of 2018 (BBA 2018; P.L. 115-123), enacted February 9, 2018. For FY2018 BBA 2018 increased the defense limit by $80 billion (to $629 billion) and increased the nondefense limit by $63 billion (to $579 billion)" ("Energy and Water Development: FY2019 Appropriations," by Mark Holt and Corrie E. Clark, *Congressional Research Service*, R45258, July 17, 2018)
- "In dividing up the spoils of that budget agreement, Congress rebuked the Trump administration's initial vision for the federal government in many ways. The president's desire to drastically cut spending on the environment was rebuffed... "In order to get the defense spending, primarily, but all the rest of our priorities funded, we had to give away a lot of stuff that we didn't want to give away" to Democrats, Mick Mulvaney, the White House budget director, told reporters" ("Congress Approves $1.3 Trillion Spending Bill, Averting a Shutdown," by Thomas Kaplan, *New York Times*, March 22, 2018)
- "Buried in the $1.3 trillion spending bill passed by Congress and grudgingly signed by President Trump were surprisingly large increases in funding for clean energy programs at the Department of Energy. The Office of Energy Efficiency and Renewable Energy, which has helped reduce the cost of solar power, got a 14 percent bump. The Advanced Research Projects Agency-Energy, which funds long-shot technologies like algae biofuels, got a 16 percent increase. The Office of Nuclear Energy got a 19 percent increase. The bill was seen as a repudiation of Mr. Trump's budget requests. The president, for instance, had asked lawmakers to eliminate the advanced projects agency, saying that such research was best left to the private sector." ("Three Climate Updates You Might Have Missed (and One We Did, Too)," by Brad Plumer, Lisa Friedman, and John Schwartz, *New York Times*, March 28, 2018)
- "A number of Republicans who don't typically talk about global warming have nonetheless been eager to support clean energy research in recent years. "The one thing we do better than any country in the world is innovation through research," said Senator Lamar Alexander, Republican of Tennessee, at an advanced projects agency conference this month. "We must be careful not to lose this advantage"... As industries like wind and solar have expanded, they've acquired significant political clout. So far, at least, that's made it harder for even the most committed climate change denialists in Washington to roll back clean energy programs" (Ibid)

Energy R&D Appropriations for FY2019

Primary Bill: Energy and Water, Legislative Branch, and Military Construction and Veterans Affairs Appropriations Act, 2019; Energy and Water Development and Related Agencies Appropriations Act, 2019

Public Law: 115-244 **Enacted:** September 21, 2018 **Effective:** October 1, 2018

Function	Nominal change		Real change		Classification
	Millions ($)	YOY%	Millions ($2012)	YOY%	
Defense	$920.0	12.2%	$729.1	10.3%	Exogenous

Congress appropriated significant increases in nominal and real funding for NNSA's atomic energy defense R&D programs for FY2019, again facilitated by the Bipartisan Budget Act of 2018 having recently lifted the BCA's discretionary spending caps. Funding for DOE's nondefense energy research programs saw only a modest nominal increase and a smaller rise in real terms. Modernizing U.S. nuclear weapons and the nuclear triad remained a top priority of the Trump administration, and the FY2019 budget request reflected as much. Emphasis on nuclear security and weapons modernization was shared by Congress; the House Appropriations Committee recommended an additional $222 million for the NNSA above and beyond the FY2019 budget request, while the Senate Appropriations Committee nearly met the administration's request in full. The budget request had again proposed cutting DOE's renewable energy programs and tried to force a shift away from late-stage energy R&D to focus solely on early-stage work, an approach soundly rejected by appropriators in both chambers and the conference committee. The Bipartisan Budget Act of 2018, enacted in February 2018, had raised the defense and nondefense discretionary spending limits for FY2018 and FY2019, enabling another sizable increase in NNSA's budget for FY2019. In an unusual development, Congress bundled the twelve appropriations bills into three "minibus" appropriations bills, as opposed to a single, larger omnibus bill. The first of these appropriations bills, which funded the Department of Energy, was cleared shortly before the beginning of the fiscal year, but the appropriations process remained highly dysfunctional; disagreements over the third minibus bill led to a record-breaking 35-day partial government shutdown in late 2018 and early 2019. The increased funding for atomic energy defense R&D programs appears to have been driven by easing concerns about long-term deficit reduction, frustration with the BCA, and national security concerns about the aging U.S. nuclear arsenal. The policy change appears unrelated to any concerns about inflation, unemployment, or other short-run macroeconomic prerogatives, and as such, we classify it as exogenous. Most pertinent narrative evidence:

- "Around the world, we face rogue regimes, terrorist groups, and rivals like China and Russia that challenge our interests, our economy, and our values. In confronting these horrible dangers, we know that weakness is the surest path to conflict and unmatched power is the surest means to our true and great defense. For this reason, I am asking Congress to end the dangerous defense sequester and fully fund our great military. As part of our defense, we must modernize and rebuild our nuclear arsenal, hopefully, never having to use it, but making it so strong and so powerful that it will deter any acts of aggression by any other nation or anyone else." Donald J. Trump, State of the Union Address, January 30, 2018 (*The American Presidency Project*, https://www.presidency.ucsb.edu/node/331779)
- "A tailored and flexible American nuclear deterrent is key to protecting national security and future prosperity for both the homeland and America's allies and partners. In

line with the Nuclear Posture Review, the Budget supports a nuclear enterprise that is appropriately tailored to deter 21st-century threats. To that end, the Budget requests $24 billion to modernize and sustain the three legs of the nuclear triad—land, sea, and air—as well as nuclear command, control, and communications systems." (Budget of the United States, FY2019, pp. 35-36)

- "President Trump submitted his FY2019 budget proposal to Congress on February 12, 2018. The President's budget requests for agencies included in the Energy and Water Development appropriations bill totaled $36.341 billion (excluding rescissions)—$6.871 billion (15.9%) below the FY2018 appropriation. A $375 million increase (3.5%) was proposed for DOE nuclear weapons activities. In contrast, the two versions of the FY2019 Energy and Water Development Appropriations bill passed by the House and Senate... would boost total appropriations above the FY2018 level." ("Energy and Water Development: FY2019 Appropriations," by Mark Holt and Corrie E. Clark, *Congressional Research Service*, R45258, July 17, 2018)
- "The [House Appropriations Committee] recommendation includes $15,313,147,000 for the NNSA, $644,195,000 above fiscal year 2018 and $222,097,000 above the budget request... The NNSA's budget request for Weapons Activities proposed significant reductions to infrastructure recapitalization and deferred maintenance reduction efforts. The Committee is concerned that, in order to pay for the projected costs of its major nuclear modernization programs, the NNSA is undercutting the investments needed to address the entirety of its aging infrastructure problems and to build a nuclear weapons workforce that possesses the skills and knowledge needed to design, develop, test, and manufacture warheads, as endorsed in the Administration's Nuclear Posture Review... The recommendation provides additional funding above the request to continue the current pace of infrastructure recapitalization efforts across the nuclear security enterprise, including efforts to reduce the backlog of deferred maintenance and to upgrade physical security systems to improve the security posture of the NNSA sites." (H. Rpt. 115-697, May 21, 2018, p. 107)
- "The Committee recommendation for the [NNSA] continues funding for recapitalization of our nuclear weapons infrastructure while modernizing and maintaining a safe, secure, and credible nuclear deterrent without the need for underground testing. This is among our most important national security priorities." (S. Rpt. 115-258, May 24, 2018, p. 101)
- "The budget request proposes a shift away from later-stage [R&D] activities to refocus the Department on an early-stage [R&D] mission. The [Senate Appropriations] Committee believes that such an approach will not successfully integrate the results of early-stage [R&D] into the U.S. energy system and thus will not adequately deliver innovative energy technologies, practices, and information to American consumers and companies. The Committee directs the Department to implement mid- and late-stage [R&D] activities as directed in this report in a timely manner" (Ibid, p. 62)
- "The Department is directed [by the conference committee] throughout all of its programs to maintain a diverse portfolio of early-, mid-, and late-stage research, development, and market transformation activities." (H. Rpt. 115-929, p. 148)

4.3 Narrative Analysis of NASA R&D Appropriations

The Soviet Union's successful launch of Sputnik 1 on October 4, 1957, radically and rapidly changed U.S. investment in aerospace R&D. In quick response, President Dwight D. Eisenhower proposed the creation of a new agency, the National Aeronautics and Space Administration, deliberately chosen to place the U.S. space program under civilian rather than military control. After some short-lived disagreement about a civilian versus military trajectory, Congress obliged, and President Eisenhower signed the National Aeronautics and Space Act into law on July 29, 1958, establishing the agency effective October 1, 1958. NACA, a smaller agency created to increase aeronautics research during WWI that had worked with the military ever since, was dissolved and folded into the new agency; given the relative size of their budget, we ignore NACA activities prior to Sputnik's launch. But Congress provided NACA with substantial emergency supplemental appropriations after Sputnik's launch, while legislation was being drafted to create NASA, and it was understood that the research functions of NACA were about to be folded into the new aerospace agency, so our history begins then in FY1958.[27]

Despite long planning horizons for space mission research, development, testing, and evaluation, NASA's program direction has, at times, swung dramatically in response to geopolitical events, accidents, or different visions of a new administration (at least every four or eight years). The U.S. space program has also evolved wildly during NASA's relatively short existence, and new scientific breakthroughs or high-profile space program accomplishments (or setbacks) have periodically swayed Congress's willingness to fund the agency's R&D work. Reflecting as much, NASA's budgetary structure has been frequently reshuffled, but in recent years the principal NASA budget accounts (and subaccounts) funding aerospace R&D are those for Science (Earth Science, Planetary Science, Astrophysics, the James Webb Telescope, and Heliophysics), Aeronautics, Space Technology, Exploration (Human Exploration Capabilities, Commercial Spaceflight, Exploration Research and Development), and Space Operations (International Space Station, Space and Flight Support). Earlier budgetary accounts focused more on manned versus unmanned spaceflight and ground-based mission support or NASA-wide activities for research, development, and operations, research and program management, and construction and equipment; see Appendix A.3 for details regarding budget accounts and quantification of NASA's aerospace R&D funding.

NASA's early work was focused on catching up to the Soviet Union in the fields of rocketry and space science; there was a large gap to close, stemming from nuclear weapons development and related decisions about strategic weapons systems over the past decade. Given the weight and size of early atomic bombs, the U.S. had heavily invested in long-range strategic bombers, whereas the Soviet Union was well behind the U.S. in bomber technology and instead invested in ballistic missiles capable of lifting heavy payloads, also a key building block for their space program. It was not until the development and testing of much smaller hydrogen bombs and miniaturized thermonuclear warheads in the early 1950s that the U.S. started heavily investing in long-range missile technology—both nations had deployed significant air defenses, compromising long-range bombers—but these missiles were designed to lift smaller payloads than the early Soviet missiles designed for atomic warheads. Certain missile programs and the U.S. scientific satellite program were transferred to NASA, along with NACA, and the new space agency accelerated work developing larger rockets that could carry both unmanned satellites and manned spacecraft. Adding pressure, the U.S.S.R. continued to hit a series of early space milestones before the United States;

[27] This overview is based in part on the NASA (2023) timeline as well as the primary sources cited below in this chapter.

the Soviet Union's Luna 1 satellite made the first flyby of the moon in January 1959, Luna 2 became the first unmanned object to reach the moon's surface in September 1959, and cosmonaut Yuri Gagarin became the first human to fly in space and the first to orbit the earth in April 1961, among other early space race feats.

The first U.S. manned space program was Project Mercury (1958-63), intended to launch an American astronaut into orbit and safely return them to Earth, as well as to learn about supporting human life in space. Astronaut Alan Sheppard became the first American in space during a short suborbital flight in May 1961. Just weeks later, President John F. Kennedy dramatically altered the trajectory for the space program when he challenged the U.S. to land an astronaut on the Moon and safely return them by the end of the decade. Along with President Kennedy's lofty moon mission came huge budget requests for NASA and rapid growth in Congressional appropriations for the space program; between FY1958-64, NASA's budget grew in real terms by roughly 40-150% each year. Project Gemini (1961-66), the second manned spaceflight program, developed a more advanced, longer-range spacecraft for a crew of two astronauts, working toward the goal of transporting astronauts to the Moon. And the Apollo Program (1961-1972) developed the larger three-person spacecraft destined for the Moon landing. The crew of Apollo 8 became the first humans to orbit the Moon in December 1968, and the crew of Apollo 11 met President Kennedy's challenge with just a few months to spare, when astronauts Neil Armstrong and Buzz Aldrin landed on the Moon's surface in July 1969 and then safely returned to Earth. The Apollo program continued with five subsequent, successful Moon landings over 1969-72, but by then Congress had long since lost interest in funding such a costly manned spaceflight program.

By the mid-1960s, it was increasingly clear that the U.S. had caught up with or surpassed the Soviet Union's space program and would likely win the Moon race, to the effect of NASA requesting less funding and Congress being less inclined to fully fund those requests. And when President Kennedy was assassinated in November 1963, NASA lost their most influential benefactor; no other president committed nearly the same degree of budgetary resources to the space program. After being sworn into office, President Johnson continued to prioritize the Moon mission in large part to honor Kennedy, but NASA's (now sizable) budget was soon pitted against other priorities. The Vietnam War, the war on poverty and Great Society legislation, and growing inflationary pressure from the federal budget all constrained NASA's budget, and "beating the Soviets in space" lost its allure as a funding call after the Moon landing; the inflationary OPEC oil shock led to a further acceleration of inflation and related tightening of the federal purse-string, with NASA's budget taking another hit. In real terms, NASA's research and science budget peaked in FY1965 and then steadily fell for more than a decade, with funding cut nearly 60% over FY1966-76.

Funding for NASA was much tighter in the post-Apollo landscape, but the space program adapted and pursued new missions, and the agency retained a critical mass of congressional support, including some prominent members from Florida (home to the Kennedy Space Center), Texas (Johnson Space Center), Alabama (Marshall Space Flight Center), Maryland (Goddard Space Flight Center), Virginia (Langley Research Center), Mississippi (Stennis Space Center), Ohio (Glenn Research Center), and California (Ames Research Center, Armstrong Flight Research Center, and the Jet Propulsion Laboratory). In 1972, NASA began development work on a reusable space shuttle, officially named the Space Transportation System (STS), a fourth and hopefully more cost-effective installment of the manned space program. And in 1973, NASA launched the first U.S. space station, Skylab, two years after the Soviet Union had launched the Salyut 1, the first-ever manned space station. But the

space program began shifting away from adversarial competition with the Soviets and toward diplomacy and international cooperation; in 1975, Soviet and U.S. spacecraft docked together in the first joint space mission between the superpowers, cemented by a handshake between astronauts and cosmonauts, seen as a major deescalation of the Cold War. Emphasis was also placed on unmanned space exploration further into the solar system and beyond, with a successful flight to Mars in 1971 (Mariner 9) and Mars landing in 1976 (Viking 1).

Breaking the trend in NASA's falling budget, President Carter took a particular interest in the space program in the late 1970s, part of a broader push to increase federal funding for science and technology. Concerned about the environment and focused on nuclear nonproliferation efforts, the Carter administration was keen to use unmanned space satellites to learn more about the weather, natural disasters, natural resources, and compliance with arms control treaties on Earth, as well as the solar system more broadly. In 1981, U.S. manned spaceflight resumed with the first launch of the new space shuttle, opening the door to the launch of more unmanned missions from orbital shuttle missions as well as the eventual construction of a permanently manned space station (Skylab reentered Earth's atmosphere and disintegrated in 1979 before the new shuttle program could be used to restore its orbit).

The Reagan administration was also keenly interested in the space program, but wanted more integration between NASA and DOD, and prioritized the development of a permanent manned U.S. space station that would serve both civilian and military objectives; significant funding for the space shuttle program was funneled to NASA via DOD during the Reagan administration. But NASA's manned space program was dealt a devastating blow when the space shuttle Challenger exploded shortly after takeoff in January 1986, and the shuttle fleet was grounded for years while developing and testing improvements for safer flights. The pause delayed the launch of unmanned scientific missions in addition to slowing work on a space station, which remained a top priority of President Reagan and Vice President George H.W. Bush, who was elected president in November 1988. In July 1989, on the 20th anniversary of the Apollo Moon landing, President George H.W. Bush announced an ambitious plan to return astronauts to the Moon and then to venture to Mars, in addition to continuing work on a permanently manned U.S. space station. Shuttle launches had recently resumed in September 1988, and the revolutionary Hubble Space Telescope was deployed from the space shuttle Discovery shortly thereafter in April 1990.

The end of the Cold War led to another shift in the space program, again toward international cooperation and diplomatic objectives; the Cold War "peace dividend" also facilitated Congress appropriating the large increases in NASA's budget once again being requested by the Bush administration. But plans for a U.S. space station—running behind schedule and vastly over budget—were scrapped by the Clinton administration in 1993 in favor of cooperating with Russia, Canada, Japan, and the European Space Agency on an international space station. President Clinton was primarily focused on deficit reduction, and the administration's secondary emphasis on investments in science and technology ended up prioritizing funding for NIH and NSF, not NASA; real aerospace R&D funding for NASA steadily fell over FY1993-2000. In an era of fiscal restraint, the Clinton administration prioritized cheaper unmanned space exploration, arguably of greater scientific merit. In December 1995, NASA's Galileo spacecraft made the first orbit around Jupiter, having been launched in October 1989. President Clinton also axed his predecessor's plans to return to the Moon and then venture to Mars, but the administration continued to use the space program to advance diplomatic objectives, particularly cooperation with Russia after the collapse of the Soviet Union. In November 2000, American astronaut Bill Shepherd and

Russian cosmonauts Yuri Gidzenko and Sergei Krikalev boarded as the first crewed mission of the International Space Station, which has been manned and orbiting Earth ever since.

President George W. Bush picked up his father's mantle and proposed deploying a manned Moon base by 2020, but never committed the same degree of funding for manned spaceflight, and NASA's inflation-adjusted budget remained fairly flat during his administration. Manned spaceflight took another massive setback during his administration when the space shuttle Columbia was destroyed reentering Earth's atmosphere in February 2003, once again grounding the shuttle program. NASA received a jolt of funding early in the Obama administration when the ARRA fiscal stimulus provided a significant increase for the agency's scientific efforts in 2009, but the budget battles and fiscal austerity that followed the Great Recession led to another significant retrenchment in real aerospace R&D funding over FY2010-2013. The Obama administration approved a transition to commercial space companies for transportation and the retirement of the shuttle program, which made its final flight in July 2011, but also prioritized NASA's unmanned scientific programs, particularly those related to climate change. At the end of our chronology in FY2019, NASA's inflation-adjusted R&D budget was roughly 16% smaller than its space race peak in FY1965.

NASA R&D Appropriations for FY1958

Primary Bill: Independent Offices Appropriation Act, 1958

Public Law: 85-69 **Enacted:** June 29, 1957 **Effective:** July 1, 1957

Secondary: Second Supplemental Appropriation Act, 1958

Public Law: 85-352 **Enacted:** March 28, 1958 **Effective:** March 28, 1958

Nominal change		Real change		Classification
Millions ($)	YOY%	Millions ($2012)	YOY%	
$39.1	50.0%	$173.2	46.2%	Exogenous

Congress significantly increased both nominal and real aerospace R&D appropriations for FY1958, largely motivated by the "Sputnik crisis" and the rapidly escalating space race. Even before Sputnik's launch, the Eisenhower administration requested a significant increase in NACA's budget for FY1958, mostly for "additional research in aerodynamics, powerplants, and aircraft structures." The committee's work at the time was largely focused on the "design and performance of aircraft, missiles, and their powerplants," much of which was coordinated with DOD, so NACA's funding was a national security priority, particularly as pertained to the ongoing missile race; see "Department of Defense R&D Appropriations for FY1958" for more details. The Soviet Union's unexpected launch of the Sputnik 1 satellite on October 4, 1957, quickly upped the ante in the missile race and, more broadly, upended U.S. aerospace policy, resulting in a rapid expansion of NACA's budget for FY1958 before the agency was absorbed into the newly created NASA in FY1959. After Sputnik's launch, the Eisenhower administration requested supplemental FY1958 funds for NACA in their FY1959 budget, in addition to requesting even more funding for FY1959. The second FY1958 supplemental appropriations bill provided an additional $10 million for NACA, on top of $106 million appropriated for NACA in the FY1958 Independent Offices appropriations bill, which represented a $29 million (37%) increase over enacted funding for FY1957. The increases in aerospace R&D funding appear to have been motivated by national security concerns and a geopolitical emergency, and do not appear to have been influenced by unemployment or other short-run macroeconomic prerogatives. As such, we classify this policy event as exogenous. The Independent Offices Appropriation Act, 1958

provided a significant increase for NACA's R&D and R&D plant activities for FY1958, even before the Second Supplemental Appropriation Act, 1958 provided another smaller boost to real aerospace R&D appropriations, so we date this policy event to 1957Q3. Most pertinent narrative evidence:

- "The success of this country in military and civil aeronautics depends heavily on the [R&D] programs of [NACA]. The recommended appropriations of 118 million dollars will enable the Committee to give further emphasis to basic research upon which the development of the aircraft of the future must depend. This amount will also permit the acquisition of new, highly specialized facilities for investigation of problems encountered under widely varying conditions of flight." (Budget Message of the President, FY1958, January 16, 1957, p. M0)
- "Research conducted by [NACA] is directed at developing the scientific and engineering data necessary for continued improvement in the design and performance of aircraft, missiles, and their powerplants. The Committee is currently primarily concerned with the problems of military aviation, including specific problems in the development of particular military projects, and its program is closely coordinated with the aeronautical programs of [DOD]... The Committee's activities are carried on mainly at its 3 laboratories and 2 flight stations and involve actual flight tests of piloted and pilotless aircraft, experimentation with the aid of wind tunnels and other specialized equipment, and theoretical studies. The increase requested in 1958 is primarily for additional research in aerodynamics, powerplants, and aircraft structures" (Budget of the United States, FY1958, p. 147)
- "Since World War II appropriations for operating costs of the NACA have tripled... The [House Appropriations] Committee recommends $71,000,000 [for salaries and expenses] for 1958, an increase of $6,823,500 over 1957, and a reduction of $5,800,000 in the budget estimate. In 1957 Congress appropriated for 8,235 employees and a further increase of 765 positions is requested for 1958. The Committee is of the opinion that sheer numbers do not add efficiency or necessarily result in research progress and believes the NACA should reappraise its program and devote its funds to vital research to reduce the annually rising costs." (H. Rpt. 85-197, March 15, 1957, p. 11)
- "The House action appears to be designed to level off the NACA at its currently authorized strength. This action is not consistent with the NACA's increasing responsibilities to the success of the Nation's military aircraft program... The NACA agrees that "sheer numbers do not add efficiency or necessarily result in research progress." The NACA budget, however, was not made up by adding "sheer numbers." It recommends the minimum increase necessary for the effective utilization of previously approved and recently completed research facilities. Our future national security depends in large measure on ideas obtained through [R&D]-research to furnish new ideas, and the application of those new ideas to military requirements to provide superior airpower. The NACA is the primary agency doing this work. We must have both the tools and the staff to effectively use these tools. The restoration of the House cut of $5,800,000 is urgently required for this purpose." Changes Recommended in NACA Items in the Independent Offices Appropriation Bill, 1958, as Reported to the House March 15, 1957, April 3, 1957 (Hearings Before the Senate Appropriations Committee on the Independent Offices Appropriation Bill, 1958, pp. 77-78)
- "supplemental appropriations of $12 million are requested for the fiscal year 1958... to permit [NACA] to expand its [R&D] activities dealing with basic problems involved in

the flight of aircraft, ballistic and guided missiles, and space vehicles" (Budget Message of the President, FY1959, January 13, 1958, p. M44)

- "[NACA] reviewed the budget situation in light of the recent public demonstrations of Russian scientific technology and concluded that we must utilize our scientific resources, both personnel and equipment, to the maximum practical extent. All NACA activities are being pressed now to expedite research in the hyper-sonic speed areas for application in the missile-development program. Under the minimum budget available for the current year we are unable properly to meet our responsibilities in these areas. Many facilities are understaffed as our current budget requires a reduction in staff throughout the year. Funds are lacking for the procurement of electric power to permit efficient utilization of existing facilities and progress is being delayed by a shortage of funds to procure rockets. Many needed modifications to existing facilities are being deferred. The shortage of funds is requiring the committee to reduce its research effort at a time when it should be increasing. The requested supplemental appropriation will permit an increase in research effort in the most critical areas in the current fiscal year." Excerpt from House Report No. 1373, NACA Supplemental Budget Request Justification, February 26, 1958 (Hearings Before the Senate Appropriations Committee on H.R. 10881, the Second Supplemental Appropriations Act, FY1958, p. 90)
- "Russia's 1957 launching of the first earth satellite brought about a Congressional reappraisal of the U.S. missile and satellite program. The Administration's immediate reaction to the Russian satellites was to play down their military importance and to stress the distinction between military missiles and non-military, science-oriented satellites. President Eisenhower told his news conference on Oct. 9, 1957, that the Russian satellite launching "does not raise my apprehensions one iota" about the security of the U.S. He said the Government had given priority to missile development and had considered the satellite program "merely an engagement on our part to put up a vehicle of this kind during the period" of the International Geophysical Year, which ran from July 1, 1957, through Dec. 31, 1958. But on Nov. 7 the President moved toward a revision of the U.S. missile and satellite program by naming Dr. James R. Killian Jr., president of Massachusetts Institute of Technology, his special assistant for science and technology. Killian was to work with William M. Holaday, assistant to the Secretary of Defense for guided missile development, on integrating the Nation's scientific program" ("Congress Establishes Civilian Space Agency," *CQ Almanac 1958*, 14th ed., 09-160-09-164. Washington, DC: Congressional Quarterly, 1959)
- "Congressional reaction to the Russian satellites was immediate, and much of it was critical of Administration policy. Four Senate and House subcommittees late in 1957 undertook studies of various aspects of the U.S. missile and satellite programs..." (Ibid)

NASA R&D Appropriations for FY1959

Primary Bill: Independent Offices Appropriation Act, 1959

Public Law: 85-844 **Enacted:** August 28, 1958 **Effective:** August 28, 1958

Secondary: Supplemental Appropriation Act, 1959

Public Law: 85-766 **Enacted:** August 27, 1958 **Effective:** August 27, 1958

Tertiary: Second Supplemental Appropriation Act, 1959

Public Law: 86-30 **Enacted:** May 20, 1959 **Effective:** May 20, 1959

Nominal change		Real change		Classification
Millions ($)	YOY%	Millions ($2012)	YOY%	
$188.1	160.4%	$849.0	154.8%	Exogenous

Congress again significantly increased both nominal and real aerospace R&D appropriations for FY1959, entirely motivated by the "Sputnik crisis" and rapidly escalating space race. The Eisenhower administration's FY1959 budget request, submitted a few months after Sputnik's launch, requested another sizable increase in NACA's funding for FY1959, principally for R&D work on "basic problems involved in the flight of aircraft, ballistic and guided missiles, and space vehicle," which Congress approved. A consensus quickly formed that U.S. space programs should be consolidated, preferably under a single agency, and a fierce debate ensued in Washington over whether the U.S. space program should be placed under military or civilian control; in April, 1958, President Eisenhower tipped the scales, opting for civilian control and "peaceful and scientific purposes" for the space program, and recommended the creation of a new National Aeronautics and Space Agency (NASA). Congress heeded the president's request and on July 29, 1958—less than one year after Sputnik's launch—President Eisenhower signed into law the National Aeronautics and Space Act of 1958, thereby creating NASA, which absorbed and abolished NACA as a preceding independent agency; the legislation also granted the president temporary authority to transfer related functions, personnel, and funds from other federal agencies to NASA. Two months later, President Eisenhower signed an executive order transferring control and funding for the U.S. scientific satellite program (also known as the Vanguard rocket program) and other military rocket and satellite programs to NASA; in total, $121 million in FY1959 appropriations were transferred to NASA's R&D accounts from ARPA, the U.S. Air Force, and U.S. Army. The first FY1959 supplemental appropriation act provided $80 million specifically for the newly created NASA, on top of $101 million appropriated for NACA in the FY1959 Independent Offices appropriations bill and the transfers from DOD. Shortly before the end of the fiscal year, a second supplemental provided an additional $3.2 million for NASA. The increases in aerospace R&D funding appear to have been motivated by national security concerns and a geopolitical emergency, and do not appear to have been influenced by unemployment or other short-run macroeconomic prerogatives. As such, we classify this policy event as exogenous. We date this policy event to 1958Q3, when the Independent Offices Appropriation Act, 1959, Supplemental Appropriation Act, 1959, and transfer of funds from DOD all took effect, resulting in a highly significant increase in real aerospace R&D appropriations for FY1959 well ahead of the enactment of the Second Supplemental Appropriation Act, 1959. Most pertinent narrative evidence:

- "The progress of the Soviets in long-range missiles and other offensive weapons, together with their continuing rejection of a workable disarmament, compels us to increase certain of our defense activities which we have only recently expanded many fold... Funds are provided for an expanded [R&D] effort on military satellites and other outer space vehicles, and on antimissile missile systems, to be carried out directly under the Secretary of Defense." (Budget Message of the President, FY1959, January 13, 1958, pp. M5, M17)
- "supplemental appropriations of $12 million are requested for the fiscal year 1958 and new obligational authority of $107 million for 1959 to permit [NACA] to expand its [R&D] activities dealing with basic problems involved in the flight of aircraft, ballistic and guided missiles, and space vehicles" (Ibid, p. M44)

- "The Eisenhower Administration may propose taking the job of conquering outer space away from the armed services... [DOD] currently is running the space effort on a temporary basis, but there have been a host of proposals in Congress and elsewhere for turning space exploration over to other agencies. These include the formation of an entirely new civilian department embracing all scientific endeavors. In addition to proposals for giving the A.E.C authority over space projects, some lawmakers have recommended [NACA] take over... Proponents of a civilian space agency contend it would have the strong propaganda advantage of removing the purely military label from dramatic space-travel feats now being planned. Moreover, they say, a non-military body would not tend to put most of its efforts into research leading to new weapons, but would also concentrate on purely scientific aspects of space exploration" ("Job of Conquering Outer Space May Be Switched From Military to Civilian Control; Killian to Study Issue," *Wall Street Journal*, February 5, 1958)
- "Recent developments in long-range rockets for military purposes have for the first time provided man with new machinery so powerful that it can put satellites into orbit, and eventually provide the means for space exploration. The [U.S. and U.S.S.R.] have already successfully placed in orbit a number of earth satellites. In fact, it is now within the means of any technologically advanced nation to embark upon practicable programs for exploring outer space. The early enactment of appropriate legislation will help assure that the United States takes full advantage of the knowledge of its scientists, the skill of its engineers and technicians, and the resourcefulness of its industry in meeting the challenges of the space age... I recommend that aeronautical and space science activities sponsored by the United States be conducted under the direction of a civilian agency, except for those projects primarily associated with military requirements. I have reached this conclusion because space exploration holds the promise of adding importantly to our knowledge of the earth, the solar system, and the universe, and because it is of great importance to have the fullest cooperation of the scientific community at home and abroad in moving forward in the fields of space science and technology. Moreover, a civilian setting for the administration of space function will emphasize the concern of our Nation that outer space be devoted to peaceful and scientific purposes. I am, therefore, recommending that the responsibility for administering the civilian space science and exploration program be lodged in a new National Aeronautics and Space Agency, into which [NACA] would be absorbed." Dwight D. Eisenhower, Special Message to the Congress Relative to Space Science and Exploration, April 2, 1958 (*The American Presidency Project*, by Gerhard Peters and John T. Woolley, https://www.presidency.ucsb.edu/node/234638)
- "Proponents of civilian control of a United States space program warned yesterday that this program would be dominated by the military if Congress votes most of the funds for space research to the military agencies. Testifying before the House Committee on Astronautics and Space Exploration, Lee A. Dubridge, president of the California Institute of Technology, said that if civilian space research is to be put under a civilian agency, then that agency should be provided adequate funds for the job. Some are predicting that Congress will vote most of the funds for space research to the military agencies... The Budget Bureau has requested $480 million for a military space program and $100 million for a civilian space program for fiscal year 1959." ("Civil Control of Space Plan Seen in Peril: Military Domination Feared in Research Fund Apportionment," by Edward Gamerekian, *The Washington Post*, April 26, 1958)

- "The National Aeronautics and Space Act of 1958 created a new civilian agency to direct the Nation's scientific activities relating to all non-military aspects of outer space. The impetus for the passage of the act was the force with which Russia launched Sputnik I on Oct. 4, 1957. The USSR's orbiting of man's first satellite gave visible proof of its great advances in both the military and non-military fields of space technology. Also attesting to the Soviet advance were published accounts of the top-secret Gaither report, presented to the National Security Council on Nov. 7, 1957, which warned that Soviet progress in military and industrial power and in scientific knowledge necessitated sweeping and costly revisions in the United States Government and economy..." ("Congress Establishes Civilian Space Agency," *CQ Almanac 1958*, 14th ed., 09-160-09-164. Washington, DC: Congressional Quarterly, 1959)
- "I have today signed H. R. 12575, the National Aeronautics and Space Act of 1958. The enactment of this legislation is a historic step, further equipping the United States for leadership in the space age. I wish to commend the Congress for the promptness with which it has created the organization and provided the authority needed for an effective national effort in the fields of aeronautics and space exploration... [NACA], with its large and competent staff and well-equipped laboratories, will provide the nucleus for the NASA. The NACA has an established record of research performance and of cooperation with the Armed Services. The combination of space exploration responsibilities with the NACA's traditional aeronautical research functions is a natural evolution. The enactment of the law establishing the NACA in 1915 proved a decisive step in the advancement of our civil and military aviation. The Aeronautics and Space Act of 1958 should have an even greater impact on our future." Dwight D. Eisenhower, Statement by the President Upon Signing the National Aeronautics and Space Act of 1958, July 29, 1958 (*The American Presidency Project*, by Gerhard Peters and John T. Woolley, https://www.presidency.ucsb.edu/node/233793)
- "By virtue of the authority vested in me by the National Aeronautics and Space Act of 1958... and as President of the United States, it is ordered as follows: ... All functions (including powers, duties, activities, and parts of functions) of [DOD], or of any officer or organizational entity of [DOD], with respect to the following are hereby transferred to [NASA]: (a) The United States scientific satellite project (Project VANGUARD); (b) Specific projects of the Advanced Research Projects Agency and of the Department of the Air Force which relate to space activities (including lunar probes, scientific satellites, and super-thrust boosters) within the scope of the functions devolving upon [NASA] under the provisions of the National Aeronautics and Space Act of 1958, and which shall be more particularly described in one or more supplementary Executive orders hereafter issued... The Secretary of the Treasury shall immediately transfer to the appropriation of [NASA] for "Research and Development", from such appropriations of [DOD] as the Secretary of Defense shall designate, the following amounts..." Dwight D. Eisenhower, Executive Order 10783—Transferring Certain Functions From [DOD] to [NASA], October 1, 1958 (*The American Presidency Project*, by Gerhard Peters and John T. Woolley, https://www.presidency.ucsb.edu/node/235549)
- "The purpose of the bill is to authorize supplemental appropriations for [NASA] for the fiscal year 1959 totaling $48,354,000... The $20,750,000 supplemental estimate for [R&D] is earmarked entirely for the manned space flight program—Project Mercury. These funds are requested in order to permit making as rapid progress as possible in the effort to prove our ability to send a man into orbital flight and return him safely to

Earth. Fiscal year 1959 finds already available for Project Mercury total $37,661,200. The $20,750,000 additional authorization in this bill would increase the 1959 program to $58,411,00. The budget request for 1960 for Project Mercury is $70 million and Dr. Glennan, the Administrator of NASA has testified that 'before we have completed this first U.S. effort to put a man into space, the bill will have exceeded $200 billion'" (S. Rpt. 86-82, March 5, 1959, pp. 1-2)

- "The [Senate Appropriations] committee considered a supplemental estimate in Senate Document No, 112 in the amount of $125,000,000 for space activities and functions to be undertaken by this new agency... In addition, $117,000,000 is to be provided by transfer from [DOD], and $294,000,000 will be used in 1959 by [DOD] on space activities which are primarily military in nature; for a total of $536,000,000 of 1959 funds directly applicable to space programs. Furthermore, the committee understands the former [NACA] will continue to function as the research branch of the new agency, and funds are available for that work in 1959 in the amount of $101,100,000. The committee believes that it will take some time to properly plan for this new agency, and accordingly recommends at this time appropriations [of $75 million]... In the event additional funds are needed after the first of the year, the committee will be glad to consider such a request." (S. Rpt. 85-2350, August 13, 1958, p. 14)
- "[NASA] requests full restoration of the $335,400 reduction recommended by the House Committee on Appropriations in NASA's request for supplemental funds... Since October 1, 1958, when [NASA] was officially declared in being, NASA has been operating with a great sense of urgency in planning and developing the programs essential to the missions of NASA. With the approval of the Bureau of the Budget, NASA operations to implement these programs have been scheduled on the premise that funds in support of the pay act costs would be provided by Congress. To absorb the House reduction within the "Salaries and expenses" appropriation at this time would require a critical reduction of research activities through cancellation of a scheduled recruiting program, curtailment of travel, a cutback in the procurement of supplies and equipment, and a reduction in wind tunnel operations. This action would be a crippling blow to the entire NASA program." Change Recommended in NASA Item In the Second Supplemental Appropriation Act, 1959, as Reported to the House on March 20, 1959, April 7, 1959 (Hearings Before the Senate Appropriations Committee on the Second Supplemental Appropriations Act, FY1950, p. 1083)

NASA R&D Appropriations for FY1960

Primary Bill: National Aeronautics and Space Administration Appropriation, 1960

Public Law: 86-45 **Enacted:** June 15, 1959 **Effective:** July 1, 1959

Secondary: Supplemental Appropriation Act, 1960

Public Law: 86-213 **Enacted:** September 1, 1959 **Effective:** September 1, 1959

Tertiary: Additional Supplemental Appropriations, 1960

Public Law: 86-425 **Enacted:** April 14, 1960 **Effective:** April 14, 1960

Nominal change		Real change		Classification
Millions ($)	YOY%	Millions ($2012)	YOY%	
$167.0	71.5%	$968.3	69.3%	Exogenous

Congress again appropriated significant increases in both nominal and real aerospace R&D funding for FY1960, again entirely motivated by the "Sputnik crisis" and the rapidly escalating space race. The Soviet Union continued to lap the U.S. in hitting early space race milestones, increasing the sense of urgency about NASA's new space program. The Soviet's Luna I (dubbed "Lunik") satellite became the first object launched beyond the moon (it was intended to strike the moon) in January 1959; before the year was over, Luna II became the first spacecraft to hit the moon's surface that September. In taking their budget request to the Senate Appropriations Committee, NASA administrators warned that the Soviet Union was close to putting a manned spacecraft into Earth's orbit, while the related U.S. Mercury project was likely two years away from achieving the same objective. The FY1960 Supplemental Appropriation Act provided an additional $500.8 million for NASA, roughly two-thirds of which was for the R&D account with the remainder for the "Salaries and expenses" and "Construction and equipment" budget accounts. Late in the fiscal year, an additional FY1960 supplemental provided a further appropriation of $12.2 million for NASA's R&D account. The increases in aerospace R&D funding appear to have been motivated by concerns that the U.S. was falling further behind the U.S.S.R. in the space race and related national security concerns, and do not appear to have been influenced by unemployment or other short-run macroeconomic prerogatives. As such, we classify this policy event as exogenous. We date this policy event to 1959Q3, when the National Aeronautics and Space Administration Appropriation, 1960 and Supplemental Appropriation Act, 1960 took effect, resulting in a significant increase in real aerospace R&D appropriations for FY1960 well ahead of the smaller boost in funding from the enactment of the Additional Supplemental Appropriations, 1960. Most pertinent narrative evidence:

- "Capitol Hill sources say that the proposed 1960 budget of the National Aeronautics and Space Agency was cut more than $125 million by the White House. They predict a fight in Congress to increase it... The cut was made before the Russians launched their successful cosmic rocket past the moon. In light of the spectacular development, there is talk that NASA's budget will be "reconsidered"... The agency is said to have requested more than $600 million for the 1960 fiscal year that begins next July 1. The White House and the Budget Bureau are reported on Capitol Hill to have slashed the amount to "about $475 million." Senate Democratic Leader Lyndon B. Johnson of Texas, could have had the cut in mind when he commented Monday, after a budget conference with the President, that he was "disappointed" we're not going "further and faster" in the military and space programs."" ("The Federal Diary: Fight in Congress Expected Over Cut In NASA's Budget," by Jerry Kluttz, *The Washington Post*, January 7, 1959)
- "A major segment of our national scientific and engineering community is working intensively to achieve new and greater developments. Advance in military technology requires adequate financing but, of course, even more, it requires talent and time. All this is given only as a matter of history; as a record of our progress in space and ballistic missile fields in no more than four years of intensive effort. At the same time, we clearly recognize that some of the recent Soviet accomplishments in this particular technology are indeed brilliant." Dwight D. Eisenhower, State of the Union Address, January 9, 1959 (*The American Presidency Project*, by Gerhard Peters and John T. Woolley, https://www.presidency.ucsb.edu/node/235339)
- "In the current fiscal year, total expenditures for basic and applied research and for scientific development have reached record amounts, and a supplemental appropriation

for 1959 to advance space technology is recommended. For the fiscal year 1960, [R&D] expenditures will be increased still further, with emphasis on space exploration, peaceful uses of atomic energy, and basic science. Extensive space exploration investigations are being initiated, utilizing satellites and probes. Development work is going forward on high-energy fuel rockets, a million-pound thrust engine, and a nuclear rocket engine." (Budget Message of the President, FY1960, January 19, 1959, p. M16)

- "Important scientific data have been obtained from the satellites and lunar probes launched to date. The recent successful use of the Atlas as a satellite clearly demonstrated the potential usefulness of satellites in the field of communications. [DOD] will continue to investigate satellite applications of specific military interest. Its space programs will be closely coordinated with those of [NASA]." (Ibid, p. M28)
- "Hugh Dryden, the No. 2 man [at NASA], told Senators yesterday that the launching of the three Sputniks and the Lunik by the Russians show they now have the capability of placing a manned satellite in orbit around the earth. "We have to prepare the American people for the psychological impact of an announcement they have succeeded," he said, "for they are undoubtedly working now on such a project." Dryden and several top NASA staff members testified again during the second day of hearings before a Senate Space Subcommittee on a bill that would add $48 million to NASA's current 300-million dollar budget to accelerate the program. Hearings on the 485 million-dollar budget the request for 1960 will be held later... Project Mercury, a 2000-pound manned satellite, will cost about $200 million. The project is now underway, but it is expected to be about two years before a man is launched into orbit around the earth." ("Soviet Manned Moon Expected," by Edward Gamarekian, *The Washington Post*, February 21, 1959)
- "The amount being requested for operation of the NASA plant in 1960 in $16,670,000. This compares with $11,726,102 for the equivalent items during fiscal year 1959 or an increase of $4,843,898. The increase reflects the expanding requirements for new space research and also the urgent need to overcome some of the accumulating deficiencies in the amount of material and facilities support for NASA's extensive in-house [R&D] effort... Like other modern research, the effective conduct of both aeronautical and space research now requires increasingly specialized facilities, more complicated equipment and instrumentation, and more extensive shop services. However, in recent years, the NASA laboratories, through lack of funds, have had to curtail the modernization and equipping of their facilities." (H. Rpt. 86-361, May 14, 1959, pp. 4-5)
- "The biggest single item in the [first FY1960 supplemental] bill—$500,575,000 for [NASA]—represented a compromise between the House figure of $462,075,000 and the Senate appropriation of $530,300,000, which also was the full amount requested for NASA by the Administration." ("First Supplemental, 1960," *CQ Almanac 1959*, 15th ed., 04-344-04-346. Washington, DC: Congressional Quarterly, 1960)
- "Congress established [NASA] in 1958 and required, on a temporary basis, that no funds could be appropriated for the agency without prior Congressional authorization. This requirement subsequently was extended indefinitely. Congress in 1959 authorized a total of $533,654,000 for NASA—$48,354,000 for fiscal 1959 (PL 86–12) and $485,300,000 for fiscal 1960 (PL 86–45). This was exactly the amount requested by the Administration... The [House] Committee cut $45,500,000 from the $530,300,000 NASA request; most of the cut—$33,070,000—came from funds requested for [R&D]... The [Senate] Committee restored the $23,225,000 cut from NASA's fiscal 1960 bud-

get and added two amendments providing $45,000,000 for fiscal 1959, bringing the agency's funds for the two years up to the requested $530,300,000. Dr. T. Keith Glennan, NASA administrator, July 13 told the Committee the House cuts would have "disastrous consequences" on the Nation's space program and would retard Project Mercury, the manned satellite program... The final version of the bill appropriated $500,575,000 for NASA. Conferees accepted the basic provisions of the House bill—$91,400,000 for salaries and expenses, $318,675,000 for [R&D] and $52,000,000 for construction and equipment in fiscal 1960—and added two cut-down Senate amendments providing additional amounts of $16,675,000 for [R&D] and $21,825,000 for construction and equipment for fiscal 1959." (Ibid)

- "In a related development on space funds President Eisenhower April 14 signed into law a measure (H J Res 621—PL 86-425) appropriating supplemental funds of $23 million for NASA in fiscal 1960. [The bill provided] $19 million of it for the Project Mercury man-in-space program and $4 million for modifications at the Atlantic Missile Range for advanced launch vehicles." ("Independent Offices," *CQ Almanac 1960*, 16th ed., 04-400-04-402. Washington, DC: Congressional Quarterly, 1960)
- "Two years after Russia launched the first earth satellite, Oct. 4, 1957, United States space policies still were in a state of flux, and scientific experts continued to warn that the Nation was failing to keep pace with the U.S.S.R. in this vital field. Meanwhile, Russia scored a new series of space achievements, culminating in its Sept. 14 announcement that it had hit the moon with a space rocket and its Oct. 4 announcement that a space satellite, Lunik III, had been launched successfully on a planned orbit beyond the moon... U.S. space policies were under continuing scrutiny in Congress in 1959. A special unit of the Senate Aeronautical and Space Sciences Committee... [on] July 18 issued a unanimous report stating that U.S. space development efforts, both civilian and military, were handicapped by: Administration failure to develop a "comprehensive" long-range civilian-military space program; inadequate coordination of the work of NASA and the [DOD's] ARPA; and inadequate definition of the "various space roles and missions" of the three armed services... the [House] Science and Astronautics Committee held hearings on various phases of the missile and satellite programs in 1959. It planned full-scale hearings in 1960 to try to determine, in the words of Chairman Overton Brooks (D La.), whether the U.S. must "continue to play second fiddle" in the space field." ("1959 Developments in Space Race," *CQ Almanac 1959*, 15th ed., 09-259-09-260. Washington, DC: Congressional Quarterly, 1960)

NASA R&D Appropriations for FY1961

Bill: Independent Offices Appropriation Act, 1961

Public Law: 86-626 **Enacted:** July 12, 1960 **Effective:** July 12, 1960

Nominal change		Real change		Classification
Millions ($)	YOY%	Millions ($2012)	YOY%	
$440.4	84.1%	$1,959.5	82.8%	Exogenous

Congress again appropriated significant increases in both nominal and real aerospace R&D funding for FY1961, motivated by geopolitical rivalry with the U.S.S.R. and national security concerns as the space race escalated. Project Mercury—trying to beat the Soviet Union to manned spaceflight—was a top priority of the Eisenhower administration, as was

developing new generations of rockets for the space program. President Eisenhower also transferred the Saturn rocket program, originally intended to launch military satellites, from the Army Ballistic Missiles Agency over to NASA. The administration's FY1961 budget request again proposed significant increases in funding for NASA's space program, as well as supplemental funding for FY1960 to restore budget cuts made by the more thrifty House Appropriations Committee. The House committee again tried to pare back the FY1961 request for NASA, approving $39 million less than requested, but these cuts to the R&D, Salaries and expenses, and Construction and equipment budget accounts were successfully restored by the Senate Appropriations Committee, which had approved the entire budget request. Looking past Project Mercury, influential members of Congress were also concerned that the U.S. was falling behind the U.S.S.R. in the more symbolic race to put a man on the moon, raising further objections to cutting NASA's budget. In turn, NASA administrators were acutely aware that their biggest lag behind the Soviets was in the field of high-thrust launch rockets, but were defensive about the rest of their space program being deficient. The increases in aerospace R&D funding appear to have been motivated by concerns that the U.S. was falling further behind the U.S.S.R. in the space race and related national security concerns, and do not appear to have been influenced by any concerns about unemployment or other short-run macroeconomic prerogatives. As such, we classify this policy event as exogenous. Most pertinent narrative evidence:

- "America has made great contributions in the past two years to the world's fund of knowledge of astrophysics and space science. These discoveries are of present interest chiefly to the scientific community, but they are important foundation-stones for more extensive exploration of outer space for the ultimate benefit of all mankind... the United States is pressing forward in the development of large rocket engines to place much heavier vehicles into space for exploration purposes... it is necessary to remember that we have only begun to probe the environment immediately surrounding the earth. Using launch systems presently available, we are developing satellites to scout the world's weather; satellite relay stations to facilitate and extend communications over the globe; for navigation aids to give accurate bearings to ships and aircraft; and for perfecting instruments to collect and transmit the data we seek. This is the area holding the most promise for early and useful applications of space technology." Dwight D. Eisenhower, State of the Union Address, January 7, 1960 (*The American Presidency Project*, by Gerhard Peters and John T. Woolley, https://www.presidency.ucsb.edu/node/234770)
- "[NASA] is carrying forward the nonmilitary space projects started by [DOD] and has initiated additional programs that will lay the foundations for future exploration and use of outer space... Appropriations of $802 million for 1961, together with anticipated supplemental appropriations for 1960 of $23 million to restore substantially the Congressional reduction in the space program last year, are recommended... I am assigning to this new agency sole responsibility for the development of space booster vehicles of very high thrust, including Project Saturn. This assignment includes the transfer of certain facilities and personnel of the Army Ballistic Missiles Agency. With the imminent completion of the Jupiter missile project, this outstanding group can concentrate on developing the large space vehicle systems essential to the exploration of space. Certain amendments to the National Aeronautics and Space Act of 1958 will be proposed to clarify the organization and streamline the management of the space programs" (Budget Message of the President, FY1961, January 18, 1960, p. M33)
- "Our space programs are based on a systematic and technically sound approach to the

complicated scientific and engineering problems involved. This approach will ensure continued demonstrable achievements. Project Mercury has a high priority and we should be ready to attempt actual maimed space flights within the next two years. Progress on the development of very high thrust engines and the vehicles to use them will make it possible, in the not-too-distant future, to launch much larger space vehicles and thus extend the conquest of space. For the near future satellites and space probes will continue to depend primarily on Thor and Atlas missiles as boosters... These vehicles will make possible a wide variety of highly useful scientific experiments which will provide essential information for future exploration of outer space by manned and unmanned vehicles... In all of these projects, the success of the space vehicle launchings depends on a strong continuing program of supporting research and ground testing." (Ibid, pp. 34-36)

- "[NASA] was urged by a member of the House Space Committee yesterday to speed up plans to try to put a man on the moon. NASA planning contemplates that this may be possible sometime in the 1970s but Rep. B.F. Sisk (D-Calif.), said at a House hearing that an earlier target date should be set. "No one has any serious doubts that the first man on the moon will be a Russian or an American," Sisk said. "We are concerned as to which one it will be." Sisk, chairman of a subcommittee conducting authorization hearings of NASA's 1961 budget, said he felt NASA officials did not share that concern... Sisk said various civilian and military experts in space technology have expressed belief the United States will be capable of a manned moon flight by at least 1968. And most of them, he added, have predicted that Russia will do it before then... Sisk noted a cutback of $6 million in funds for the F1 super rocket booster project. NASA made the cut last year after its research appropriation had been trimmed $18 million by Congress. He questioned the wisdom of making such a heavy cut..." ("NASA Urged To Speed Its Moon Project," by the Associated Press, *The Washington Post*, February 23, 1960)
- "The Nation's space chief hit back yesterday at critics who, he said, are trying to make everybody believe "we are so far behind that we may never forge ahead" of Russia. The Russians, he asserted, are ahead only in the power of their space vehicles. This view was expressed by T. Keith Glennan, director of [NASA], in a statement asking the House Appropriations Committee to approve the agency's $915-million-dollar budget for the year beginning July 1. Conceding Soviet superiority in rocket power, Glennan added: "I Don't think they will maintain that superiority for long if we continue to build up our capability"... "Except in the impression created by an admittedly able effort involving the use of high-thrust, rocket-propelled launch vehicle systems, I don't admit to our being behind. Our plans and efforts to overcome our disability in the high-thrust rocket field are moving solidly ahead" ("NASA's Chief Strikes Back at Space Critics," by United Press International, *The Washington Post*, March 15, 1960)
- "[NASA] received $915 million for fiscal 1961, exactly what the President had requested. The initial budget request of $802 million was supplemented Feb. 1 by an additional Presidential request for $113 million for the Saturn booster rocket, making a $915 million total request." ("Independent Offices," *CQ Almanac 1960*, 16th ed., 04-400-04-402. Washington, DC: Congressional Quarterly, 1960)
- "The [House] Committee bill provided $876,015,000 for [NASA], a cut of $38,985,000 from the $915,000,000 requested. It provided the full amount requested for the development of new rockets—$277,608,000—but made reductions in funds requested for

[R&D], construction, and personnel... the [Senate] Committee exceeded budget requests by... $50 million for National Aeronautics and Space Administration [R&D]. Congress May 24 had authorized the $50 million in the NASA authorization bill (HR 10809—PL 86-481) for fiscal 1961. In other actions affecting NASA appropriations, the Committee restored House cuts of $4,260,000 for salaries and expenses; $19,213,000 for [R&D] (as well as adding the $50 million); and $15,512,000 for construction and equipment which brought all three items up to the budget requests." (Ibid)

NASA R&D Appropriations for FY1962

Bill: Independent Offices Appropriation Act, 1962

Public Law: 87-141 **Enacted:** August 17, 1961 **Effective:** August 17, 1961

Nominal change		Real change		Classification
Millions ($)	YOY%	Millions ($2012)	YOY%	
$860.9	89.3%	$3,826.3	88.5%	Exogenous

Congress again appropriated significant increases in both nominal and real aerospace R&D funding for FY1962, again motivated by geopolitical rivalry with the U.S.S.R. and national security concerns as the space race escalated. Newly elected President John F. Kennedy had campaigned on concerns of a missile gap and technological deficit with the Soviet Union and soon proposed substantial increases in funding for NASA, aligned with his ambitious vision for the space program. As the appropriators were considering the FY1962 budget request, Soviet cosmonaut Yuri Gagarin flew the first manned mission to outer space in April 1961, once orbiting the earth, and narrowly beating Project Mercury in the manned spaceflight race. American astronaut Alan Shepard became the second person to fly in space in May 1961, less than a month later, albeit on a suborbital mission; NASA and the administration were focused on catching up to the Soviets with an American orbital space mission of their own. President Kennedy pledged to "step up our efforts" in the space race, and the administration reversed course on proposed cuts to President Eisenhower's final budget for the agency, instead requesting an additional $549 million for NASA in a fiscal year 1962 supplemental request made in May 1961. In an unusually scheduled address to Congress on May 25, President Kennedy asked the nation to "commit itself to achieving the goal, before this decade is out, of landing a man on the moon and returning him safely to the earth" and asked Congress to fund a space program of $7-9 billion over the next five years, in addition to the FY1962 supplemental. Congress appropriated almost the full amended budget request—$1.75 billion instead of $1.78 billion for FY1962. This dramatic increase in aerospace R&D funding appears to have been motivated by concerns that the U.S. was falling further behind the U.S.S.R. in the space race, related national security concerns, and the resolve to beat the Soviets to the moon. Moreover, the expanded NASA space program does not appear to have been influenced by short-run macroeconomic prerogatives, such as concerns about unemployment or inflation; as such, we classify this policy event as exogenous. Most pertinent narrative evidence:

- "Communist power has been, and is now, growing faster than our own and at a greater rate of growth, and by "Communist power," I mean military power, economic power, scientific power, and educational and political power. They are moving faster than we are... The missile lag looms large... We need to increase the thrust of our rocket engines. The Soviet Union's recent missile that they recovered weighed 5 tons, and

until we get a powerful rocket engine second to none, we are going to be second in space, with all of the significance that space is going to have. We do not want the Soviet Union to be the first country to put a reconnaissance rocket around the globe, which will be like having a flight of U-2s pass over our country every day... let us put an end to this policy of deciding our fiscal requirements and then deciding what we can spend on defense. Let our danger decide our fiscal requirements, and then fit our fiscal requirements to meet them." John F. Kennedy, Speech at the VFW Convention, Detroit, MI, August 26, 1960 (*The American Presidency Project*, by Gerhard Peters and John T. Woolley, https://www.presidency.ucsb.edu/node/274628)

- "Today this country is ahead in the science and technology of space, while the Soviet Union is ahead in the capacity to lift large vehicles into orbit. Both nations would help themselves as well as other nations by ten moving these endeavors from the bitter and wasteful competition of the Cold War. The United States would be willing to join with the Soviet Union and the scientists of all nations in a greater effort to make the fruits of this new knowledge available to all..." John F. Kennedy, State of the Union Address, January 30, 1961 (*The American Presidency Project*, by Gerhard Peters and John T. Woolley, https://www.presidency.ucsb.edu/node/234534)
- "Civil space activities being carried forward under [NASA] include: (1) the development of larger and improved space vehicles, new types of propulsion and equipment, and a wide range of necessary supporting [R&D]; (2) the development of systems of meteorological and communications satellites; and (3) the search for new knowledge about the universe through unmanned, and eventually manned, space exploration... NASA also carries out research related to new and improved types of aircraft and missiles, chiefly to support programs in the military... Appropriations of $1,110 million for 1962, and supplemental appropriations of $50 million for 1961, are recommended " (Budget Message of the President, FY1962, January 16, 1961, p. M40)
- "In the program for manned space flight, the reliability of complex booster, capsule, escape, and life-support components of the Mercury system is now being tested to assure a safe manned ballistic flight into space, and hopefully a manned orbital flight, in calendar year 1961. Further testing and experimentation will be necessary to establish whether there are any valid scientific reasons for extending manned space flight beyond the Mercury program. In unmanned space exploration, the scientific information received from our Earth satellites and space probes has taught us a great deal about the Earth and surrounding space. In the near future, the first launching under the Ranger unmanned lunar exploration program will take place... Investigations in the vicinity of the planets Mars and Venus are planned under Project Mariner with initial launchings scheduled for 1962. Large earth-orbiting astronomical and geophysical observatories are also planned as successors to our present scientific satellites" (Ibid, p. 43)
- "The achievement by the USSR of orbiting a man and returning him safely to the ground is an outstanding technical accomplishment. We congratulate the Soviet scientists and engineers who made this feat possible. The exploration of our solar system is an ambition that we and all mankind share with the Soviet Union, and this is an important step toward that goal. Our own Mercury man-in-space program is directed toward that same end." John F. Kennedy, Statement by the President on the Orbiting of a Soviet Astronaut, April 12, 1961 (*The American Presidency Project*, by Gerhard Peters and John T. Woolley, https://www.presidency.ucsb.edu/node/234585)
- "President Kennedy pledged today his determination to "step up our efforts" so that

the United States would "prevail" on the new frontier of space. Meanwhile, budgetary figures made public by the House Science and Astronautics Committee showed that the Administration had cut the amount of funds requested to speed the development of various long-range programs. These programs included scientific and weather satellites, lunar and planetary exploration, advanced manned space vehicles, and super-booster rockets necessary to explore interplanetary space. The cuts were made in funds requested by [NASA] for revising the Eisenhower space budget. The Kennedy Administration permitted a $125,670,000 increase... but rejected $182,521,000 more requested by the agency. The budgetary cuts and the Presidential pledge illustrate the changing attitude within the Administration about the urgency of the space program. Before the Soviet man-in-space feat, the Administration was cutting the funds the space agency deemed necessary. Now, as the President indicated in his statement today, the administration is looking for ways to accelerate the program and could end up restoring the money requests cut last month" ("Kennedy Pledges Speed-Up in Space; Administration Shifts View on Urgency of Program," by John W. Finney, *New York Times*, April 26, 1961)

- "All America rejoices in this successful flight of Astronaut Shepard. This is a historic milestone in our own exploration into space. But America still needs to work with the utmost speed and vigor in the further development of our space program. Today's flight should provide an incentive to everyone in our nation concerned with this program to redouble their efforts in this vital field. Important scientific material has been obtained during this flight, and this will be made available to the world's scientific community." John F. Kennedy, Statement by the President on the Flight of Astronaut Alan B. Shepard, May 5, 1961 (*The American Presidency Project*, by Gerhard Peters and John T. Woolley, https://www.presidency.ucsb.edu/node/234585)
- "Recognizing the head start obtained by the Soviets with their large rocket engines, which gives them many months of lead-time, and recognizing the likelihood that they will exploit this lead for some time to come in still more impressive successes, we nevertheless are required to make new efforts on our own. For while we cannot guarantee that we shall one day be first, we can guarantee that any failure to make this effort will make us last. We take an additional risk by making it in full view of the world, but as shown by the feat of astronaut Shepard, this very risk enhances our stature when we are successful. But this is not merely a race. Space is open to us now; and our eagerness to share its meaning is not governed by the efforts of others. We go into space because whatever mankind must undertake, free men must fully share. I therefore ask Congress, above and beyond the increases I have earlier requested for space activities, to provide the funds which are needed to meet the following national goals: First, I believe that this nation should commit itself to achieving the goal, before this decade is out, of landing a man on the moon and returning him safely to the earth. No single space project in this period will be more impressive to mankind, or more important for the long-range exploration of space; and none will be so difficult or expensive to accomplish. We propose to accelerate the development of the appropriate lunar spacecraft. We propose to develop alternate liquid and solid fuel boosters, much larger than any now being developed, until certain which is superior. We propose additional funds for other engine development and for unmanned explorations–explorations that are particularly important for one purpose which this nation will never overlook: the survival of the man who first makes this daring flight. But in a very real sense, it will not be one man going to the moon–if we make this judgment affirmatively, it will be an entire nation. For all of

us must work to put him there." John F. Kennedy, Special Message to the Congress on Urgent National Needs, May 25, 1961 (*The American Presidency Project*, by Gerhard Peters and John T. Woolley, https://www.presidency.ucsb.edu/node/234560)

- "Let it be clear—and this is a judgment which the Members of the Congress must finally make—let it be clear that I am asking the Congress and the country to accept a firm commitment to a new course of action, a course which will last for many years and carry very heavy costs: 531 million dollars in fiscal '62—an estimated seven to nine billion dollars additional over the next five years. If we are to go only halfway, or reduce our sights in the face of difficulty, in my judgment it would be better not to go at all... It is a most important decision that we make as a nation. But all of you have lived through the last four years and have seen the significance of space and the adventures in space, and no one can predict with certainty what the ultimate meaning will be of mastery of space. I believe we should go to the moon..." (Ibid)
- "The House and Senate, in quick succession, voted today to give President Kennedy all the money he sought to try to put an American on the moon before a Russian gets there. The bill, which now goes to the President, authorizes [NASA] to spend $1,700,000,000 this year, including $10,000,000 for the man-on-the-moon project. Mr. Kennedy's goal is to send an American manned spacecraft to the moon by 1970." ("1.7 Billion Space Fund Voted by Both Houses," *New York Times*, July 21, 1961)
- "The [Senate Appropriations] committee feels that there is a demonstrated need for the speeding up of advanced programs with immediate objectives of manned orbital space vehicles which will relate themselves to weather observations and forecasting, communications, intelligence, and military defense. Such programs may well lead ultimately to interplanetary exploration. The committee believes that such objectives are an immediate necessity, in order to keep abreast of world developments and ahead in the overall scientific capability and knowledge of the world. What we are dealing with is the whole technological future of our country in the aeronautical and space sciences." (S. Rpt. 87-620, July 25, 1961, p. 22)
- "The [House] Committee cut the Administration's request of $1,235,300,000 for NASA by $35.3 million, including a $27.5 million cut in the request for [R&D]. The report said the appropriation was, in effect, the first payment on the agency's programs for fiscal 1962 and that its "overall needs will be reviewed when hearings are held on the President's revised program"... The largest sum added by the [Senate Appropriations] Committee was $549 million for [NASA]. President Kennedy May 25 raised his budget request for NASA by $549 million, bringing his total request for NASA to $1,784,300,000. The Senate Committee appropriated $1,749,000,000... The conferees reduced by $77 million the funds for NASA voted by the Senate. The cut was made across the board rather than in any specific space project, with $58 million cut from the amount for [R&D]. In all, NASA received $112.5 million less than the President requested." ("Independent Offices," *CQ Almanac 1961*, 17th ed., 149-52. Washington, DC: Congressional Quarterly, 1961)
- "The earliest the United States can now figure on putting a man in orbit is toward the end of the year, according to Project Mercury officials... The second orbiting of a Soviet astronaut occasioned little surprise among officials in Washington. Nevertheless, it appeared almost certain to intensify demands that the nation pay more attention to the development of manned spaceships for possible military missions." ("U.S. Goal is

1962: 2 Tests Are Planned Before an Attempt at Orbital Flight," by Richard Witkin, *New York Times*, August 7, 1961)

- "[The U.S.] lag in manned space flight dates to the divergent courses taken by this nation and the Soviet Union in the post-war development of strategic weapons. The United States concentrated on manned bombers and kept missile development on comparatively tin dollar rations... Another factor was the enormous size of the missile that would be necessary to carry the large, heavy and unwieldy atom bombs over intercontinental distances... The Russians did not let the size of the rocket required deter them. Behind in manned bombers, they decided to put great emphasis on missiles. It was not until after the development of the hydrogen bomb that the United States decided, in 1954, to go all-out in missile development. Because of their enormous power in a comparatively small package, a rocket vehicle much smaller than necessary for atomic bombs could be used to deliver them. The first intercontinental ballistic missile developed, then, was the Atlas—the same rocket, basically, on which Project Mercury is depending for the nation's first manned flights into orbit. Requirements for space flight were not a key point in the selection of the Atlas design" (Ibid)

NASA R&D Appropriations for FY1963

Bill: Independent Offices Appropriation Act, 1963

Public Law: 87-741 **Enacted:** October 3, 1962 **Effective:** October 3, 1962

Nominal change		Real change		Classification
Millions ($)	YOY%	Millions ($2012)	YOY%	
$1,848.1	101.3%	$8,246.2	101.2%	Exogenous

Congress again appropriated significant increases in both nominal and real aerospace R&D funding for FY1963, driven by President Kennedy's recent pledge to put a man on the moon as well as broader national security concerns and geopolitical rivalry with the Soviet Union. President Kennedy's FY1963 budget request—the first since announcing the moon mission in May 1961—proposed doubling NASA's budget in a single year. Congress appropriated a $1.85 billion annual increase in NASA's funding, nearly the entire administration's request, nonetheless doubling their budget for FY1963. The rapid growth in NASA's space program budget was beginning to pay dividends; a month after the budget request was made, astronaut John Glenn became the first American to make an orbital flight around the Earth. In August, the U.S. successfully launched the Mariner 2 probe on an Atlas rocket to Venus to collect data (the Mariner 1 launch had failed in July). But the administration was keen to finally surpass the Soviets by beating them to the moon, instead of merely playing catch up. Shortly before the FY1963 funding bill was enacted, President Kennedy delivered a speech at Rice University in Houston, TX, declaring that "We choose to go to the moon in this decade and do the other things, not because they are easy, but because they are hard." In his address, JFK also touched on national security concerns, arguing that U.S. preeminence in the field of space was an absolute necessity to help shape whether space would become a "sea of peace or a new terrifying theater of war." This dramatic increase in aerospace R&D funding appears to have been motivated by resolve to beat the Soviets to the moon and related national security and geopolitical concerns of the space race. Moreover, the expanded NASA space program does not appear to have been influenced by short-run macroeconomic prerogatives, such as concerns about unemployment or inflation; as such, we classify this policy event as exogenous. Most pertinent narrative evidence:

- "With the approval of this Congress, we have undertaken in the past year a great new effort in outer space. Our aim is not simply to be first on the moon, any more than Charles Lindbergh's real aim was to be the first to Paris. His aim was to develop the techniques of our own country and other countries in the field of air and the atmosphere, and our objective in making this effort, which we hope will place one of our citizens on the moon, is to develop in a new frontier of science, commerce and cooperation, the position of the United States and the Free World." John F. Kennedy, State of the Union Address, January 11, 1962 (*The American Presidency Project*, by Gerhard Peters and John T. Woolley, https://www.presidency.ucsb.edu/node/236917)
- "Budget expenditures for fiscal 1963 will total $92.5 billion under my recommendations—an increase of $3.4 billion over the amount estimated for the present fiscal year. More than three-quarters of the increase is accounted for by national security and space activities..." (Budget Message of the President, FY1963, January 18, 1962, p. 7)
- "Last year I proposed and the Congress agreed that this Nation should embark on a greater effort to explore and make use of the space environment. This greater effort will result in increased expenditures in 1962 and 1963, combined, of about $1.1 billion above what they would have been under the policies of the preceding administration; measured in terms of new obligational authority, the increase is $2.4 billion for the two years. With this increase in funds, there has been a major step up in the programs of [NASA] in such fields as communications and meteorology and in the most dramatic effort of all—mastery of space symbolized by an attempt to send a man to the moon and back safely to earth. Action is being taken to develop the complex Apollo spacecraft in which the manned lunar flights will be made, and to develop the large rockets required to boost the spacecraft to the moon... Our space program has far broader significance, however, than the achievement of manned space flight. The research effort connected with the space program—and particularly the tremendous technological advances necessary to permit space flight—will have great impact in increasing the rate of technical progress throughout the economy." (Budget Message of the President, FY1963, January 18, 1962, pp. 14-15)
- "I know that I express the great happiness and thanksgiving of all of us that Colonel Glenn has completed his trip... I also want to say a word for all those who participated with Colonel Glenn at Canaveral. They faced many disappointments and delays—the burdens upon them were great—but they kept their heads, and they made a judgment, and I think their judgment has been vindicated. We have a long way to go in the space race. We started late. But this is the new ocean, and I believe the United States must sail on it and be in a position second to none." John F. Kennedy, Remarks Following the Orbital Flight of Col. John H. Glenn, Jr., February 20, 1962 (*The American Presidency Project*, by Gerhard Peters and John T. Woolley, https://www.presidency.ucsb.edu/node/223046)
- "The [House] Committee does not want to slow down or stop any phase of the program, but it knows there will be many changes during the year as the programs progress and that savings can be achieved through careful administration... The bill includes $2,877,878,000 for [R&D and operations]... The amount recommended is $90,400,000 less than the budget estimate. The Committee has not deleted any program that has legislative authorization, but the present estimates of cost can be reduced. Since we are in this race with the Russians we want to win it, but at the same time we want to be as economical as possible and use good business judgment" (H. Rpt. 87-2050, July

27, 1962, pp. 15-16)

- "In short, our leadership in science and in industry, our hopes for peace and security, our obligations to ourselves as well as others, all require us to make this effort, to solve these mysteries, to solve them for the good of all men, and to become the world's leading space-faring nation. We set sail on this new sea because there is new knowledge to be gained, and new rights to be won, and they must be won and used for the progress of all people. For space science, like nuclear science and all technology, has no conscience of its own. Whether it will become a force for good or ill depends on man, and only if the United States occupies a position of preeminence can we help decide whether this new ocean will be a sea of peace or a new terrifying theater of war." John F. Kennedy, Address at Rice University in Houston on the Nation's Space Effort, September 12, 1962 (*The American Presidency Project*, by Gerhard Peters and John T. Woolley, https://www.presidency.ucsb.edu/node/223046)
- "But why, some say, the moon? Why choose this as our goal? And they may well ask why climb the highest mountain. Why, 35 years ago, fly the Atlantic? Why does Rice play Texas? We choose to go to the moon. We choose to go to the moon in this decade and do the other things, not because they are easy, but because they are hard, because that goal will serve to organize and measure the best of our energies and skills, because that challenge is one that we are willing to accept, one we are unwilling to postpone, and one which we intend to win, and the others, too. It is for these reasons that I regard the decision last year to shift our efforts in space from low to high gear as among the most important decisions that will be made during my incumbency in the Office of the Presidency... Within these last 19 months at least 45 satellites have circled the earth. Some 40 of them were "made in the United States of America" and they were far more sophisticated and supplied far more knowledge to the people of the world than those of the Soviet Union. The Mariner spacecraft now on its way to Venus is the most intricate instrument in the history of space science... The growth of our science and education will be enriched by new knowledge of our universe and environment, by new techniques of learning and mapping and observation, by new tools and computers for industry, medicine, the home as well as the school." (Ibid)
- "The second largest amount [in the FY1963 bill], $3,674,115,000, was for [NASA], an increase of $1,848,865,000 over fiscal 1962 NASA appropriations... The [House] Committee recommended $3,644,115,000 for NASA, $143,161,000 less than the budget estimate but nearly $2 billion more than was appropriated in fiscal 1962... $60 million was restored [in the Senate bill], leaving the total $83,161,000 under the budget estimates" ("Independent Offices Funds," *CQ Almanac 1962*, 18th ed., 04-183-04-188. Washington, DC: Congressional Quarterly, 1963)

NASA R&D Appropriations for FY1964

Bill: Independent Offices Appropriation Act, 1964

Public Law: 88-215 **Enacted:** December 19, 1963 **Effective:** December 19, 1963

Nominal change		Real change		Classification
Millions ($)	YOY%	Millions ($2012)	YOY%	
$1,426.7	38.8%	$6,227.5	38.0%	Exogenous

Congress again appropriated significant increases in both nominal and real aerospace R&D funding for FY1964, largely driven by President Kennedy's Apollo moon mission and

geopolitical competition with the Soviet Union. To restrain the deficit while delivering on a promised tax cut, the president's FY1964 budget request cut most expenditures, but defense and space programs were exempted from this fiscal restraint, and another large budget increase was proposed for NASA. But in a telling turn of events, Congress balked at NASA's hefty price tag, and cut $500 million, or about 30%, from the requested increase in funds over FY1962 levels. In recent years, the Senate Appropriations Committee had partially or largely reversed the budget cuts proposed by their thriftier House counterparts, but this year they agreed with the entire reduction recommended by the House Appropriations Committee. The *New York Times* attributed the shift in sentiment and funding to election-year pressures and the desire for fiscal restraint. The cutback in NASA's funding was expected to delay the Apollo moon mission by a year or more, and called into question congressional willingness to sustain such considerable funding for the space program in the interim. President Kennedy was on a two-day tour of Texas, in part defending his space program in the "space-conscious state," when he was assassinated in Dallas, TX on November 22, 1963. This significant increase in aerospace R&D funding appears to have been motivated by resolve to beat the Soviets to the moon and related national security and geopolitical concerns of the space race; the reduction relative to the requested increase in funds appears to have been motivated by long-run fiscal concerns and "growing disenchantment with the lunar race." Moreover, NASA's growing space program does not appear to have been influenced by concerns about inflation or other short-run macroeconomic prerogatives; as such, we classify this policy event as exogenous. Most pertinent narrative evidence:

- "In these past months we have reaffirmed the scientific and military superiority of freedom. We have doubled our efforts in space, to assure us of being first in the future... I will shortly submit a fiscal 1964 administrative budget which, while allowing for needed rises in defense, space, and fixed interest charges, holds total expenditures for all other purposes below this year's level." John F. Kennedy, State of the Union Address, January 14, 1963 (*The American Presidency Project*, by Gerhard Peters and John T. Woolley, https://www.presidency.ucsb.edu/node/237129)
- "In this budget for 1964, most of the increase in expenditures over the current year is also for national security and space programs, carrying forward efforts already begun to strengthen our defenses and to participate more actively in man's attempt to explore outer space." (Budget Message of the President, FY1964, January 17, 1963, p. 15)
- "The accelerated programs for exploration and use of outer space moved ahead vigorously during the past year, and further significant advances are anticipated in the year ahead. This budget provides for an increase of $2 billion in appropriations for [NASA] to proceed with the top priority manned lunar landing program and with its wide range of programs of scientific investigation and development of useful applications such as communications and meteorological satellites. Expenditures in 1964 are estimated to rise to $4.2 billion, which is $1.8 billion over the current year's level—an increase of 75%. Efforts are being concentrated on the continued development of the complex Apollo spacecraft and the large Advanced Saturn launch vehicle needed to boost the Apollo to the moon... The recent Mariner flight past Venus attests to the progress we are making in unmanned space investigations. Development of geophysical, astronomical, meteorological, and communications satellites will also continue. This budget provides for strong research efforts aimed at developing the technology needed for advanced space missions, including future manned space flight and unmanned explorations of Venus and Mars." (Ibid, p. 18)

- "A cost-conscious Congress, concerned about Uncle Sam's soaring budget for space, is preparing to dictate a slower 'go' policy for exploring the universe... The brakes won't be slapped on the U.S. race to put a man on the moon. But, for the first time since its creation five years ago, [NASA] can count on considerably less money for many space flight activities than it wishes. The Congressional crackdown promises to force the postponement of some projects... The first big tip-off to the hardening Congressional mood is the House Space Committee's rather surprising decision to whack $500 million from the Kennedy Administration's request for $5.7 billion in new NASA spending authority for the fiscal year beginning July 1... "There aren't many of us who regard this as a crash program anymore, asserts California's Rep. George Miller, the space committee's soft-spoken chairman. "We want NASA to act with celerity and dispatch, but we also want it to build a solid foundation for the future and not go rushing into a lot of unneeded projects." ("Soaring NASA Outlays Will Spur Lawmakers To Curb Explorations," by Paul Duke, *The Wall Street Journal*, June 27, 1963)
- "The Senate dealt an unexpected and perhaps crippling blow today to the Administration's plans for a lunar expedition in this decade. The Senate action, cutting back the space budget to $5.1 billion, came as a surprise to the Administration, which had been looking to the Senate to restore some funds to a space agency budget that had been sharply reduced by the House. Instead, the Senate cut the budget back to the level approved by the House. As a result, [NASA] in the current fiscal year will receive $5.1 billion in new appropriations—$612 million less than originally requested by the Administration... The reduced budget will force a slowdown in the schedule for the moon expedition, pushing the target date for the first lunar landing from the 1967-68 schedule into the 1968-69 period... the Congressional action raises a serious question of whether the Administration can count on the budgetary support necessary to achieve a lunar landing by the 1969 deadline set by President Kennedy in May 1961. The Senate action was attributed to a growing disenchantment with the lunar race and an increasing preoccupation, as an election year approaches, with the issue of the economy... The economy drive was also evidenced by the Senate's refusal to reverse sharp reductions in the $589 million budget request for the [NSF]" ("Senate Approves House Space Cuts," by John W. Finney, *The New York Times*, November 21, 1963)
- "The most controversial item was $5,100,000,000 for [NASA]. It was $1,425,885,000 more than fiscal 1963 NASA appropriations but represented a cut of $612 million in President Kennedy's fiscal 1964 program—achieved by cutting $361,179,600 from the authorization he requested and then by appropriating $250,820,400 less than was authorized." ("Cut in NASA Funds Highlights Independent Offices," *CQ Almanac 1963*, 19th ed., 168-74. Washington, DC: Congressional Quarterly, 1964)
- "The NASA appropriation, part of which would finance the nation's moonshot program, Project Apollo, came under particularly heavy criticism during the debate. Project Apollo's opponents argued that its cost was out of proportion to the benefits of landing a man on the moon. [House] Appropriations Committee Chairman Clarence Cannon (D Mo.) said that with the total estimated $20 to $40 billion cost of the moonshot, the Government could "build a school-house in every community" or "eliminate every communicable child disease" in the nation or endow "free hospitals and homes" for all the nation's aged." (Ibid)
- "President Kennedy mixed a strong defense of his space program with some old-fashioned, earth-bound politics today as he opened a two-day tour of Texas. In this

space-conscious state, he pledged that the conquest of that "new frontier" would go ahead. He gave the reassurance despite Congressional reductions in his space budget. He declared in a speech at Brooks Air Force Base: "There will be setbacks and frustrations and disappointments. There will be pressures for our country to do less and temptations to do something else. But this research must and will go on. The conquest of space must and will go ahead." ("Kennedy Pledges Space Advances; Opens Texas Tour," by Tom Wicker, *New York Times*, November 21, 1963)

NASA R&D Appropriations for FY1967

Bill: Independent Offices Appropriation Act, 1967

Public Law: 89-555 **Enacted:** September 6, 1966 **Effective:** September 6, 1966

Nominal change		Real change		Classification
Millions ($)	YOY%	Millions ($2012)	YOY%	
-$207.3	-4.0%	-$1,037.9	-4.5%	Exogenous

For the first time since President Kennedy announced the Apollo moon mission in 1961, Congress appropriated significant decreases in both nominal and real aerospace R&D funding for FY1967. In his forward to the FY1967 budget request, President Johnson explained that NASA appropriations would be falling by roughly $300 million for the year because the space program was "progressing from the more expensive development phase into operational status, and new projects of equivalent cost will not be started." In particular, the Gemini program—the second manned spaceflight program, following Mercury and in preparation for Apollo—was nearing completion. While the moon mission and space program more broadly had been top priorities of President Kennedy, the Johnson administration was being pulled in many different directions at once; the Vietnam War and the administration's war on poverty and Great Society legislation were also straining the federal budget deficit. The budget request explained that "many older and lower priority activities have been reduced or eliminated, and economies have been sought in every operation of the Government." NASA administrators were publicly warning that the U.S.S.R. might beat the U.S. to the moon and worrying about the agency's purpose—and funding—post-Apollo. As the Vietnam War escalated, the specter of inflation began creeping into the budget process, with President Johnson warning in his statement on signing the FY1967 NASA authorization that continued progress in the space program could be made "only if business and labor leaders will make their contribution by responsible pricing and bargaining decision." The administration requested a decrease in NASA's funding for FY1967, and the appropriations conference bill cut an additional $444 million from the budget request, having split the difference between lower House approvals and smaller budget cuts recommended by the Senate. The decrease in aerospace R&D funding appears to have been motivated by the Gemini program nearing completion and a weakening constituency for the space program during the Johnson administration, after years of rapid growth in NASA's budget and the rise of new domestic and wartime budget priorities. Noted concerns about inflation do not appear to have influenced the reduction in NASA's funding for FY1967, and the policy change seems unrelated to other short-run macroeconomic prerogatives, such as concerns about unemployment. As such, we classify this policy event as exogenous. Most pertinent narrative evidence:

- "Let us carry forward the plans and programs of John Fitzgerald Kennedy—not because of our sorrow or sympathy, but because they are right... we must assure our

pre-eminence in the peaceful exploration of outer space, focusing on an expedition to the moon in this decade..." Lyndon B. Johnson, State of the Union Address, January 8, 1964 (*The American Presidency Project*, by Gerhard Peters and John T. Woolley, https://www.presidency.ucsb.edu/node/242292)

- "We are a rich nation and can afford to make progress at home while meeting obligations abroad—in fact, we can afford no other course if we are to remain strong. For this reason, I have not halted progress in the new and vital Great Society programs in order to finance the costs of our efforts in Southeast Asia. But even a prosperous nation cannot meet all its goals all at once. For this reason, the rate of advance in the new programs has been held below what might have been proposed in less troubled times, many older and lower priority activities have been reduced or eliminated, and economies have been sought in every operation of the Government." (Budget Message of the President, FY1967, January 24, 1966, p. 7)
- "In 1967, less than six years after this Nation set the goal of a manned landing on the moon within the present decade, we will begin unmanned test flights of the giant Saturn V rocket and the Apollo spacecraft—the complete space vehicle required for achieving that goal. Later on in the 1960's, we will undertake the manned lunar mission itself. Our many space achievements—both manned and unmanned—have dramatically advanced our scientific understanding and technological capabilities. They have also clearly demonstrated our remarkable progress in the peaceful exploration of space. In 1967, our large space projects will be progressing from the more expensive development phase into operational status, and new projects of equivalent cost will not be started. Accordingly, expenditures of [NASA] are estimated to decline by $300 million in 1967." (Ibid, p. 22)
- "The President's budget leaves no margin for setbacks or failures in the attempt to put men on the moon by 1970, the head of the space agency said today. In telling Congress that budget cuts are taking flexibility out of the Apollo lunar program, James E. Webb repeated a warning that has been sounded by space officials with increasing volume over the last three years... He testified before the House Science and Astronautics Committee on the request by [NASA] for $5,012,00,000 for [FY1967]... Mr. Webb also repeated the warning, sounded frequently in recent months, that new goals beyond the first lunar landings must be set soon or the space program will lose valuable momentum. A 'strong and increasing effort' must be begun under the budget that will be requested next January and then pushed vigorously if the United States is to keep pace with the Soviet Union, he said. Meanwhile, 'there is more chance than I thought a year ago that Russia will be [on the moon] before 1969,' Mr.Webb said. The Soviet program moved ahead 'very much more rapidly,' last year than did the American, he said... 'We are as much as two years behind the Soviet Union in certain aspects of space power.' The new budget 'will not close' this gap, he said.'" ("NASA Says Budget Hems in Program: Hems in Program," *New York Times*, March 11, 1966)
- "The [House] Committee considered budget estimates totaling $5,012,000,000 for the space program which is $163,000,000 less than was appropriated for NASA in the current year. The Committee is recommending $4,495,000,000, which is $62,000,000 less than the request for 1967... The Committee recommends $4,245,000,000 for all [R&D] activities of the agency related to space and aeronautics including the full request for fiscal year 1967 for the Apollo program... This is a reduction of $1,600,000 in the budget estimate and $286,000,000 less than in 1966... The decline in funding from

1966 is attributed to decrease requirements of the Gemini program which is nearing completion." (H. Rpt. 89-1477, May 5, 1966, pp. 13)

- "The nation is facing a crisis in space planning, James E. Webb, head of [NASA], said today. The question is what to do with the vast, $20-billion Apollo project after men have landed on the moon... Congress has cut $1.5 billion from Mr.Webb's budget requests in three years. The executive branch, pressed by other problems, has not fought Congress hard on this issue. As a result, Apollo already is a high-risk program, with no reserves for failures. Any major setback would mean missing the lunar deadline of 1970 set by President Kennedy in 1961... Apollo's original goals were to land men on the moon in this decade and to give the nation the managerial, industrial, and technological resources to do almost anything it chose to do in space. Both goals are almost in sight, and Mr. Webb feels a sense of frustration that no one seems interested in guaranteeing the success of reaching either" ("NASA Chief Urges Space Planning Now For Post-Moon Era," by Evert Clark, *New York Times*, May 30, 1966)
- "I have signed today a bill authorizing $5,000,419,000 for [NASA] for the current fiscal year. This bill follows closely the recommendations made in the budget for 1967. It reaffirms once again the historic decision by this Nation in 1961 to lead in space exploration and the peaceful uses of space. It enables us to move ahead toward our goal to send men to the moon and back in this decade... I sign this bill, greatly encouraged by such remarkable recent successes as the brilliant performance of the Surveyor spacecraft on its first mission to the moon, and the highly significant advances in manned space flight being made by the Gemini team... However, if particular segments of our economy continue to raise their prices and increase the cost of this and other programs, it will be necessary for the Government to further reduce its expenditures, particularly in those areas where prices are rising in an inflationary way... If we are to continue our space effort and continue to make the magnificent progress represented by our past achievements, we can do so only if business and labor leaders will make their contribution by responsible pricing and bargaining decisions." Lyndon B. Johnson, Statement by the President Upon Signing Bill Authorizing Appropriations for [NASA], August 5, 1966 (*The American Presidency Project*, by Gerhard Peters and John T. Woolley, https://www.presidency.ucsb.edu/node/239247)
- "The [Senate] Committee increased House appropriations by $41.6 million to a total $4,991,600,000 [for NASA]. Included in the increase was funding of the full Budget request for the Gemini program and restoration of $40 million divided equally between the construction of facilities and administrative operations... [The conference bill] recommended appropriations totaling $4,968,000,000, $32,419,000 less than the amount authorized for fiscal 1967 and $44 million less than the Administration request." ("Appropriations for Independent Offices," *CQ Almanac 1966*, 22nd ed., 166-72. Washington, DC: Congressional Quarterly, 1967)

NASA R&D Appropriations for FY1968

Bill: National Aeronautics and Space Administration Appropriation Act, 1968

Public Law: 90-131 **Enacted:** November 8, 1967 **Effective:** November 8, 1967

Nominal change		Real change		Classification
Millions ($)	YOY%	Millions ($2012)	YOY%	
-$378.8	-7.6%	-$1,954.9	-9.0%	Exogenous

Congress again appropriated a significant decrease in both nominal and real aerospace R&D funding for FY1968, cutting funding for NASA to the lowest levels in five years. NASA had been pushing for a decision about post-Apollo programmatic direction, and the Johnson administration finally delivered in their FY1968 budget request, proposing prolonged manned orbital missions and longer moon exploration missions, in addition to the unmanned Voyager mission to Mars. Funding needs for Apollo continued to fall, as the program had largely advanced from the "costly phase of the development cycle" on to operations, but the administration requested budgetary increases for unmanned and future manned space programs. The FY1968 budget proposed a modest $82 million increase in NASA's funding, but the appropriators slashed into the proposed budget, appropriating $511 million (10%) less than requested; the House Appropriations Committee decided that all new programs could be deferred, noting that they would have appropriated more "under less stringent fiscal circumstances." The House Committee seemed pleased with NASA's progress to date, and were concerned with competing costs of the Vietnam War and "vital domestic programs" as well as the rising budget deficit; a significantly pared back budget was deemed adequate to support a "viable space program." While the House had been prioritizing fiscal restraint and less funding for NASA, their Senate counterparts largely agreed to a change; more importantly, the Johnson administration did not push back against the appropriators in defense of NASA. The enacted cuts were not without controversy; the appropriators were accused of ceding the race for interplanetary exploration to the Russians by defunding the Voyager project, and Senator Margaret Chase Smith, ranking member of the Aeronautical and Space Sciences Committee, lashed out against President Johnson for "relegating the space program to a secondary position." Even so, the political constituency for the space program had certainly weakened, contributing to the decrease in aerospace R&D funding; the Gemini and Apollo programs moving out of development phases, waning perception that the U.S. was losing the space race, backlash to years of NASA's budget skyrocketing, and the rise of competing budget priorities contributed more broadly. The policy change does not appear to have been influenced by any short-run macroeconomic prerogatives, such as concerns about unemployment or inflation; as such, we classify this policy event as exogenous. Most pertinent narrative evidence:

- "Despite a 19-month lapse since the last Russian flight and despite hectic activity by the U.S., [NASA Director James] Webb said, the Russians are still ahead of the U.S. in the race to land men on the moon. He also said they are ahead in several areas by as much as two years. "They are still ahead of us in the areas of booster rocket and payload capabilities," Mr. Webb, said, "and it will be at least another year or two before we catch up." Mr. Webb didn't say how soon he expected Russian manned space flights to be resumed. Their latest known flight was in March 1965. But, he said, Russia was developing a booster rocket even larger than the U.S.'s Saturn 5, which has a payload capability of 280,000 pounds." ("NASA Chief Predicts Soviet Will End Its Lull in Space Flights Soon," *Wall Street Journal*, October 11, 1966)
- "In 1961, this Nation resolved to send a manned expedition to the moon in this decade... This budget provides for the initiation of an effective follow-on to the manned lunar landing. We will explore the moon. We will learn to live in space for months at a time. Our astronauts will conduct scientific and engineering experiments in space to enhance man's mastery of that environment. The Surveyor and Orbiter projects, in photographing the moon, have demonstrated dramatically the value of unmanned spacecraft in investigating other objects in the solar system. Accordingly, we are

proceeding with the development of the Voyager system for an unmanned landing on Mars in 1973. We will also continue other unmanned investigations nearer the Earth... We are not doing everything in space that we are technologically capable of doing. Rather, we are choosing those projects that give us the greatest return on our investment. To support these new projects and to maintain our existing programs, an increase of $82 million is requested in new obligational authority for [NASA] for 1968. Expenditures, however, will decline by $300 million in the coming year, primarily because of reduced requirements for the manned lunar landing program." (Budget Message of the President, FY1968, January 24, 1967, pp. 21-22)

- "The primary objectives of the National Aeronautics and Space Administration programs are to extend our ability to operate in space and to use that capability for the benefit of mankind. The achievement of the manned lunar landing by 1970 will demonstrate clearly our position as a leading space-faring nation... New obligational authority of $5,050 million is recommended for fiscal year 1968, an increase of $82 million over 1967... In preparation for the manned lunar landing, earth orbital flight tests of the manned Apollo spacecraft using the uprated Saturn I launch vehicle will begin during fiscal year 1967. First flight tests of the large Saturn V launch vehicle will occur near the end of fiscal year 1967. The first manned flights on the Saturn V are planned before the end of fiscal year 1968. Funds provided for manned space flight activities in 1968 are adequate to meet the scheduled milestones unless unanticipated setbacks occur." (Budget of the United States, FY1968, pp. 93-94)
- "In fiscal year 1968, a new manned space program will be started to further advance man's ability to operate in space and to conduct scientific experiments. Launch vehicles and spacecraft developed for the manned lunar landing mission will be used with specially designed experiments in the early portion of this program. In later flights, improved spacecraft systems will be used. Manned flights in earth orbit of up to 1 year's duration are planned, using a multiple rendezvous technique and re-using empty rocket tanks and other systems left in orbit. Manned exploration missions of up to 14 days on the surface of the moon are planned to follow the initial manned landings. Because of the long lead times inherent in space activities, this program must be initiated now to maintain continuity in our manned space flight program after the manned lunar landing." (Ibid, pp. 94-95)
- "The 1968 Budget involves difficult decisions for space programs... Congress is presented with several major new programs looking far into the future which will require substantial investments in resources and manpower. Expenditure estimates for NASA for 1968 are already greatly reduced from previous funding levels. The [House] Committee recommends further reductions, bringing funding for the space program to the lowest level in several years. The amount recommended in the bill is less than would be recommended under less stringent fiscal circumstances, but the Committee is of the opinion that the $4,583,400,000 proposed will support a viable space program, and one that is consistent with available resources" (H. Rpt. 90-569, August 18, 1967, pp. 2-3)
- "The reductions recommended by the [House] Committee should in no respect be interpreted as an expression of a lack of confidence in our space endeavors. The Committee is impressed by the knowledge and dedication of the officials administering this program. The United States has made great strides in space exploration... We have launched 16 manned flights, and all have been successful. NASA has launched more than 200 unmanned flights and achieved dramatic breakthroughs otherwise since Congress de-

cleared that we should undertake a broad and expansive space program... Even with budgetary stringencies facing us, this nation must move forward in space" (Ibid, p. 3)

- "Congress in 1967 appropriated $4,588,900,000 for [NASA] for fiscal 1968... The total was $511,100,000 less than the Administration's request for $5.1 billion—the largest reduction ever made by Congress in the space program. As unusual as the large cut itself, however, was the attitude of President Johnson—one of the initial proponents of the space program—toward it. Faced with an economy-minded Congress, the President in August took the rare action of publicly stating his acceptance of deep cuts the House was making in his own space budget. Although the Senate later voted additional sums, the House prevailed in most of its reductions. The final appropriation was $5.5 million more than the House had provided and $90 million less than the sum voted by the Senate. It was $379,100,000 less than the fiscal 1967 figure" ("NASA Appropriations." In CQ Almanac 1967, 23rd ed., 05-432-05-435. Washington, DC: Congressional Quarterly, 1968")
- "Appropriations for NASA in past years had been included in the regular Independent Offices Appropriations bill. However, when the House passed that bill on May 17, funds for NASA were omitted because the required authorization bill had not been enacted. That bill (S 1296—PL 90-67) was cleared on Aug. 8, authorizing $4,865,751,000. Congress then voted the NASA appropriations separately in HR 12474." (Ibid)
- "The greatest [NASA appropriations] controversy was over R&D funds, particularly for five programs. Before the bill went to conference, both chambers eliminated one program, Advanced Missions, a project designed to study the direction of manned space flight in the future. In adopting the conference report on the bill, Congress eliminated another, Voyager, a program for unmanned explorations of Mars in the 1970s. It was argued that funds for these programs, aimed at space exploration in the future, could be deferred. Congress agreed to significantly reduced funds for the other disputed R&D programs: the NERVA II nuclear rocket project; Apollo Applications, a project designed to make further use of flight skills and hardware developed during the Apollo lunar landing program; and Tracking and Data Acquisition." (Ibid)
- "Acknowledging that it was funding NASA at the lowest level since 1963, the [House] Committee asserted, nevertheless, that the $4,583,400,000 recommended would "support a viable space program" in 1968... In considering the appropriation requests, the Committee said it was "acutely aware" of the many demands that were currently placed on the financial resources of the country. Among these, the Committee mentioned the financial needs of the Vietnam War, the cost of "vital" domestic programs, and the prospect of an estimated large budget deficit. In general, the effect of the Committee's action was to reduce or deny funds to new projects in the space program, while continuing to fund ongoing projects at levels only slightly under the Administration's request." (Ibid)
- "In general debate on the bill, Margaret Chase Smith (R-ME) sharply criticized the President for accepting the House cuts in NASA appropriations. Mrs. Smith was ranking minority member of the Aeronautical and Space Sciences Committee and a member of the appropriations subcommittee that handled the NASA bill. She said Mr. Johnson's action "clearly signaled a new policy of relegating the space program to a secondary position and one of considerably lower priority than that which he insisted upon when he was chairman of the Senate Space Committee." Mrs. Smith said he "literally pulled the rug from under those who direct the space program." (Ibid)

- "[Rep.] James G. Fulton (R-PA) criticized members of the House Appropriations Committee for voting to delete funds for the Voyager project. Citing the recent Russian success in landing an unmanned spacecraft on Venus, Fulton said, "We're tremendously behind the Russians in interplanetary exploration." If the House did not reconsider and approve the $36 million voted by the Senate, Fulton warned, "that is the end of interplanetary research programs for America. We're dropping out of the race." (Ibid)

NASA R&D Appropriations for FY1969

Bill: Independent Offices and Department of Housing and Urban Development Appropriation Act, 1969

Public Law: 90-550 **Enacted:** October 4, 1968 **Effective:** October 4, 1968

Nominal change		Real change		Classification
Millions ($)	YOY%	Millions ($2012)	YOY%	
-$593.8	-12.9%	-$3,158.5	-15.9%	Endogenous

Congress again appropriated a significant decrease in both nominal and real aerospace R&D funding for FY1969, cutting funding for NASA to the lowest levels in six years. "Lessening of inflationary pressure" was one of the four overarching objectives for fiscal policy in the FY1969 budget, and the administration was proposing to reduce funding or postpone projects when possible; NASA was not exempted from this anti-inflationary budgetary restraint. The Johnson administration proposed a modest decrease in NASA's funding in their FY1969 budget request, driven by "our progress beyond the costly [R&D] phases of the manned lunar mission, as well as the immediate need to postpone spending for new projects wherever possible." The Apollo program, which was close to attempting a moon landing, was still prioritized, but other NASA programs were postponed or cut back to less ambitious levels than previously proposed in the FY1968 budget that Congress had axed; for instance, President Johnson proposed a cheaper, less ambitious Mars exploration project than the Voyager program request from the previous year. But Congress again took a hatchet to this pared-down budget request for NASA, appropriating $375 million (8.6%) less the requested. In justifying these budget cuts to the space program, the House Appropriations Committee cited the nation's "serious Budget deficit and monetary crisis" in addition to the competing needs and budgetary pressures from the Vietnam War and "vital domestic programs," notably President Johnson's war on poverty; as in the FY1968 appropriations cycle, the Senate Appropriations Committee did not blunt the sizable cuts proposed by the House but instead proposed slightly deeper cuts and the administration did not push back in defense of their budget request for the space program. In June—after the appropriators had reported their committee bills but before the end of conference—President Johnson enacted the Revenue and Expenditure Control Act of 1968 (Pub. L. 90-364) in order to "apply the fiscal brakes" to curb inflation; the bill raised taxes, lowered spending limits for FY1969, and required the administration to propose $8 billion in recessions of FY1969 appropriations in their next budget request. James Webb, the increasingly frustrated NASA director who had led the agency since the beginning of the Kennedy administration, abruptly resigned days after the FY1969 funding bill was enacted and publicly lamented NASA's budget trajectory. Shortly before trouncing Hubert Humphrey in the 1968 presidential election, Richard Nixon echoed Webb's frustrations while campaigning, lambasting the administration for "short-sighted cutbacks" to NASA's budget and broader cuts to federal R&D that "threatened national security." Beyond competing priorities from the domestic and foreign wars, the reductions

in NASA's budget appear to have been in part motivated by short-run concerns about the federal budget exacerbating inflationary pressure—part of a broader effort to reduce inflation, interest rates, and the budget deficit. As such, we classify this policy event as endogenously motivated. We date this policy to 1968Q4, when the Independent Offices and Department of Housing and Urban Development Appropriation Act, 1969 took effect and significantly reduced real aerospace R&D funding; the previously enacted Revenue and Expenditure Control Act of 1968 had only created a framework for potentially later rescinding NASA appropriations for FY1969. Most pertinent narrative evidence:

- "At home we face equally stubborn foes—poverty, slums and substandard housing, urban blight, polluted air and water, excessively high infant mortality, rising crime rates, and inferior education for too many of our citizens. In recent years, we have come to recognize that these are conquerable ills. We have used our ingenuity to develop means to attack them, and have devoted increasing resources to that effort... We would be derelict in our responsibilities as a great nation if we shrank from pressing forward toward solutions to these problems. But faced with a costly war abroad and urgent requirements at home, we have had to set priorities. And "priority" is but another word for "choice." We cannot do everything we would wish to do. And so we must choose" (Budget Message of the President, FY1969, January 29, 1968, p. 7)
- "The overall fiscal policy for 1969 has been designed to achieve four major goals: Continuation of sustained growth in jobs and real income for the American people; Lessening of inflationary pressures; Improvement in the U.S. balance of payments; Reduction in Federal borrowing, aimed at reducing the upward pressure on interest rates." (Ibid, pp. 10-11)
- "I am proposing certain reductions which primarily reflect the stringent nature of the 1969 budget. I am, for example, recommending a temporary reduction in certain construction programs, not because they have outlived their usefulness, but because a deferral of this construction is appropriate in a period when we must relieve inflationary pressures by reducing the deficit" (Ibid, p. 19)
- "The Mercury and Gemini programs have clearly demonstrated our progress in manned space flight. The recent, highly successful launch of the huge Saturn V rocket emphasizes the great strides we have made in creating a large launch vehicle capability. We will resume manned flight tests of the Apollo spacecraft this year and proceed toward the manned lunar expedition. To meet our most urgent national needs in some areas requires us to reduce spending in others. New obligational authority requested for [NASA] in this budget is about $220 million below the 1968 amount... This reduction reflects our progress beyond the costly [R&D] phases of the manned lunar mission, as well as the immediate need to postpone spending for new projects wherever possible... Based on a careful examination of priorities, the 1969 budget provides increases in some areas to prepare for important advances in future years, while deferring other less urgent, new projects. The production of our large Saturn-class space boosters is continued but at a reduced rate. The development of a nuclear rocket engine to increase the capability of our Saturn V launch vehicle is also continued, but at a smaller size and thrust than originally planned, to reduce development cost... We will not abandon the field of planetary exploration. I am recommending the development of a new spacecraft for launch in 1973 to orbit and land on Mars. This new Mars mission will cost much less than half the Voyager program included in last year's budget." (Ibid, pp. 28-29)

- "Our national space program has come a long way during the first decade of the space age. We have launched more vehicles, have traveled more miles, and have achieved more time in space than any other nation in the world... The Nation is proud of our effort in space exploration." (H. Rpt. 90-1348, May 3, 1968, p. 12)
- "The [House Appropriations] Committee recognizes the current budgetary situation with increased costs of the Vietnam conflict and domestic demands, and accordingly, of necessity, has reduced the program levels in all new appropriations for 1969. The funding provided will afford a balanced space program to carry out national policy goals and objectives while considering other financial requirements of the country... overall space expenditures for NASA have been reduced from about a $6,000,000,000 level in recent years, to a $4,000,000,000 obligational level in the current fiscal year as herein recommended." (Ibid, p. 12)
- "A reduction of $12,950,000 [from the House allowance] is recommended by the [Senate Appropriations] committee, to provide a total amount for the programs authorized for "Research and development" of $3,370,300,000, which is $306,900,000 below the budget estimate. The committee concurs in the House recommendation that only the most important and highest priority programs be funded at this time. It is essential to continue the momentum of the Apollo program that has been reestablished." (S. Rpt. 90-1375, July 9, 1968, pp. 9-10)
- "The special costs of supporting our fighting men in Vietnam and the costs of launching and supporting comprehensive education, health, city, job, and conservation programs in our society have added many billions to our budget. The Nation's economy is moving too fast because of an unacceptable budgetary deficit. We must now apply the fiscal brakes. With the [Revenue and Expenditure Control Act of 1968] measure I sign today, we will cut $20 billion from the deficit in fiscal year 1969. This marks the largest shift of the budget toward restraint in the past two decades. Now we can attack decisively—at the roots—the threats to our prosperity: accelerating inflation, soaring interest rates, deteriorating world trade performance... This bill deals with expenditures as well as taxes. It requires the President to reduce Federal expenditures by $6 billion from the January budget for the fiscal 1969. The January budget was lean and tight... But the Congress–as a condition of its approval for the tax bill–has imposed a deep reduction in that budget." Lyndon B. Johnson, Statement by the President Upon Signing the Tax Bill, June 28, 1968 (*The American Presidency Project*, by Gerhard Peters and John T. Woolley, https://www.presidency.ucsb.edu/node/236911)
- "Appropriations for the space program were $3,995,273,000, the lowest appropriation since 1963. The appropriation was a cut of $375,127,000 in the Administration request. Funding for the space program, once a high-priority item, had become a target for budget cuts... The [House] Committee said that in arriving at its recommendations it had given "due consideration" to the nation's "serious Budget deficit and monetary crisis" and the need for "full support for our forces in Vietnam"... and "vital domestic programs."... [The committee] approved $4,008,223,000 for [NASA]. This was a reduction of $362,177,000 in the Budget request of $4,370,400,000. Appropriations for NASA had declined in the past several years; the fiscal 1969 appropriation was about $600 million less than in 1968 and almost $1 billion less than in 1967. Of the total NASA appropriation about $2.2 billion was for the Apollo project to place a man on the moon." ("Open Housing Funds Denied In HUD-NASA Money Bill," *CQ Almanac 1968*, 24th ed., 06-465-6-472. Washington, DC: Congressional Quarterly, 1969)

- "The American civilian space program has concluded its first decade with an impressive string of successes and with astronauts poised for their first ride in the Apollo mooncraft. But, on its 10th birthday today, the program lacks a leader and has no clear mandate for the future... since Soviet Sputnik 1 showed the way in 1957, the drive for space supremacy has cost the United States $44 billion... On the threshold of its greatest exploits, the agency finds the public no longer clamoring for the moon and Congress no longer handing over blank checks. War in Vietnam, poverty at home, and disorder in the cities have forced space out as a top priority From a peak of $5.9 billion in 1966, the agency's spending dropped to $4.7-billion during the fiscal year that ended last June 30, and appropriations for the present fiscal year may wind up being about $3.8-billion after Congressional cuts... In announcing his unexpected resignation two weeks ago, James E. Webb, the agency's administrator for nearly eight years, made no secret of his unhappiness with this turn of events. He complained that "A good many people have tended to use the space program as a whipping boy" and warned that the Russians may be jumping ahead in the space race." ("NASA, on 10th Birthday, Faces Uncertain Future: Space Agency Has Lost High Priority and Has No Clear Mandate After Apollo," by John Noble Wilford, *New York Times*, October 1, 1968)
- "Richard M. Nixon blamed the Administration today for cutbacks in scientific [R&D] that he said threatened national security. Soviet advances in military research could make the Soviet Union militarily dominant, he warned in a statement issued during a campaign swing through the Long Island suburbs. He said that the American scientific community had been 'demoralized' by the Administration's 'short-sighted policies.' Specifically, he deplored those cuts that had, 'struck at the lifeline of our future progress-science education'—the reduction by [NASA] of its graduate student grants from 1,300 to 50... He assailed 'short-sighted cutbacks' in the space program, noting that Soviet scientists had taken a 'bold new stride' toward a landing on the moon. He quoted James E. Webb, who resigned recently as director of NASA, as describing the new Soviet moon probe as showing 'a capability that could change the basic structure and balance of power in the world.' Mr. Nixon said the Administration was 'short-changing its scientific community' and 'risking the opening of a research gap' with the Soviet Union." ("Nixon Scores Cuts in Science Funds," by Homer Bigart, *New York Tines*, October 6, 1968)
- "After a delay of more than ten months, Congress in 1968 enacted a 1967 Administration request for a 10-percent surcharge on personal and corporate income taxes. But Congressional action on the tax increase—"surcharge" was the Administration term—was at best a Pyrrhic victory for President Johnson. The President gained his long-sought tax increase, but Congress exacted as its price for the increase a $10-billion reduction in projected fiscal 1969 appropriations, a $6-billion reduction in fiscal 1969 spending, an $8-billion rescission of unspent prior-year appropriations, and an approximately 245,000-man cutback in the number of civilian employees in the Executive Branch... [the bill] required the President in submitting the fiscal 1970 Budget to include specific recommendations for legislation to rescind $8 billion in unspent prior-year appropriations." ("Congress Votes Surtax With Expenditure Controls," *CQ Almanac 1968*, 24th ed., 12-263-12-278. Washington, DC: Congressional Quarterly, 1969)

NASA R&D Appropriations for FY1970

Primary Bill: Independent Offices and Department of Housing and Urban Development

Appropriation Act, 1970

Public Law: 91-126 **Enacted:** November 26, 1969 **Effective:** November 26, 1969

Secondary: Second Supplemental Appropriations Act, 1970

Public Law: 91-305 **Enacted:** July 6, 1970 **Effective:** July 6, 1970

Nominal change		Real change		Classification
Millions ($)	YOY%	Millions ($2012)	YOY%	
-$246.3	-6.2%	-$1,775.4	-10.6%	Endogenous

Congress again appropriated a significant decrease in both nominal and real aerospace R&D funding for FY1970, cutting funding for NASA to the lowest levels in seven years. The outgoing Johnson administration's final budget request was again intended to help "relieve" inflationary pressures by "holding down Federal outlays." NASA's budget request—roughly the same as for FY1969—was focused on seeing through the Apollo 11 moon landing, scheduled for FY1970, but otherwise "[did] not make full use of the Nation's space capabilities," according to Thomas Paine, NASA's acting administrator. On July 20, 1969, the Apollo 11 mission made good on President Kennedy's drive to put a man on the moon before the decade's end, with American astronauts Neil Armstrong and Buzz Aldrin becoming the first humans to step foot on the lunar surface; Armstrong famously proclaimed "That's one small step for a man, one giant leap for mankind" as half a billion people watched from earth.[28] President Nixon had campaigned on increasing funding for science and technology, and had railed against recent budget cuts to the space program, but the new administration did not reverse NASA's recent budget trajectory. Instead, an even lower NASA authorization was requested and approved for FY1970, authorizing roughly $300 million less for the space program than in FY1969, as "inflation squeezed all programs," according to *Congressional Quarterly*. The administration was planning several more upcoming moon missions, but revised down NASA's budget request for FY1970 by $45 million, and much of Congress had lost interest in sustaining high levels of funding for NASA even before the moon landing, which further eroded any remaining urgency about space program funding; the Vietnam War, housing and urban problems, and "the inflationary spiral" back on Earth continued to compete for funds and congressional attention, as the House Appropriations noted in justifying their proposed budget cuts to the space program. The moon landing also drew considerable focus to—and some ire about—the cumulative cost of the space program to date; NASA had spent a little over $35 billion (about 3.4% of GDP) in just 11 years, and DOD had spent an additional $22 billion or so on space programs to date. The Senate Appropriations had approved the outgoing Johnson administration's original (higher) budget request for NASA, but the conferees settled much closer to the lower House approval for NASA R&D and the lower Senate allowance for NASA research and program management. Just before the end of the fiscal year, the Second Supplemental Appropriations Act, 1970 (Pub. L. 91-305) appropriated a $38 million increase for NASA's Research and program management budget account for pay increases, motivated by higher rates of inflation, but NASA R&D funding nonetheless saw a sizable net reduction for the year. Beyond the success of the Apollo moon landing and competing budgetary priorities, the reductions in NASA's budget again appear to have been in part motivated by short-run concerns about the federal budget exacerbating inflationary pressure and efforts to restrain inflation. As such, we classify this policy event as endogenously motivated. This policy event is dated

[28] "July 20, 1969: One Giant Leap For Mankind," NASA, https://www.nasa.gov/mission_pages/apollo/apollo11.html

to 1969Q4, when the Independent Offices and Department of Housing and Urban Development Appropriation Act, 1970 took effect, resulting in a significant decrease in NASA R&D appropriations well before the enactment of the more minor supplemental bill. Most pertinent narrative evidence:

- "The 1970 budget program calls for... A budget surplus in the year ahead, as well as in the current fiscal year, to relieve the inflationary pressures in the economy and to reduce the strains that Federal borrowing would place on financial markets and interest rates... In periods of inflationary pressure, such as we are now experiencing, the need for holding down Federal outlays is beyond dispute" (Budget Message of the President, FY1970, January 15, 1969, pp. 7, 15)
- "Our space plans call for the first American to set foot on the moon during the period covered by this budget. This achievement will climax a great national effort of 8 years duration, and will mark the attainment of the national goal established by President Kennedy in 1961. The budget also provides for the continuation of manned space flights for exploration of the moon beyond the first manned expedition, and for manned experiments in earth orbit for prolonged periods. Significant continuing efforts in unmanned space flight and ground-based research are also supported... New budget authority of $3.8 billion, together with unobligated funds from prior years, will permit a program level in 1970 equal to that of the current year. However, total outlays of $3.9 billion are $300 million less than in 1969, largely because of the completion of the most expensive developmental phase of the manned lunar landing program." (Budget of the United States, FY1970, pp. 89-90)
- "It may be the Year of the Moon, but you'd never know it from the space agency's budget request for fiscal 1970. With little but the prevailing wind of austerity in mind, NASA is asking Congress for $3.88 billion for the next fiscal year, the same it was told it could spend in the current year, more than $2 billion less than it spent five years ago and the first time it's asked for less than $4 billion in any year in the last eight. "This budget," says NASA's Acting Administrator Thomas O. Paine in painful understatement, "does not make full use of the Nation's space capabilities." What it does is allow NASA to close out the Apollo program, by landing four parts of astronauts on different parts of the moon in the next two years, starting with two crew members of Apollo 11 this summer." ("Major Requests in Johnson Budget," *The Washington Post*, January 16, 1969)
- "Dr. Thomas O. Paine, acting administrator of [NASA], described NASA's fiscal 1970 budget "as a 'holding' budget that provides for progress but defers critical and program funding decisions to the new Administration." Paine said that the fiscal 1970 budget was designed to maintain NASA's overall program at approximately its fiscal 1969 level. He said an additional $117 million was available in funds that had been appropriated for fiscal 1969 but had not been spent because of the expenditure cut required by the Revenue and Expenditure Control Act of 1968 (PL 90-364)." ("NASA Authorization," *CQ Almanac* 1969, 25th ed., 300-305. Washington, DC: Congressional Quarterly, 1970)
- "Before you take a break, Mr. Chairman, I was home, as many members were, over the Easter period. Some people suggested to me where to reduce the budget in order to help dampen inflationary pressures. One place, they say, is the space program. Some said we should care less about going to the moon... I do not have much interest in going to the moon as an end in itself, but the benefits to medicine, to the military, to industry, science, and education, are so great that we cannot ignore the importance

of the space program. One man asked me to document that point. I found myself floundering a bit when I tried to add up $30 or $40 billion worth of "fallout" benefits..." House Appropriations Committee Chairman George H. Mahon (D-TX), April 19, 1969 (Hearings Before the House Appropriations Committee on the Independent Offices and Department of Housing and Urban Development Appropriations, FY1970, p. 688)

- "For the programs of [NASA] the bill provides total appropriations of $3,696,983,000. This amount is $63,544,000 below the original budget, $18,544,000 below the revised budget, $298,290,000 below the appropriations for 1969 and $269,394,000 below the total authorizations recently approved by the House. The [House Appropriations] Committee shares our Nation's pride in the accomplishments of the national space program... The NASA team which has made the space program a resounding success is to be commended. The two manned space flights around the moon this past year are feats that rank high among the accomplishments of man. The proposed landings on the moon this year will be another dramatic and major step and achievement in space exploration. The Committee feels that an adequately funded space program is essential to the progress of this Nation. However, with the inflationary spiral, the crisis we face in the inner cities, the crucial housing shortage, and other domestic and international problems, the Committee must, in its deliberations, give consideration to all of these problems, assess priorities, and then recommend the funding level providing a balanced space program." (H. Rpt. 91-316, June 19, 1969, p. 12)
- "Hello Neil and Buzz, I am talking to you by telephone from the Oval Room at the White House, and this certainly has to be the most historic telephone call ever made from the White House. I just can't tell you how proud we all are of what you have done. For every American, this has to be the proudest day of our lives, and for people all over the world, I am sure that they, too, join with Americans in recognizing what an immense feat this is. Because of what you have done the heavens have become a part of man's world, and as you talk to us from the Sea of Tranquility, it inspires us to redouble our efforts to bring peace and tranquility to earth. For one priceless moment in the whole history of man, all the people on this earth are truly one—one in their pride in what you have done and one in our prayers that you will return safely to earth." Richard M. Nixon, Telephone Conversation With the Apollo 11 Astronauts on the Moon, July 20, 1969 (*The American Presidency Project*, by Gerhard Peters and John T. Woolley, https://www.presidency.ucsb.edu/node/239626)
- "The lunar landing cost anywhere from $350-million to $30-billion, depending on who is counting and how. [NASA's] official estimate of Apollo 11's costs is $350 million, but this omits the Federal expenditure on [R&D], capital construction of ground facilities, and all the programs that have led up to the landing, such as Mercury and Gemini... In its 11 years of existence, NASA had spent, up to the start of this month, $36.25-billion... [with] $23-billion for manned spaceflight, $5.2-billion for scientific investigations, $3.5-billion for space technology, $2.5-billion for support operations, $1.1-billion for space applications, and $900-million for aircraft technology. About two-thirds of this total sum, or $24 billion, is reckoned as the cost of the Apollo program. But the $24-billion does not include the $2.75-billion of expenses that went into the one-man Mercury and two-man Gemini programs, necessary to build experience in space flights, and the unmanned Ranger, Surveyor, and Orbiter programs that yielded valuable information on where to land on the moon and with what... In addition, the Defense Department spent more than $2-billion on space last year and has spent an amount estimated at

$20-billion in the last 15 years." ("Costs of Landing Put At $30-Billion," by Richard D. Lyons, *New York Times*, July 22, 1969)

- "Congress Nov. 7 cleared for the President's signature the fiscal 1970 National Aeronautics and Space Administration authorization bill... containing $3,715,527,000, including funds for three additional manned moon flights in fiscal 1970... The amount agreed to by the conferees was the same as that requested by the Nixon Administration and approved earlier by the Senate. The total was $250,850,000 less than that approved by the House and $297,846,000 below the amount authorized in 1968. The reduction in over-all authorizations below fiscal 1969 came in the midst of Congressional debate over space spending and domestic priorities and despite the success of the Apollo 11 and 12 moon flights. The amount approved for the Apollo program (the Administration request) was $1,691,100,000. This is compared with a fiscal 1969 authorization of $2,025,000,000... Inflation squeezed all programs between rising costs and demands for reduced spending." ("NASA Authorization," *CQ Almanac* 1969, 25th ed., 300-305. Washington, DC: Congressional Quarterly, 1970)
- "A delay of major proportions in enacting annual appropriations bills for the departments and agencies of the Federal Government during 1969 forced the Congress to pass four continuing resolutions during the first session of the 91st Congress to enable federal departments to continue spending at fiscal 1969 appropriations levels." ("Agencies Operate Through Continuing Appropriations," CQ Almanac 1969, 25th ed., 686. Washington, DC: Congressional Quarterly, 1970)

NASA R&D Appropriations for FY1971

Bill: Independent Offices and Department of Housing and Urban Development Appropriation Act, 1971

Public Law: 91-556 **Enacted:** December 17, 1970 **Effective:** December 17, 1970

Nominal change		Real change		Classification
Millions ($)	YOY%	Millions ($2012)	YOY%	
-$436.3	-11.6%	-$2,448.1	-16.4%	Endogenous

Congress again appropriated significant decreases in both nominal and real aerospace R&D funding for FY1971, largely driven by concerns about inflationary pressures from the federal budget and diminished Congressional interest in the space program, particularly after the successful Apollo 11 moon landing the year before. In March 1970, President Nixon laid out an ambitious proposal for the next phase of the U.S. space program, which included the Skylab temporary space station, a subsequent permanent space station, and a new space shuttle transportation system. Nevertheless, the administration requested significantly less funding for NASA than was authorized for FY1970—in part because of an anticipated decline for the successful Apollo program. Congress authorized more funding than requested, a first in the agency's brief existence, but President Nixon vetoed the first version of the House Independent Offices Appropriations bill because it exceeded his budget request by $541 million, and was threatening to drive up the budget deficit and inflationary pressures; the House tried but failed to override the veto, amidst a fierce debate about the relationship between the federal budget and inflation. In the final enacted appropriations bill, Congress approved slightly less funding for NASA than the administration had requested. While some members of Congress were concerned about the inflationary impact of federal spending on

the space program, others wanted to redirect funds from NASA to other domestic priorities; the constituency in support of space funding, which had been weakening ever since President Kennedy was assassinated, was much diminished after the moon landing, ambitions of the Nixon administration notwithstanding. Beyond competing budgetary priorities, the reductions in NASA's budget again appear to have been in part motivated by short-run concerns about the federal budget exacerbating inflationary pressure, and part of a broader effort to reduce inflation, interest rates, and the budget deficit. As such, we classify this policy event as endogenously motivated. Most pertinent narrative evidence:

- "I have pledged to the American people that I would submit a balanced budget for 1971. This is particularly necessary because the cost of living has been rising rapidly for the past five years. The budget I send to you today—the first for which I bear full responsibility as President—fulfills that pledge... This anti-inflationary budget begins the necessary process of reordering our national priorities. For the first time in two full decades, the Federal Government will spend more money on human resource programs than on national defense." (Budget Message of the President, FY1971, February 2, 1970, p. 7)
- "Man has ventured to the moon and returned—an awesome achievement... I have reviewed many exciting alternatives for the future. Consistent with other national priorities, we shall seek to extend our capability in space—both manned and unmanned. I intend to do this within total space outlays 12% smaller than in 1970. In our current efforts, we will continue to stress additional uses of space technology. Our actions will make it possible to begin plans for a manned expedition to Mars." (Ibid, p. 37)
- "The space agency's spending, employment, and operations would be reduced to their lowest level since the United States set its course for the moon almost a decade ago under the budget proposed by President Nixon today. Reductions of 12.5 percent in funds to be spent by [NASA] will result in the closing of two and perhaps three of its centers, the postponement of probes to the planets, the deferral of scientific missions to study the phenomena of the solar system, and the stretching of lunar exploration over a longer period than originally planned. NASA's new budget envisions the spending of $3.4 billion in the coming fiscal year, a decrease of almost half a billion dollars from outlays now. The budget cuts were deepened last week on order of the White House, according to Dr. Thomas O. Paine, the NASA administrator, who said 'the last turn of the screw' was applied then. At a budget briefing for newsmen last Saturday Dr. Paine sidestepped the question of the amount of the additional reductions... It appeared that among the money-saving changes made as a result of Mr. Nixon's last-minute economy push was the postponement for six months of the launching of the large scientific laboratories containing a big solar telescope... The largest project cuts were made in the Apollo program, almost three-quarters of a billion dollar's worth. But it already had been anticipated that the cost of the Apollo program would drop as the rockets and spacecraft for the remaining Apollo moon landings moved toward the end of assembly lines" ("12.5% Slash in NASA Funding Will Force Sharp Program Cut," by Richard D. Lyons, *The New York Times*, February 3, 1970)
- "Over the last decade, the principal goal of our Nation's space program has been the moon. By the end of that decade, men from our planet had traveled to the moon on four occasions, and twice they had walked on its surface... Having completed that long stride into the future which has been our objective for the past decade, we must now define new goals which make sense for the seventies. We must build on the successes

of the past, always reaching out for new achievements. But we must also recognize that many critical problems here on this planet make high-priority demands on our attention and our resources. By no means should we allow our space program to stagnate. But—with the entire future and the entire universe before us—we should not try to do everything at once. Our approach to space must continue to be bold—but it must also be balanced." Richard M. Nixon, Statement About the Future of the United States Space Program, March 7, 1970 (*The American Presidency Project*, by Gerhard Peters and John T. Woolley, https://www.presidency.ucsb.edu/node/240967)

- "Congress June 22 cleared for the President's signature the fiscal 1971 National Aeronautics and Space Administration authorization bill... containing $3,410,878,000. It included funds for the permanent space station/space shuttle project—NASA's program for manned space flight after the scheduled completion of the Apollo series in 1974. Funds also were included for the 1972–1973 Apollo Applications flight (Skylab), a temporary space station in earth orbit using hardware developed for the Apollo lunar missions... The amount included in the conference report was $77,878,000 above the $3,333,000,000 requested by NASA. The authorization was $304,649,000 below the $3,715,527,000 authorized in the fiscal 1970 NASA authorization bill... For the first time since the establishment of NASA, under the National Aeronautics and Space Act of 1958, total authorizations in the bill were above the Administration request" ("Congress Authorizes $3.4 Billion for Space Agency," *CQ Almanac 1970*, 26th ed., 02-200-02-207. Washington, DC: Congressional Quarterly, 1971)
- "Edward I. Koch (D N.Y.) opposed the [House Science] Committee's increase in NASA's budget "by almost $300 million... Rather than increase the NASA budget, I would recommend that it be reduced." Koch cited education, housing, mass transit, pollution abatement, and crime control as higher national priorities than the space program... Charles A. Mosher (R Ohio) also criticized the increase. He said there was "an urgent need to curtail Government spending" to control inflation." (Ibid)
- "I am determined to hold the line against a dangerous budget deficit. I am determined to hold the line against the kind of big spending that would drive up prices or demand higher taxes. For that reason, I am today returning, without my approval, two bills the Congress has passed that would increase the Federal budget deficit by nearly one billion dollars. [First veto:] The Independent Offices Appropriations bill, which includes funds for urban development, exceeds my budget request by $541 million... I am vetoing this bill because it would help drive up the cost of living, harming the people it is most designed to help. This kind of excessive spending would also help cause the kind of huge deficits that drive up interest rates..." Richard Nixon, Vetoes of Appropriations Bills for the Office of Education and for Independent Offices and the Department of Housing and Urban Development, August 11, 1970 (*The American Presidency Project*, by Gerhard Peters and John T. Woolley, https://www.presidency.ucsb.edu/node/240309)
- "The [enacted] bill was $300 million less than the $18,009,525,300 contained in the first HUD-Independent Offices appropriations bill (HR 17548), which the President vetoed Aug. 11. The House Aug. 13 failed to override the veto. The first HUD-Independent Offices appropriations bill was $541,301,800 over the Administration's budget request of $17,468,223,500. HR 19830 was still $241,301,800 over the request, but House and Senate floor managers called it a compromise the President was likely to accept." ("Compromise HUD, NASA, Offices Bill Passed after Veto," *CQ Almanac 1970*, 26th ed., 02-742-02-752. Washington, DC: Congressional Quarterly, 1971.)

- "[The House Appropriations Committee] approved an appropriation of $3,197,000,000, a reduction of $136 million from the Nixon request and $499,633,000 less than the fiscal 1970 total. The amount recommended was $403,875,000 less than the total authorization adopted on April 23 by the House... The Committee recommended that the Apollo 14 flight, tentatively scheduled for October 1970, be deferred until after the first of calendar year 1971 to allow time for an evaluation of the study on Apollo 13. The Administration request for $2,606,100,000 for [R&D] was cut by the Committee to $2.5 billion—a reduction of $106.1 million. The funds recommended would provide for one Apollo flight instead of two flights in fiscal 1971... The final appropriation for NASA—$3,268,675,000—was an increase of $71,675,000 over the House bill and a $50,628,000 reduction from the Senate bill. The largest cuts made in the agency budget were for [R&D]." (Ibid)
- "Debate [on whether to override the first bill's veto] was marked by sharp partisan charges and counter-charges as to whether the Administration or the Democratic-controlled Congress was responsible for inflation. Democrats and Republicans clashed over whether or not the increase in appropriations over the Administration's request was itself inflationary... Republicans countered that the Nixon Administration was spending twice what the Johnson Administration had spent in its last year on urban renewal, housing and water and sewer programs. To spend more, they said, would cause additional inflationary pressure which would be more harmful..." (Ibid)
- "For the sixth consecutive year, Congress in 1970 reduced appropriations for [NASA]. The $3,268,675,000 appropriated by Congress on Dec. 7 for fiscal 1971 (HR 19830—PL 91-556) was $480,541,000 below the appropriation for fiscal 1970 and $64,325,000 under the budget request for fiscal 1971. The high point for NASA funding was fiscal 1965, when more than $5.2 billion was appropriated. The budget cuts reflected some disenchantment by Congressmen and scientists with the Apollo (moon landing) program, especially after a near-disaster in April 1970, when Apollo 13 with three astronauts aboard almost was stranded in space. It was felt unmanned exploration of space and the planets was cheaper and less risky to human life. Other critics of the space program saw domestic needs as more pressing than space exploration. The budget cuts forced NASA to cancel manned missions after 1974, space out remaining Apollo missions over a longer period, delay an eight-month earth orbital mission from 1972 to 1973, and suspend production of the Saturn V rocket after completion of the 15th Saturn V." ("91st Congress: Legislation Completed, Not Completed," *CQ Almanac 1970*, 26th ed., 05-76-05-87. Washington, DC: Congressional Quarterly, 1971)
- "The Nixon Administration is moving to make the hydra-headed Federal science and technology apparatus more responsive to the nation's needs, a feat that has eluded the most herculean efforts of policy planners since the [R&D] boom began a generation ago. Central to the new effort... is the identification of priorities in the areas of science and technology and the weighing of the priorities against one another to determine where they will rank in the struggle for federal dollars... In the last year of Federal belt-tightening, science has repeatedly been portrayed as a rudderless ship, lacking in direction, purpose, and, more importantly, Presidential concern... The reorganization efforts will focus on the $14-billion a year worth of applied [R&D] programs that seek to take the knowledge of science and translate it into better housing, mass transportation, cleaner air and healthier people." ("Nixon Reorganizing Vast Federal Science Complex," by Richard D. Lyons, *New York Times*, November 1, 1970)

NASA R&D Appropriations for FY1972

Bill: Department of Housing and Urban Development; Space, Science, Veterans, and Certain Other Independent Agencies Appropriation Act, 1972

Public Law: 92-78 **Enacted:** August 10, 1971 **Effective:** August 10, 1971

Nominal change		Real change		Classification
Millions ($)	YOY%	Millions ($2012)	YOY%	
-$4.5	-0.1%	-$516.9	-4.1%	Exogenous

Congress slightly cut nominal aerospace R&D funding for FY1972, resulting in a significant decrease in real appropriations. President Nixon's budget message declared that "excessive demand was eliminated as a source of inflationary pressure" in the previous two years, and the emphasis of the budget was no longer restraining spending growth to contain inflationary pressures. The administration's FY1972 request proposed holding appropriations for the space program roughly flat from the year before; the Apollo program had also moved out of the costly development phase, thus requiring less funding, but the administration wanted to start development work on a new generation of space shuttles to reduce the long-run cost of manned orbital space operations. The House Science and Astronautics Committee authorized $162 million more for NASA than requested, with Chairman George P. Miller (D Calif.) lamenting the recent trend in appropriations for NASA and pushing for funding that would support a "viable" space program. The Senate Appropriations Committee recommended $24 million above the budget request, providing more funds for R&D work on the space shuttle and nuclear rocket engine programs, but their House counterparts approved $29 million less than the budget request; differences were roughly split by the conference committee, and the R&D account landed roughly at the House-approved budget request. The political constituency backing the space program had weakened after the moon landing, but the Soviet Union's successful orbital launch of Salyut 1—the first crewed space station—in April 1971 upped the pressure to accelerate, or at least not delay, development work on Skylab and the shuttle. The slight decline in nominal funding and significant decline in real aerospace R&D appears to have been largely motivated by decreased funding needs for the Apollo program, backlash to NASA's rapid budget growth in the 1960s, and newer competing budget priorities balanced with new geopolitical and strategic concerns about the U.S.S.R.'s orbiting space station. Supporters of the space shuttle program cautioned that cutting funding would "relegate the U.S. to a second-state role in space... exacerbate unemployment and compromise national security," but the end policy decision does not appear to have been driven by concerns about unemployment, inflation, or other short-run macroeconomic prerogatives. As such, we classify this policy event as exogenous. Most pertinent narrative evidence:

- "The 1972 budget reaffirms the determination of the Federal Government to take an activist role in bringing about the kind of prosperity that has rarely existed in the American economy—a prosperity without war and without runaway inflation... When I took office two years ago, rampant inflation was the Nation's principal economic problem. This inflation was a direct result of the economic policies of the period 1966 to 1968 when we were mired in war in Vietnam, and when Federal spending rose sharply... My administration acted promptly to move us out of that war and cool the superheated economy. We controlled Federal spending in 1969 and achieved a budget surplus. Spending was restrained again in 1970. Independently, the Federal Reserve System maintained a monetary policy of restraint which increased in severity

throughout calendar year 1969 and continued into early 1970... Excessive demand was eliminated as a source of inflationary pressure during this period. The turnaround of this inflationary trend permitted us to enter the second phase of our plan: to follow more expansive economic policies without losing ground in the battle against inflation." (Budget Message of the President, FY1968, January 24, 1967, pp. 7-8)

- "Programs designed to attack the problems of the 1950's or 1960's can be expected to lose relevance as we move into the 1970's. The 1972 budget incorporates the results of a diligent search to uncover inefficient, obsolete, or lower-priority programs... Implementation of these proposals would result in 1972 outlay savings of $1.0 billion. Included are the termination and reduction of certain projects in both the [AEC] and [NASA]..." (Budget of the United States, FY1972, January 29, 1971, p. 50)
- "The 1972 budget provides for a balanced space program guided by three purposes—exploration, scientific knowledge, and practical applications. Despite decreased outlays in 1972, the budget will allow steady progress in exploiting the scientific return from continued exploration of the moon, extending man's capability to live and work in space, continuing unmanned exploration of the planets and the universe, and developing practical applications of space technology. Development will begin on the engine of a space shuttle in an effort to reduce substantially the cost of future space operations in earth orbit... New budget authority of $3.3 billion is approximately the same as the 1971 level. Total outlays of $3.2 billion are $217 million less than in 1971. This decrease reflects a decline in spending for the Apollo manned lunar expeditions and reductions in space technology and supporting activities." (Ibid, p. 102)
- "The orbiting of the Soviet Union's huge new space station has given an unexpected boost to backers of the American space shuttle, the multibillion-dollar gleam in the eye and the aerospace industry. The shuttle is viewed by [NASA] as the transportation system necessary as a forerunner to the construction in orbit by the end of the decade of an American space station that would carry a dozen crewmen... Opponents of these projects, which would cost tens of billions of dollars, have slowly been gathering support since the heady days of the first moon landing. Yet it has been almost a cliche here that a threat of a Soviet space extravaganza is enough to shore up waning support for the American space program... Development of the shuttle hinges on the attitude of the Administration and Congress toward a larger space program. Yet the Administration already has reduced the military and civilian space budgets, while Congressional opposition has increased in the past year. The shuttle originally was due to fly in 1976, a date that now looks wildly optimistic." ("Soviet Space Station Spurs Shuttle Plan," by Richard D. Lyons, *New York Times*, June 8, 1971)
- "Today the House of Representatives is scheduled to vote on providing $100 million for preliminary work on a reusable space rocket called the space "shuttle." Though the sums are small, the stakes are high: Today's vote is part of a mounting battle over the future of the American space program... The shuttle, which will ultimately cost $9 billion or $10 billion, is expected to survive the House test, as it survived a related Senate vote yesterday. But its toughest battles lie ahead... To spacemen the shuttle is more than just another rocket; it's the proposed heart of the U.S. space program in the decades ahead. NASA is now an agency desperately searching for new missions. Past are its vintage years, the early 1960s, when it could count on uncritical congressional acceptance of almost any new scheme. Instead, the agency has been struggling for almost two years now to shape a program that the politicians will support... NASA's

last manned flight is scheduled for 1973, and the agency may even lose one or two of its remaining Apollo moon missions in 1972 because of waning public and political support." ("Space Shuttle: NASA's Last Chance," by Jonathan Spivak, *Wall Street Journal*, June 30, 1971)

- "[C]ongressional opponents are linking the shuttle to the broader issue of national priorities. Led in the Senate by Walter Mondale, the Minnesota Democrat, they contend that massive spending on another big new space project is wholly unwarranted while the national needs remain unmet in the areas of education, health care, combating poverty, and renovating the cities. "The shuttle is one of the outstanding symbols of a tragically distorted sense of priorities," says Sen. Mondale. "I see it as a central issue in the direction of American life." Shuttle supporters say such attacks are animated by a short-sighted hostility to technology, and they, too, talk of national priorities. Killing the shuttle, they argue, would relegate the U.S. to a second-rate role in space at a time when the Soviets are having great success with their Salute space station. Moreover, they argue, defeating the shuttle would impede industrial development, exacerbate unemployment, and compromise national security." (Ibid)
- "Congress July 28 cleared for the President a bill... authorizing $3,354,950,000 for [NASA] for fiscal 1972. The Administration initially requested $3,271,350,000 for NASA; subsequently, an amendment of $29,285,000 to the NASA budget request was submitted for a total request of $3,300,635,000... The conference agreement was $54.3 million more than the $3,300,635,000 requested... Major increases approved in conference included $30 million more than the budget request for the space flight operations program and $43 million more than the budget request for the nuclear power and propulsion program. Of the $30-million increase for the space flight operations program, $15 million went to the Skylab program and $15 million went to the space shuttle." ("NASA: $3.3-Billion Authorized for Fiscal 1972," *CQ Almanac 1971*, 27th ed., 06-630-06-634. Washington, DC: Congressional Quarterly, 1972)
- "The House Science and Astronautics Committee April 22 reported a clean bill... authorizing $3,433,580,000 ($162.2-million more than requested...) for [NASA] for fiscal year 1972. It was the third year in a row that the committee reported an increase over the amount requested by the Administration... The majority of the committee's increased authorization was in the [R&D] program where $150.4 million was added to the Administration's request... Rep. George P. Miller (D Calif.), chairman of the House Science and Astronautics Committee, explained the committee's reasons for increasing the space authorization above the Administration's budget request: "I should remind the committee (of the whole House) that last year's request was the lowest space budget submitted to Congress since fiscal year 1962 and this year's request is lower by $61,650,000... the committee recommends an increase of about 5 percent this year... This increase will provide NASA with funds in critical areas... to ensure that a viable program is pursued."" (Ibid)
- "[The House Appropriations Committee approved] $3,271,500,000, $29,135,000 under the budget request and $41,119,000 below fiscal 1971 appropriations. The full budget request of $2,517,700,000 for [R&D], a drop of $47,300,000 from fiscal 1971, was approved... The [Senate Appropriations] Committee recommendation of $3,324,635,000 was $24,000,000 more than the budget request and $53,135,000 more than the House allowance. The bulk of the funding was in [R&D], for which the committee recommended $2,541,700,000, $24,000,000 more than the budget request... Conferees ap-

proved $2,522,700,000 for [R&D]... They earmarked $39 million for development of the NERVA (nuclear rocket engine) program and $18.5 million for space shuttle facilities development." ("HUD, VA, NASA, Other Agencies: $18.3-Billion for 1972." In CQ Almanac 1971, 27th ed., 07-238-07-244. Washington, DC: Congressional Quarterly, 1972)

NASA R&D Appropriations for FY1974

Bill: Department of Housing and Urban Development; Space, Science, Veterans, and Certain Other Independent Agencies Appropriation Act, 1974

Public Law: 93-137 **Enacted:** October 26, 1973 **Effective:** October 26, 1973

Nominal change		Real change		Classification
Millions ($)	YOY%	Millions ($2012)	YOY%	
-$367.9	-10.8%	-$2,060.0	-17.4%	Endogenous

Congress again appropriated a significant decrease in both nominal and real aerospace R&D funding for FY1974, largely driven by concerns about the inflationary influence of the federal budget and diminished Congressional interest in the space program. President Nixon warned in his budget message that "instead of operating primarily as a stimulus, the budget must now guard against inflation," and was trying to keep federal spending capped at $250 billion to achieve that goal. The administration proposed cutting appropriations for NASA by roughly $400 million relative to FY1973, principally by slowing development work on the reusable space shuttle program and suspending work on the High Energy Astronomy Laboratory; the request for NASA was the lowest in a decade. In June 1973, President Nixon addressed the nation and announced new price controls aimed at the recent acceleration in inflation and asked Congress to do its part by holding down "the cost of government," threatening to "veto spending bills that we cannot afford." A week later, the House Appropriations Committee commended NASA for a host of recent accomplishments and then proceeded to trim $3 million from the R&D budget account and $24 million from the construction account in their committee bill. The Senate Appropriations Committee concurred with that cut to R&D funds but slightly blunted the reductions for construction and capital equipment, and the conference committee agreed to reduce aerospace R&D funding to the lowest levels since early in the Apollo program. Beyond waning public enthusiasm for the space program, the reductions in NASA's budget again appear to have been in part motivated by short-run concerns about the federal budget exacerbating inflationary pressure, part of a broader effort to reduce inflation and the budget deficit. As such, we classify this policy event as endogenously motivated. Most pertinent narrative evidence:

- "The space agency announced cutbacks in its work as its part of trying to keep overall government spending at President Nixon's $250 billion spending ceiling. The reductions will mean a $200 million savings by [NASA] in the current fiscal year. The cutbacks range across NASA's activities but will require the outright cancellation of only a few projects... The NASA reductions will bring the agency's spending level down to $3.06 billion in the current fiscal year, which ends June 30. Officials don't expect any deeper cuts in the coming fiscal year and are hopeful that other space projects won't be affected by the economy campaign." ("NASA Spending Cut $200 Million For Fiscal 1973: Space Agency Action in Line With Nixon Economy Goal; Space Shuttle Is Slowed," *The Wall Street Journal*, January 6, 1973)

- "During the past two years, with the economy operating below capacity and the threat of inflation receding, the Federal budget provided fiscal stimulus that moved the economy toward full employment. The 1974 budget recognizes the Federal Government's continuing obligation to help create and maintain—through sound monetary and fiscal policies... instead of operating primarily as a stimulus, the budget must now guard against inflation." (Budget Message of the President, FY1974, January 29, 1973, p. 4)
- "The 1974 budget provides a continued program in space science, aeronautics, and the practical application of space technology. The major initiative for the 1970's is the development of a manned, reusable space shuttle which will enable more economical access to space, beginning about 1980... The last manned visit to the moon under the Apollo program was successfully completed in December 1972. In calendar year 1973, Skylab, a three-man experimental space station, will test man's ability to live and work in space for up to 56 days. In calendar year 1975, the United States and the U.S.S.R. will conduct a rendezvous and docking mission with manned spacecraft. By about 1980, use of the space shuttle will reduce the cost of operations in earth orbit by enabling the recovery of satellites for reuse, repair of satellites in orbit, and reuse of launch vehicles" (Budget of the United States, FY1974, pp. 88-89)
- "The nation's space program is being slowed down again, the eighth straight year it has either suffered a decline or failed to get a raise... New spending authority, much of its commitments to the future, is down to $3.016 billion, almost $400 million less than it was the current fiscal year and the lowest it's been in more than a decade... The rest of the news out of the space agency is bad. It already announced the suspension of work on the High Energy Astronomy Laboratory and a year's stretch out in the returnable manned space shuttle... The cuts will also mean a personnel reduction of almost 1,900 people in NASA" ("Nixon Proposes Sharp Cutbacks in Some Federal Programs," *The Washington Post*, January 30, 1973)
- "We must be restrained in Federal spending... The Federal Government spent too much [in the 1960s], too fast in that period and the result was runaway inflation... We expect inflation to be reduced even further in 1973—for several reasons. A fundamental reason is the Nation's growing opposition to runaway Federal spending... There are many areas in which the President and the Congress should and must work together on behalf of all the people—and the level of spending, since it directly affects the pocketbooks of every family in the land, is one of the most critical. I have fulfilled my pledge that I would not recommend any programs that would require a general tax increase or would create inflationary pressures" Richard M. Nixon, State of the Union Address on the Economy, February 22, 1973 (*The American Presidency Project*, by Gerhard Peters and John T. Woolley, https://www.presidency.ucsb.edu/node/256029)
- "But there is one great problem that rightly concerns every one of us, and that is, as you know, rising prices, and especially rising food prices. By the end of last year, we had brought the rate of inflation in the United States down to 3.4 percent... But now prices are going up at unacceptably high rates... Effective immediately, therefore, I am ordering a freeze on prices... The most important single thing the Congress can do in holding down the cost of living is to hold down the cost of government. For my part, I shall continue to veto spending bills that we cannot afford, no matter how noble-sounding their names may be. If these budget-busters become law, the money would come out of your pocket—in higher prices, higher taxes, or both." Richard Nixon, Address to the Nation Announcing Price Control Measures, June 13,

1973 (*The American Presidency Project*, by Gerhard Peters and John T. Woolley, https://www.presidency.ucsb.edu/node/255542)

- "During the past eighteen months, [NASA] has enjoyed a number of significant accomplishments. During calendar 1972 all of NASA's launches and missions were successfully flown. Apollo 17, the last of the six lunar landings, will be remembered as the most rewarding to the scientist. Mariner 9 brought back data that radically changed the thinking about Mars. The first Earth Resources Satellite is providing data on the Earth's environment and natural resources, and the United States and the Soviet Union agreed to carry out the first joint space flight. The 1974 budget request proposes continuation of the Space Shuttle System and the American-Russian Apollo-Soyuz project. Funds are also requested for the second and third crew visits to Skylab; the Viking program which is scheduled to make a soft landing on Mars in July of 1976; a Mariner Venus-Mercury mission to be launched in October of this year... The Committee recommends an appropriation of $2,194,000,000 in support of [R&D] activities, which is a reduction of $3,000,000 below the budget request." (H. Rpt. 93-296, June 19, 1973, p. 15)
- "The FY1974 plan, according to the Agency, provides for completion of the Skylab missions, preparations for the Apollo/Soyuz Test Project, the first cooperative manned flight effort between the United States and the USSR, and increased activity in the design and development of the Space Shuttle... The FY1974 budget request provides for continued investigation of phenomena of the universe using automated spacecraft, sounding rockets, balloons and aircraft, and ground-based research... Within the total appropriation of $2,194,000,000 recommended by the Committee for [R&D], the Committee expects NASA to carry out, to the extent possible, the suggestions contained in the House Report" (S. Rpt. 93-272, June 25, 1973, pp. 19-20)
- "[The House Appropriations Committee recommended] $2,988,800,000—$27.2-million less than the budget request and $418.85 million less than the fiscal 1973 appropriation. While praising NASA's record of accomplishment, the committee recommended $16.3 million less than the requested $28 million for further funding of supersonic flight research. The committee called the $11.7 million level "the more reasonable, 1973 level of effort." It also reduced a request for construction funds from $112 million to $87.8 million, suggesting that funds for the space shuttle system need not be provided earlier than they were actually needed... [The Senate Appropriations Committee recommended] $3,002,100,000—$13.9-million less than the budget request, $13.3 million more than the House allowance, and $405.5 million less than the fiscal 1973 appropriation. The committee concurred with the House by recommending an appropriation of $2,194,000,000 for [R&D], which was $3 million below the budget request... Conferees agreed to appropriate $3,002,100,000 for NASA, as in the Senate version, instead of the $2,988,800,000 recommended in the House bill. The $13,300,000 thereby added to the space agency's fund for construction of facilities brought the total appropriation closer to the administration's requested $3,016,000,000." ("Congress Votes $19-Billion For HUD, VA, NASA Programs," *CQ Almanac 1973*, 29th ed., 193-200. Washington, DC: Congressional Quarterly, 1974)

NASA R&D Appropriations for FY1975

Bill: Department of Housing and Urban Development; Space, Science, Veterans, and Certain Other Independent Agencies Appropriation Act, 1975

Public Law: 93-414 **Enacted:** September 6, 1974 **Effective:** September 6, 1974

Nominal change		Real change		Classification
Millions ($)	YOY%	Millions ($2012)	YOY%	
$191.4	6.3%	-$275.7	-2.8%	Exogenous

Congress appropriated a substantial nominal increase for NASA's FY1975 budget, but in the highly inflationary environment at hand, it nonetheless resulted in a significant decrease in real aerospace R&D funding for the year. President Nixon's final budget request embraced a "New [fiscal] Federalism philosophy" in which the federal budget would only prioritize "meeting national problems," and the budget proposed substantial increases in federal funding for energy, health, defense, and space research—all deemed appropriate roles for the federal government. With the first era of the manned space program nearing completion and the second phase awaiting the completion of the space shuttle program, the administration prioritized funding for further progress on the shuttle, as well as developing new science and weather satellites and "a spacecraft to locate and map geothermal sources" of energy back on earth. The space program was also taking a turn from competition with the Soviet Union to cooperation; the high-profile Apollo-Soyuz mission—the first cooperative Soviet and American space mission, intended (and subsequently perceived) as a detente in the Cold War— scheduled for July 1975. While the House appropriators once again pared back the budget request, their Senate counterparts added even more funding for NASA's R&D programs than the requested increase. The nominal increases in NASA's budget do not appear to have been motivated by concerns about unemployment or inflation but instead were related to pursuing broader scientific efforts and peaceful geopolitical objectives, learning more about the earth's natural resources, and improving weather forecasting technologies. Contrary to some recent years, FY1975 funding decisions for NASA do not appear to have been influenced by inflationary pressures or related efforts to curb federal spending, or any other short-run macroeconomic prerogatives. As such, we classify this policy event as exogenous. Most pertinent narrative evidence:

- "[O]nce again the familiar voice of the perennial prophets of gloom telling us now that because of the need to fight inflation, because of the energy shortage, America may be headed for a recession... Let me speak to that issue head-on. There will be no recession in the United States of America. Primarily due to our energy crisis, our economy is passing through a difficult period. But I pledge to you tonight that the full powers of this Government will be used to keep America's economy producing and to protect the jobs of America's workers. We are engaged in a long and hard fight against inflation. There have been, and there will be in the future, ups and downs in that fight. But if this Congress cooperates in our efforts to hold down the cost of Government, we shall win our fight to hold down the cost of living for the American people." Richard M. Nixon, State of the Union Address, January 30, 1974 (*The American Presidency Project*, by Gerhard Peters and John T. Woolley, https://www.presidency.ucsb.edu/node/256218)
- "In the face of economic uncertainty, my budget recommendations provide for a fiscal policy that would support high employment while restraining inflation. It would maintain the flexibility to take further action, if needed, to offset the effects of energy shortages. My budget recommendations hold the rise of Federal spending to the minimum increases necessary" (Budget Message of the President, FY1975, February 4, 1974, p. 4)

- "The 1975 budget provides a program that is balanced among space science, aeronautics, and the practical application of space technology. The development of a manned, reusable space shuttle will continue in order to make possible more economical access to space. Outlays in 1975 of $3.3 billion are $95 million greater than anticipated 1974 expenditures. In 1976, outlays are expected to be about $3.4 billion. (Budget of the United States, FY1975, p. 77)
- "In calendar 1973, Skylab, a three-man experimental space station, began to test man's ability to live and work in space for up to 84 days. In July 1975, the United States and the U.S.S.R. will conduct a rendezvous and docking mission with manned spacecraft. By about 1980, the use of the space shuttle will reduce the cost of operations in earth orbit by enabling the recovery of satellites for reuse, repair of satellites in space, and reuse of launch vehicles... Exploration of the solar system will proceed using unmanned spacecraft. Work has begun on spacecraft which will explore the atmosphere of Venus. Preparations will continue for the July 1976 Viking unmanned search for life on Mars. Recently, the first spacecraft to travel to Jupiter obtained scientific measurements and photographed that planet. Two larger spacecraft are being developed to explore Jupiter and Saturn in more detail late in the 1970's. Development will continue on high energy astronomy observatories to study the composition of distant stars." (Ibid, pp. 77-78)
- "In the [space science and] applications program, [R&D] will continue on a new generation of weather satellites to provide major improvements in weather forecasting. A satellite to monitor the earth's pollution is being developed. In addition, the demonstration of the utility of satellite data for agriculture, geology, and other applications will continue with the launch and operation of the second Earth resources technology satellite. Work will begin on a spacecraft to locate and map geothermal sources which have the potential of being used as sources of energy. A satellite will be developed to monitor the oceans..." (Ibid, p. 78)
- "President Nixon proposed the biggest defense budget in the nation's history reflecting both inflation and the desire to negotiate with the Soviet Union from a position of military strength... [NASA] is seeing its first annual budget upturn since its glory days of the mid-60s. The President wants NASA to spend nearly $3.3 billion in the new fiscal year, up $95 million from the pinched current period. But space planners still didn't get as much as they want for the space shuttle, NASA's next major manned vehicle, and were forced to delay its first orbital flight..." ("Record Defense Budget of $85.8 Billion Reflects Inflation And Nixon's Wish to Negotiate With USSR From Strength," by Richard J. Levine, *The Wall Street Journal*, February 5, 1974)
- "I first want to pay my respects to those who have been in the Skylab program... When man first landed on the Moon, of course, it was an enormous event—and the second time and the third time. Even the first orbital flight, as we all recall, those names are legendary. But then, sometimes here in America we become accustomed to extraordinary feats, and sometimes we tend to take for granted bravery, intelligence, courage, all of these wonderful attributes that those men have displayed on this 84-day mission in space... we also recognize the contribution they are making to America and to science and to better relations between nations... I would like to now add a word with regard to the joint expedition that will take place, I understand, in July of 1975 with the Soviet cosmonauts... The Russian people want peace, and we want peace. The Russian people want progress, and we want progress. The Russian people want to cooperate with the United States, and we want to cooperate with the Russian people

and with all people on the Earth in anything that will advance the cause of science, the cause of health, the cause of a better life for all of our children, as well, of course, as the cause of peace." Richard Nixon, Remarks Following a Tour of the Lyndon B. Johnson Space Center, March 20, 1974 (*The American Presidency Project*, by Gerhard Peters and John T. Woolley, https://www.presidency.ucsb.edu/node/256561)

- "The successful flight of Mariner 10 to the planet Mercury marks another historic milestone in America's continuing exploration of the solar system. With this mission, we will begin to end centuries of speculation about our planetary neighbor closest to the Sun. On behalf of all Americans, I extend warmest congratulations to NASA and the Mariner 10 team on their outstanding performance." Richard Nixon, Message Following Successful Flight of Mariner 10, March 29, 1974 (*The American Presidency Project*, by Gerhard Peters and John T. Woolley, https://www.presidency.ucsb.edu/node/256624)
- "During the past year, [NASA] marked the end of an era. The original manned space program, which began with Project Mercury, ended with the highly successful flights of Skylab. Except for the Apollo-Soyuz mission, American men will not return to space until the first Space Shuttle Mission in 1979. As the space program moves into the next era, NASA is to be congratulated for the role it has played in contributing to the technological leadership of the Nation... The [House Appropriations] Committee recommends an appropriation of $2,327,380,000 in this bill... The total recommendation is $14,200,000 below the budget request and is $41,000,000 below the authorization" (H. Rpt. 93-1139, July 21, 1974, p. 16)
- "The [Senate] Committee recommends an appropriation of $2,349,080,000 for funding NASA's [R&D] program. This amount is $7,500,00 over the budget estimate and $21,700,000 over the allowance in the House bill. The Committee approved all budgeted items in this account, including $6,200,000 for the Large Space Telescope (LST) and $8,000,000 for SEASAT, funding for which had been denied by the House" (S. Rpt. 93-1056, August 1, 1974, p. 19)
- "[The House Appropriations Committee recommended] $3,203,050,000—$39,644,000 less than the budget request, but $168,043,000 more than the fiscal 1974 appropriation... The committee cut a total of $14.2 million from the $2,341,580,000 request for NASA [R&D] programs. The cuts would kill the initial development of a large space telescope and defer the development of an experimental satellite to observe ocean characteristics... Adding a total of $39,644,000 to the House-passed amount, the [Senate] committee proposed an appropriation of $3,242,694,000 for NASA. The recommendation was the same as the budget request, but the committee made increases in the amount requested for [R&D] while cutting construction and program management requests by an identical amount. The total amount did not include $4,435,000 appropriated for NASA in the fiscal 1975 energy [R&D] bill." ("HUD-NASA-VA Appropriations: $21.2 Billion," *CQ Almanac 1974*, 30th ed., 90-97. Washington, DC: Congressional Quarterly, 1975)
- "Rejecting the "meat axe approach" of cutting appropriations bills on the Senate floor, the Senate, at the urging of Appropriations Committee Chairman John L. McClellan (D Ark.), agreed to let the committee determine where such cuts were to be made. Momentum to cut all appropriations bills by about 3 percent in order to reduce federal spending by approximately 10 percent, as recommended by many economists as necessary to curb inflation, had been building in the Senate for about ten days." (Ibid)

NASA R&D Appropriations for FY1979

Bill: Department of Housing and Urban Development–Independent Agencies Appropriation Act, 1979

Public Law: 95-392 **Enacted:** September 30, 1978 **Effective:** October 1, 1978

Nominal change		Real change		Classification
Millions ($)	YOY%	Millions ($2012)	YOY%	
$495.1	12.2%	$507.1	5.0%	Exogenous

Congress reversed course and appropriated significant increases in both nominal and real aerospace R&D funding for FY1979, largely driven by President Carter's interest in the space program and his broader push for more federal funding for science and technology, particularly real funding increases for basic research. The space shuttle program was nearing completion and remained a top budget priority—both for funds channeled through NASA and from DOD, which was interested in using the new launch vehicle for military purposes. The Carter administration was also keen on using unmanned space satellites to learn more about Earth —notably regarding weather, natural disasters, natural resources, and compliance with arms control treaties—and the solar system more broadly. This increase in aerospace R&D funding appears to have been motivated by geopolitical imperatives of completing development work on the space shuttle as well as concerns about the environment, natural resources, human safety, and nuclear nonproliferation that benefited from satellite imaging. Contrary to some earlier years, FY1979 funding decisions for NASA do not appear to have been influenced by inflationary pressures or related efforts to curb federal spending, or any other short-run macroeconomic prerogatives. As such, we classify this policy event as exogenous. Most pertinent narrative evidence:

- "The budget provides for continued improvements in defense intelligence systems, worldwide communications systems, and test and evaluation capabilities. Defense support for the NASA space shuttle program will continue." (Budget of the United States, FY1979, p. 74)
- "special emphasis is given in this budget to: Increased funding for basic research as part of a Government-wide effort to continue real growth in the overall level of Federal support for such research; Continued development of the space shuttle system and procurement of four shuttle orbiters for operations from both east and west coasts; Development of a satellite system for measuring energy radiation to and from Earth, as part of the administration's climate research initiative; Development of a spacecraft to study the polar regions of the Sun for the first time." (Ibid, p. 91)
- "The 1979 budget recommends continued real growth in the overall level of Federal funding for basic research and an emphasis throughout the budget on research related to critical national problems. Total obligations for the conduct of basic research across all Federal programs, including basic research funded in other functional categories, are estimated at over $3.6 billion in 1979. This represents an increase of $359 million, 10.9% over the 1978 dollar level and about 5% above expected inflation." (Ibid p. 92)
- "The [Senate] Committee recommends an appropriation of $3,295,700,000 for [R&D] activities at [NASA]. This amount is $3,500,000 above the House allowance and $9,400,000 below the budget estimate... Although the Committee notes that the House has diverted funds from the solar polar mission, the space telescope, and the Jupiter orbiter/probe to set up a space shuttle reserve, the Committee does not concur in this

decision but rather directs NASA to come before the Committee to justify the need for any additional space shuttle funding... The Committee recommends the appropriation of $914,000,000 for research and program management, which is $7,000,000 over the House allowance and the same as the amount requested in the President's budget... In supporting the full budget estimate, the Committee is aware that NASA has dramatically decreased its personnel in the past few years and that the present budget estimate will support only the fiscal year 1978 personnel level" (S. Rpt. 95-1060, May 17, 1978, pp. 44-45, 47-48)

- "The conferees resolved a dispute over funding for a new rocket motor to prevent an uncontrolled descent by the Skylab space station. The House had rejected a request by NASA for $20.5 million for the project, but the Senate had approved the request. The conferees approved the $20.5 million figure but said NASA should not obligate more than $10 million for continued development of the system without the approval of the House and Senate Appropriations Committees. In the absence of committee approval, the conferees said, the remaining $10.5 million would be available only for funding requirements of the space shuttle itself. The conferees also approved $147,500,000 for construction projects, $1 million less than recommended by the Senate but nearly $13 million more than recommended by the House. The $147.5 million would enable NASA to go ahead with the second phase of the pad "B" launch complex at Kennedy Space Center. The House had cut $12.8 million recommended for the project, but the Senate had restored the cut." ("$67.9 Billion HUD Funds Bill Cleared," *CQ Almanac 1978*, 34th ed., 78-87. Washington, DC: Congressional Quarterly, 1979)
- "We speak often of progress. But there's nothing in scientific and technological experience to compare with the enormous leaps we've made in the brief span of the two decades of the space age... Consider what we have done in just one-quarter of a human lifetime. We've put men in orbit around the Earth and around the Moon. We've put machines in orbit around the Earth, the Moon, the Sun, and the planet Mars. We've learned to maneuver in space, to dock ships together in space, and even to walk in space. On board Skylab we've learned to live and work in a weightless environment for many weeks at a time. We've begun the exploration of the inner planets and the outer planets. Two American Vikings have been sending back valuable scientific data from the surface of Mars for more than 2 years. Pioneer X has passed Jupiter and is on its way to interstellar space. It will be the first tangible product of human hands to leave the solar system... like the entire effort of space exploration, it is a striking symbol of human curiosity, human ingenuity, and the very human desire to communicate with others. And of course, the greatest event of all: We went to the surface of the Moon, not once, but six times. And each time, the astronauts returned safely to their home planet, Earth, and to their home country, the United States of America." Jimmy Carter, Kennedy Space Center, Florida Remarks at the Congressional Space Medal of Honor Awards Ceremony, October 1, 1978 (*The American Presidency Project*, by Gerhard Peters and John T. Woolley, https://www.presidency.ucsb.edu/node/243616)
- "We went to the Moon, in part, as a matter of national pride. But when we got there, we discovered something very interesting. Through the eyes and the cameras of the astronauts, we looked back at the Earth, above the strange horizon of the Moon in a pitch-black sky. We saw our own world as a single delicate globe of swirling blue and white, green, and brown. From the perspective of space, our planet has no national boundaries. It's very beautiful, but it's also very fragile. And it is the special

responsibility of the human race to preserve it. Of all the things we've learned from our explorations of space, none has been more important than this perception of the essential unity of our world." (Ibid)

- "The first great era of the space age is over; the second is about to begin. It will come into its own with the new space shuttle, the heart of our new space transportation system when it becomes operational. With its ability to lift a payload of up to 32 tons into orbit on mission after mission, the shuttle will give us regular, frequent, and economical access to space... We've invested so far some $100 billion over the history of our American space programs. It's now time for us to capitalize on that major investment even more." (Ibid)
- "We've already reaped many practical benefits from space... Communication satellites have already made global communications instantaneous, reliable, and cheap. They've brought remote areas of the Earth out of their isolation. We will continue to develop them. Weather satellites have already saved billions of dollars, and thousands of lives through early warnings of hurricanes and floods. We will continue to develop them. We've greatly strengthened our national security through defense space applications. We will continue to develop these capabilities. Photoreconnaissance satellites have become an important stabilizing factor in world affairs in the monitoring of arms control agreements. They make an immense contribution to the security of all nations. We will continue to develop them. Earth resources satellites have already proved their value to many countries through remote sensing. They tell us about everything from the location of mineral and energy deposits to the condition of our crops, from the motion of icebergs to the health of the oceans. We will continue to develop and to use these satellites for the benefit of all people of the world." (Ibid)

NASA R&D Appropriations for FY1980

Bill: Department of Housing and Urban Development–Independent Agencies Appropriation Act, 1980

Public Law: 96-103 **Enacted:** November 5, 1979 **Effective:** November 5, 1979

Nominal change		Real change		Classification
Millions ($)	YOY%	Millions ($2012)	YOY%	
$684.6	15.0%	$607.4	5.7%	Exogenous

Congress again appropriated significant increases in both nominal and real aerospace R&D funding for FY1980, again largely driven by President Carter's interest in the space program and his broader push for more federal funding for science and technology, particularly real funding increases for basic research. The space shuttle program was tentatively scheduled to undertake its first orbital mission in FY1980 and remained a top priority—both for funds channeled through NASA and from DOD, which was interested in using the new launch vehicle for military purposes. The Carter administration remained keen on using unmanned space satellites to learn more about Earth and the solar system more broadly, and operational shuttles would facilitate the launch of heavier scientific space equipment. This increase in aerospace R&D funding appears to have been motivated by geopolitical imperatives of completing development work on the space shuttle as well as concerns about the environment, natural resources, human safety, and nuclear nonproliferation that benefited from satellite imaging. Contrary to some earlier years, FY1980 funding decisions for

NASA do not appear to have been influenced by inflationary pressures or related efforts to curb federal spending, or any other short-run macroeconomic prerogatives. As such, we classify this policy event as exogenous. Most pertinent narrative evidence:

- "Proposed funding for the space program is carefully targeted both to maximize the return on investments already made and to concentrate on those areas of research where the maximum scientific and technical returns can be realized. With manned-orbital flights of the space shuttle beginning in fiscal year 1980, space program spending can achieve new and broader benefits from the Nation's 20 years of space research, development, and exploration" (Budget of the United States, FY1980, p. 115)
- "As the space shuttle becomes operational in 1981, it will extend the work environment to space and reduce the cost of manned operations in space. In preparing for this new era the administration has developed a policy to meet national needs over the next decade. The objectives are to obtain social and economic benefits from the Nation's 20-year investment in space [R&D] and to exploit new opportunities in an evolutionary manner. The budget reflects a commitment to a balanced space program with emphasis on both space science and exploration and the practical application of space technology. The budget request maintains the current schedule in the space shuttle development program, provides for expeditious transition to an operational shuttle transportation system, continues the exploration of space, and recommends new initiatives in space applications." (Ibid, pp. 120-121)
- "In 1980, outlays of $1.6 billion are recommended for continued development and production of the space shuttle system with an expected decrease to $0.7 billion in 1982. The space shuttle will increase the flexibility and productivity of manned space missions by making possible the retrieval of payloads from orbit for reuse; the servicing and repair of satellites in space; and the operation of space laboratories, such as the European-built Spacelab, for scientific and practical purposes. When fully operational, the shuttle will replace virtually all expendable launch vehicles currently used by [DOD] and by NASA. Four shuttle orbiters will meet expected civilian and military needs through the 1980's. The space shuttle's first orbital test flight is scheduled for 1979, with regular operations scheduled to begin in 1981 at Kennedy Space Flight Center, Florida and in 1983 at Vandenberg Air Force Base, California" (Ibid, pp. 121-122)
- "The Federal Government supports fundamental studies and exploration of the solar system and the universe and demonstrations of practical applications of space-based systems. It also supports the development of space technology to reduce the cost of operations in space and to develop new applications. Consistent with the administration's space policy to emphasize space science and applications, total outlays for such programs are expected to increase from $1.2 billion in 1979 to $1.3 billion in 1980, an increase of 12%. Observations from space permit unique studies of the Earth's space environment, the Sun, the planets, and stars—studies that are not possible from ground-based observatories because of the obscuring effects of the atmosphere. The budget request recommends outlays of $672 million for space science and exploration, a 15% increase over 1979." (Ibid, p. 122)
- "The 1980 budget also emphasizes the development and demonstration of practical application of space technology. To conduct these activities, the administration proposes outlays of $420 million, a 13% increase over 1979... To investigate further the value of satellite data for monitoring agricultural crop conditions, the 1980 budget requests funding for the Departments of Agriculture and Commerce and [NASA] to initiate a

research program in worldwide agricultural production forecasting... The budget provides for work on long-term, advanced space communications technology, which will assist in maintaining the Nation's leadership in satellite communications." (Ibid, pp. 122-123)

- "The [Senate Appropriations] Committee recommends an appropriation of $3,822,500,000 in fiscal year 1980 for [R&D] activities of [NASA]. This amount is the same as the budget estimate, with some adjustments to that estimate... These recommendations will enable NASA to start some of the programs that were unfortunately turned down by [OMB] for inclusion in this year's request. The Committee feels that all of these programs are important and deserve support this year, a position also strongly held by the authorizing committees" (S. Rpt. 96-258, June 21, 1979, pp. 55-58)
- "The [House Appropriations] committee cut $34.5 million from the administration's $4.9 billion request for NASA, with the bulk of the cuts falling in [R&D] programs. While granting full funding of $220 million for ongoing space shuttle development problems, the committee deferred a $15 million request for additional studies of thrust augmentation proposed for the shuttle... The [Senate Appropriations] committee recommended an increase of $33 million in the House-approved budget for [NASA]—for a total $4,943,500,000 in fiscal 1980 authority. Although the total was $1.5 million below the budget request, it represented an increase of almost 10 percent from 1979. The bulk of the increase was to fund [R&D] programs. The committee also included $17 million for projects not included in the president's budget—the variable cycle engine (for the next generation of supersonic aircraft), advanced rotorcraft technology and a satellite system to provide ocean condition data." ("HUD-Independent Agencies," *CQ Almanac 1979*, 35th ed., 207-12. Washington, DC: Congressional Quarterly, 1980)
- "In a second conference Oct. 22, conferees reached agreement on a compromise proposal (H Rept 96-542). Senate conferees agreed to scale down their demands for space funding... In return, House conferees dropped a provision in their bill requiring NASA to obtain congressional approval before starting a proposed two-mission space shuttle program. They also agreed to provide an extra $8 million above the amount in the initial House bill for two new NASA projects." (Ibid)

NASA R&D Appropriations for FY1981

Bill: Department of Housing and Urban Development–Independent Agencies Appropriation Act, 1981

Public Law: 96-526 **Enacted:** December 15, 1980 **Effective:** December 15, 1980

Nominal change		Real change		Classification
Millions ($)	YOY%	Millions ($2012)	YOY%	
$279.3	5.3%	-$385.4	-3.4%	Endogenous

Congress appropriated a substantial nominal increase for NASA's FY1981 budget, but in the highly inflationary environment at hand, it nonetheless resulted in a significant decrease in real aerospace R&D funding for the year. President Carter's initial budget request for FY1981 again proposed a sizable nominal increase in funding for the space program, reflecting continued interest in using unmanned space satellites to learn more about Earth and the solar system as well as delays and cost overruns in the space shuttle program. But

within weeks of releasing the budget, a sharp acceleration in inflation, election-year political attacks from Republicans about inflationary pressures from federal expenditures, and renewed concerns about the budget deficit forced the administration back to the drawing board; crude oil prices had been sharply rising since mid-1979 in the aftermath of the Iranian revolution, and the annual growth in the Consumer Price Index would hit a post-war high of 14.6% in March 1980. In mid-March, President Carter announced a five-point program to curb inflation, the focal point being reducing government spending, and promised to send congress a smaller revised FY1981 budget eliminating the deficit. The administration's amended budget request transmitted in late March—actually the first of several revisions—lowered their FY1981 request for NASA R&D by $205 million, among other cuts to the agency's budget. The amended budget request and election-year politics delayed the budget process, but an eventual budget resolution gave the appropriators targets to significantly cut back funding in their bills. To top it off, the appropriators were growing increasingly frustrated with cost overruns in the shuttle program—which was now running considerably behind schedule and over budget—and NASA's recent practice of re-purposing funds across budget accounts without congressional approval. The Senate Appropriations Committee and conference committee chewed out NASA for "project overruns" and "reprogramming" funds without approval. Under pressure to reduce overall funding levels, the conferees also approved an amendment imposing an additional 2% across-the-board budget for all agencies in the bill save the Veterans Administration, further lowering NASA's funding for the year; by the time the conference had convened it was also clear that the economy was slipping into a recession and the housing sector was in particular trouble, so the conferees also reshuffled more money in the bill to subsidize mortgage borrowing. Beyond the appropriators punishing NASA for budgetary mismanagement, the reduction in real funding for NASA appears to have been influenced in large part by concerns about inflation, and reflected a broader effort by the administration and Congress to reduce federal spending as part of an anti-inflationary program. As such, we classify this policy event as endogenous. Most pertinent narrative evidence:

- "Since the beginning of my Administration, I have been committed to strengthening our Nation's [R&D] capability and to advancing those areas of science and technology which are vital to our economic and social wellbeing. That commitment has been reflected in: a 40% increase in basic research funding, resulting in the highest [R&D] funding in our Nation's history... a major review of space activities and needs, resulting in a 60% increase in space funding and in the development of a space policy that will set the direction of our space efforts over the next decade" Jimmy Carter, State of the Union Address, January 21, 1980 (*The American Presidency Project*, by Gerhard Peters and John T. Woolley, https://www.presidency.ucsb.edu/node/249581)
- "During my Administration, the expenditures for Federal space programs have increased by 75%. Much of this increase is to meet the increasingly operational nature of our space activities. Nearly half of our expenditures are now for defense purposes; photo-reconnaissance satellites, for example, are enormously important in stabilizing world affairs and thereby make a significant contribution to the security of all nations. And my new initiative to establish an oceanic satellite system will provide invaluable ocean data for both the civil and defense sectors, thereby avoiding unnecessary duplication. I have also emphasized space science and exploration, continuing to fund such spectacular programs as the Voyager missions that provided us with the remarkable close-up views of Jupiter and its moons. I am proposing two new measures—the space

telescope and the new Gamma Ray Observatory to provide a unique capability to observe distant galaxies and to obtain information about our universe from outside the earth's obscuring atmosphere." (Ibid)

- "In the long run, economic growth depends critically on technological development. For many years, this country has led the world in producing new technology. We are in danger of losing this leadership. The 1981 budget continues my long-standing commitment to reverse the trends of the past two decades and provide for major and sustained increases—above the rate of inflation—for [R&D] programs. Obligations for [R&D] will increase by 13%; for basic research by 12%. Since 1978, obligations for basic research will have increased by 40%. I believe that these are among the most important expenditures we can make. The payoff, particularly for basic research, is long-term, but immense. We benefit today— in new industries, in millions of jobs, in lives saved, and in lives protected—from the investments in science made decades ago. We must continue such investments today to reap similar returns tomorrow." (Budget Message of the President, FY1981, January 28, 1980, p. M6)
- "This budget continues the administration's commitment to complete the development and initiate the operation of the Space Shuttle. The Shuttle's propulsion, thermal protection, and control systems are among the most complex challenges in the history of 20th-century engineering. Despite the additional resources required to ensure the success of the Shuttle, the administration continues to support a vigorous and balanced space program. Projects for further exploration and exploitation of space are planned to take advantage of the capabilities offered by the Shuttle... The Space Shuttle is now approaching the critical final phase of development, with the first flight scheduled for late 1980 and regular operations beginning in 1982. The substantial additional funding proposed for 1980 and 1981 is needed to permit a strengthening of ongoing development efforts to overcome remaining technical problems to make possible a fully operational Shuttle system" (Budget of the United States, FY1981, pp. 126-127)
- "As in past years, the administration is boasting of its interest in plowing funds into [R&D] projects, despite budget restraint elsewhere. Total government-wide outlays for [R&D] are budgeted at $35.6 billion next year, up 11% from the current level. Much of this gain will come in weapons research by the Pentagon... The much-delayed space shuttle continues to consume much of [NASA's] budget, set next year at $5.4 billion, up almost 9% from current outlays. The shuttle's cost is forcing NASA to ask Congress to add $300 million to its appropriations for this fiscal year... To pay for the shuttle, the space agency is having to cancel or postpone other activities it has been planning. For example, it wanted to go ahead next year for funds to start building an ion-driven engine that would send a spacecraft to visit two comets later in this decade, but President Carter turned it down. NASA's only new project in the coming year will be initial work on a satellite to be launched in 1996 for measuring highly energetic gamma rays from celestial objects" ("Some Tax Plans Are Nearly Law, Others Unlikely," *The Wall Street Journal*, January 29, 1980)
- "Since my economic and budget reports were made to the Congress and to the people in January, rapid changes in world events and economic prospects have made it necessary to intensify our anti-inflation fight. In the last eight weeks inflation rates and interest rates have surged to unprecedented heights... The inflation that we face today is deep-rooted. Its many causes have been built up over more than a decade. The most important of these causes are the soaring prices for energy throughout the world,

declining productivity growth in our Nation, and our failure in government and as individuals, as an entire American society, to live within our means... The intensive anti-inflation program that I'm announcing today involves five major components: first, discipline by reductions in the Federal Government; second, discipline by restraints on credit; third, discipline in wage and price actions; fourth, discipline by greater conservation of energy; and fifth, structural changes over a long period of time to encourage productivity, savings, and [R&D]... I will soon set forth a revised budget for fiscal year 1981, beginning next October 1. It will be a balanced budget... I will cut spending in the 1981 budget by more than $18 billion. To reach that goal, I will defer or reduce or cancel most of the new or expanded programs that were originally proposed in the 1981 budget. I will cut expenditures for personnel, operating, and maintenance throughout the Government... I will veto any legislation that exceeds the spending limits which I consider to be inconsistent with a balanced budget." Jimmy Carter, Anti-Inflation Program Remarks Announcing the Administration's Program, March 14, 1980 (*The American Presidency Project*, by Gerhard Peters and John T. Woolley, https://www.presidency.ucsb.edu/node/250037)

- "During the first two months of the year, inflation took another sharp upward leap, both in the United States and abroad. Actual prices and interest rates worsened, along with expectations about future inflation... To reverse these dangerous trends, I announced a five-point anti-inflation program... At the center of this policy is my decision to cut Federal spending so as to balance the 1981 budget. In January, I submitted to Congress a budget for 1981 that provided for substantial restraints on Federal spending and the lowest deficit in 7 years... However, in view of the continued high level of economic activity, and what has recently happened to inflation and interest rates, I have had to consider new policies. I must now ask Congress and the American people to support a revised budget that is even more restrained and austere... The revision of the 1981 budget that accompanies this message describes my proposals for increased budget discipline. The principal actions are: deferral, reduction, or cancellation of most of the new and expanded programs originally proposed in the 1981 budget; a cut in expenditures for personnel, operations, and maintenance throughout the government; an immediate limitation on Federal civilian employment, and rigid maintenance of employment ceilings to ensure that there will be at least 20,000 fewer Federal employees by the end of fiscal year 1980 than there are now; a reduction in ongoing spending programs throughout the Federal Government..." Jimmy Carter, Budget Revisions Message to the Congress Transmitting Revisions to the Fiscal Year 1981 Budget, March 31, 1980 (*The American Presidency Project*, by Gerhard Peters and John T. Woolley, https://www.presidency.ucsb.edu/node/250394)
- "The [Senate] Committee recommends an appropriation of $4,430,000,000 in fiscal year 1981 for the [R&D] activities of [NASA]. This amount is $65,500,000 more than the amended budget estimate and $139,500,000 less than the January budget request... The Committee recommends a general reduction of $6,750,000 in the space and terrestrial applications program as a result of NASA's failure to conform to reprogramming requirements in the purchase of a reconnaissance aircraft. With this reduction in the amounts authorized, the funding recommended by the Committee for NASA research and development is $6,750,000 below the authorization ceiling." (S. Rpt. 96-926, June 12, 1980, p. 63)
- "Over the past year, the Committee has been deeply concerned about the manner in

which NASA has reprogrammed funds within and between budget line items. On at least three occasions, the Committee staff has been informed by NASA of reprogramming or program commitments not previously specified in the budget justifications after the commitment of these funds was inevitable. On one such instance—November 21, 1979—the Committee officially objected to the procedures used by NASA and indicated that it expected NASA to conform to the reprogramming procedures specified in authorization legislation, Public Law 96-481, and those contained on page 5 of the Senate report accompanying the fiscal year 1980 appropriations bill, Report 96-258. Since then, the agency has, on at least two occasions, made commitments of substantial funds—$20,000,000 to $30,000,000—without prior notification." (Ibid, p. 68)

- "The spring of 1979 was to have marked the resurgence of the American manned spaceflight program. But when the space shuttle Enterprise... arrived at Kennedy Space Center on April 10, 1979, it was already a lame duck. Analysis of data from two years of glide landing and vibration tests had revealed that two of the ship's most basic aspects—its weight and mechanical structure—were unacceptable... NASA officials in Washington faced the ignominious chore of asking Congress for $185 million to supplement the $1.4 billion they had already received that fiscal year. Today, the first launch still could be a year away, and this time NASA needs $300 million more to complete the shuttle. The story of how this happened, and of why the project is so beset by difficulty, is the story of the space program in the twilight of the Apollo years. It involves disputes over the basic design, a chain of budgetary and technological compromises, governmental infighting, and corporate maneuvering. It is the story of an extraordinary engineering effort that has experienced equally extraordinary frustration in its attempts to push the state of the art in engine design and in thermal protection." ("The Endless Countdown," by Wayne Biddle, *New York Times*, June 22, 1980)
- "The twin pressures of electoral politics and volatile economic conditions combined in 1980 to put Congress' six-year-old budget process to its stiffest test over. The budget year began quietly, as President Carter presented a fiscal 1981 spending plan he touted as "prudent and responsible." That blueprint provided for a 15.8 percent increase over his budget request for fiscal 1980... By year's end, however, Carter had revised his fiscal policies three times to reflect changing economic conditions and had been ousted from office by voters who demanded a president who was more frugal with their tax dollars... When the inflation rate soared to an annualized rate of nearly 18.2 percent in January [1980], threatening a collapse of the bond markets, Republicans grabbed at the grim economic news, pointing the finger of blame at their party's opponents. They charged that excessive federal spending authorized by the Democratic-controlled government was the driving force behind the acceleration in prices. Democratic congressional leaders reacted by quickly convening a 10-day caucus with the White House to chisel the 1981 budget into balance..." ("Budget and Appropriations 1980: Overview," *CQ Almanac 1980*, 36th ed., 107. Washington, DC: Congressional Quarterly, 1981)
- "The long delay in passage of the budget resolution put Congress far behind schedule in work on annual appropriations bills... The delay also meant that the economic foundation of the budget had shifted. Inflation was easing by mid-June, not rising as it had been in February. Instead, the recession that economists had predicted would begin in 1979 had taken hold—a development that would push up government costs. At the behest of members reluctant to vote for a deficit budget so close to polling time, the House put off action on its second budget resolution until after the election...

Congress finally cleared the resolution on Nov. 20, while acknowledging that the deficit it contained would probably double by the end of the fiscal year due to increases in inflation, government borrowing costs, and a possible jump in unemployment. While the often unpopular budget process faced many tough moments during the heated election year, proponents cited the passage of the first "reconciliation" bill as evidence of Congress' new enthusiasm for fiscal responsibility. Under the first budget resolution, 18 authorizing and appropriations committees were required to cut spending by $10.6 billion in order to meet their budget targets." (Ibid)

- "The [HUD—Independent Agencies] conferees endorse the reprogramming requirements contained in the Senate report. The conferees are concerned with NASA's apparent recent inability to adequately anticipate technical problems and project overruns. Furthermore, the conferees question the adequacy of the NASA review process that leads to the selection of a course of action when such problems are encountered." (H. Rpt. 96-1476, November 21, 1980, Ibid, p. 14)
- "The [HUD—Independent Agencies appropriations bill] also contained a 2 percent across-the-board cut in funds for all agencies funded under the measure, except the Veterans Administration. But budget cutters were cautioned not to cut any one program by more than 3 percent... The [House] committee recommended $1,133,154,000 for NASA research and program management and for construction, $20 million less than requested... The [Senate Appropriations] committee recommended $5,582,404,000 for [NASA]. That was $64.8 million more than the administration's [revised] request and $4.5 million more than provided by the House." ("HUD-Independent Agencies," *CQ Almanac 1980*, 36th ed., 172-76. Washington, DC: Congressional Quarterly, 1981)
- "Conferees agreed to shift funds to revitalize the Section 235 mortgage subsidy program in an effort to stimulate homebuying and shore up the lagging home building industry." (Ibid)

NASA R&D Appropriations for FY1983

Bill: Department of Housing and Urban Development–Independent Agencies Appropriation Act, 1983

Public Law: 97-272 **Enacted:** September 30, 1982 **Effective:** October 1, 1982

Nominal change		Real change		Classification
Millions ($)	YOY%	Millions ($2012)	YOY%	
$821.9	13.6%	$956.4	8.7%	Exogenous

Congress reversed course and appropriated significant increases in both nominal and real aerospace R&D funding for FY1983, largely driven by President Reagan's interest in the space program for national security purposes. The Reagan administration's defense buildup had crept into the space program, and a GAO report estimated that roughly 25% of NASA funding would be supporting military programs. The administration continued to prioritize funding for development work on the space shuttle, which had flown its inaugural mission on April 12, 1981, but was still a work in progress with additional test flights scheduled for 1982; the administration proposed increasing shuttle funding from $2.5 billion in FY1982 to $3.0 billion in FY1983. The pivot in NASA's mission toward defense operations resulted in a looser budget constraint, one requested by the administration and largely approved by Congress. This increase in aerospace R&D funding appears to have been motivated by

national security concerns and political preferences for a sizable defense buildup extending to frontiers in space, and does not appear to have been influenced by any short-run macroeconomic concerns, such as inflation or unemployment. As such, we classify this policy event as exogenous. Most pertinent narrative evidence:

- "Advances in science and technology are essential to the security of our Nation; to the health, welfare, and safety of our citizens; and to the long-term growth and vitality of our economy... The Federal Government also supports, through the National Science Foundation, basic research that is in the broad national interest because the economic incentives of the market place are insufficient to assure adequate private sector investment in such research. For similar reasons, the Federal Government also supports space programs, including the development of the Space Shuttle." (Budget of the United States, FY1983, p. 5-34)
- "Funding is proposed to complete the development and production of the Space Shuttle and to prepare for the regular operations necessary to meet civilian and national security commitments. Funds are also included to demonstrate the ability to repair a damaged satellite while in orbit, and for modifications to enable the Shuttle to lift heavier payloads. Budget authority of $3.0 billion is proposed for the Space Shuttle program in 1983, compared to $2.5 billion in 1982." (Budget of the United States, FY1983, pp. 5-37-38)
- "An analysis of [NASA's] 1983 [R&D] budget indicates that about 25 percent of the spending will support military programs, according to a report by the General Accounting Office made public yesterday. The report, prepared for Senator William Proximire, Democrat of Wisconsin, was expected to stir more criticism that NASA is becoming increasingly militarized at the expense of civilian science and technology... The General Accounting Office, a Congressional investigative arm, reviewed NASA's budget for the fiscal year 1983 at the request of Senator Proxmire, who said that he wanted to "determine the extent to which NASA was merely acting as an agent for [DOD]"... W.H. Sheley, Jr., director of the accounting office said that, based on projections that almost half of the space shuttle flights will carry military payloads, more than $1 billion of the requested $3.5 billion for the shuttle in 1983 could be allocated as military expenditure. "Subsidizing Defense Department activities through the NASA budget is not the way to ensure that dollars spent on national maximum effect," the Senator said." ("Military said to get About 25% of NASA's 1983 Research Budget," by John Noble Wilford, *New York Times*, May 3, 1982)
- "Several times during the most recent mission of the space shuttle Columbia there were reminders of a fundamental change in the American manned space program. [NASA's] increasingly assertive partner, [DOD], is stepping out of the background to assume a larger role... Throughout the shuttle's rocky development period, NASA depended on the Pentagon's political muscle to keep the project going, though the Air Force was reluctant at first to offer support. Enthusiasm did not blossom until the Carter Administration years after NASA had made significant design accommodations for the Military. Although NASA bore the responsibility and most of the cost of developing the world's first reusable space vehicle, it is now clear that the Defense Department will be the largest single user... Consequently, although NASA was created to run an 'open' civilian space program, the Pentagon's growing involvement in the shuttle has forced the agency to accept military strictures on the release of information. Nothing about military payloads will be released. This even applies to payloads that heretofore

were not classified secret, such as military communications, navigation, and weather satellites. The shuttle is also expected to test, and perhaps eventually carry, space warfare technology such as lasers." ("For Now, It's NASA's Deck But Pentagon Holds the Cards," by John Noble Wilford, *New York Times*, July 11, 1982)

- "The budget submitted in February of 1982 included a total of $5,334,000,000 for [R&D] activities of NASA. This represents an increase of approximately 12 percent above the current estimate for fiscal year 1982. However, it is instructive that almost 90 percent of this increase devoted to the space shuttle and space transportation system. Other programs of critical need to the national interest, such as aeronautical research and communications technology, were severely reduced or eliminated." (H. Rpt. 97-720, August 10, 1982, p. 23)
- "The committee recommended $6.8 billion for NASA, a $193.8 million increase in the administration's request. The fiscal 1982 appropriation was $5.9 billion. Of the NASA appropriation, $5.5 billion was for [R&D]. This was $208.8 million more than Reagan proposed. The committee cut the administration's budget for construction by $5 million, to $95 million, and the requested appropriation for research and program management by $10 million, to $1.2 billion. The additional money was earmarked for the development of the Centaur space transportation system, an advanced communications test satellite, for planetary mission operations and analysis, and for aeronautics. In setting the appropriation for NASA, the committee agreed to a $1.78 billion cap on funding for the space shuttle, and a $1.8 billion ceiling was placed on space flight operations... Conferees left unresolved the question of how much the Defense Department should reimburse NASA for the use of the space shuttle. The Senate, but not the House, wanted to transfer $409 million from defense funds to the NASA budget to cover the Pentagon's share of shuttle launch costs. It was decided to let conferees handling the fiscal 1983 NASA authorization bill (HR 5890—PL 97-324) resolve how the reimbursement would be carried out." ("$46.9 Billion for HUD, Independent Agencies," CQ Almanac 1982, 38th ed., 231-36. Washington, DC: Congressional Quarterly, 1983.)
- "It is with great personal pleasure and pride that I sign into law House Joint Resolution 541 "Concerning the successful completion of the test flight phase of the Space Shuttle program." I have witnessed many stirring events, but none more inspiring than the successful completion of the fourth and final test flight of the space shuttle in the California desert on July 4, 1982, as we celebrated the 206th anniversary of our nation's independence. The space shuttle is an engineering and technological triumph. As the world's first reusable spaceship, it represents the culmination of a decade-long effort, not only of thousands in government but tens of thousands in industry and the university community who worked so hard to make it a reality. The shuttle program has given a lift to our national spirit. It has sparked a resurgence of pride among all Americans—pride in our ability to do great things when we set out to do them. But it has also been a productive and useful program that has built new technology, created new industries and new jobs, thus helping to strengthen our national economy." Ronald Reagan, Statement on Signing a Bill Concerning the Space Shuttle Program, August 20, 1982 (*The American Presidency Project*, by Gerhard Peters and John T. Woolley, https://www.presidency.ucsb.edu/node/246103)

NASA R&D Appropriations for FY1987

Bill: Continuing Appropriations Act, 1987; Independent Agencies
Public Law: 99-591 **Enacted:** October 30, 1986 **Effective:** October 30, 1986

Nominal change		Real change		Classification
Millions ($)	YOY%	Millions ($2012)	YOY%	
$3,115.9	39.9%	$4,805.4	38.2%	Exogenous

Congress appropriated significant increases in both nominal and real aerospace R&D funding for FY1987, largely driven by President Reagan's interest in the space program for national security purposes. The Reagan administration's defense buildup resulted in more cooperation between NASA and DOD, with the space program taking on a greater national security role since the space shuttle became operational. The Reagan administration was also intent on developing a permanent manned space station, and proposed a sizable nominal increases in NASA funding for FY1987 in their budget request. But just days before the budget was released, the Space Shuttle Challenger exploded shortly after takeoff, killing all seven astronauts on board and rocking both the nation and the agency; President Reagan addressed the grieving nation, mourning the Challenger Seven and reiterating his support for the space program, declaring that "Nothing ends here; our hopes and our journeys continue." The final FY1987 appropriations bill funding NASA involved a $2.4 billion transfer of budget authority from DOD to NASA to replace the Challenger shuttle and scientific equipment and a satellite that were also destroyed in the accident; NASA also needed to redesign and develop new shuttle hardware to ensure the safety of future launches. While it led to an increase in funding for the agency, the Challenger explosion was a public relations disaster for NASA that triggered investigations into NASA's management and a "fundamental reassessment of the space program's goals." This increase in aerospace R&D funding appears to have been motivated by the Challenger explosion, efforts to redevelop the space shuttle and build a replacement, and continue progress on the development of a space station—a top priority of President Reagan. The increase in aerospace R&D appropriations does not appear to have been influenced by any concerns about unemployment, inflation, or other short-run macroeconomic prerogatives. As such, we classify this policy event as exogenous. Most pertinent narrative evidence:

- "Nancy and I are pained to the core by the tragedy of the shuttle Challenger. We know we share this pain with all of the people of our country. This is truly a national loss. Nineteen years ago, almost to the day, we lost three astronauts in a terrible accident on the ground. But we've never lost an astronaut in flight; we've never had a tragedy like this... I've always had great faith in and respect for our space program, and what happened today does nothing to diminish it. We don't hide our space program. We don't keep secrets and cover things up. We do it all upfront and in public. There will be more shuttle flights and more shuttle crews and, yes, more volunteers, more civilians, more teachers in space. Nothing ends here; our hopes and our journeys continue. I want to add that I wish I could talk to every man and woman who works for NASA or who worked on this mission and tell them: "Your dedication and professionalism have moved and impressed us for decades. And we know of your anguish. We share it." Address to the Nation on the Explosion of the Space Shuttle Challenger, January 28, 1986 (*The American Presidency Project*, by Gerhard Peters and John T. Woolley, https://www.presidency.ucsb.edu/node/259125)
- "Astronomers build a space telescope that can see to the edge of the universe and possibly back to the moment of creation. So, yes, this nation remains fully committed

to America's space program. We're going forward with our shuttle flights. We're going forward to build our space station." Ronald Reagan, State of the Union Address, February 4, 1986 (*The American Presidency Project*, by Gerhard Peters and John T. Woolley, https://www.presidency.ucsb.edu/node/254269)

- "Despite the very tight fiscal environment, this budget provides funds for maintaining—and in some cases expanding—high-priority programs in crucial areas of national interest. Necessary services and income support for the dependent poor and the elderly receive significant funding in this budget. So do other programs of national interest, including drug enforcement, AIDS research, the space program, nonmilitary research, and national security." (Budget Message of the President, FY1987, February 5, p. M-6)
- "The budget maintains U.S. leadership in space by continuing most major ongoing space projects, by restoring progress in the space shuttle program towards routine and reliable space flight, and by initiating several major space science and technology efforts. In 1987, [NASA] plans to initiate the development phase of the Space Station, a project designed to take full advantage of the unique environment of space. In addition, the budget supports a vigorous and balanced research program in space science and the application of advanced space technologies. This includes two major new space science initiatives and a new research program supported jointly by NASA and [DOD] to explore new technologies for a transatmospheric vehicle that could reduce dramatically the cost of space flight. Budget authority of $7.0 billion is proposed for NASA space programs in 1987—an increase of $0.3 billion over 1986." (Budget of the United States, FY1987, p. 3-6)
- "The space flight programs help sustain and improve the Nation's ability to supply space transportation services and to develop the facilities to establish a permanent U.S. presence in space. These programs include the operation, upgrade, and logistical support of the space shuttle fleet; and the development, procurement, and operation of supporting technologies such as the shuttle-borne Spacelab and the upper-stage vehicles to carry shuttle-launched payloads into high-Earth orbit and beyond. This category also includes the development of the manned space station. Budget authority of $3.8 billion for these programs is proposed for 1987, the same as the 1986 level. The budget provides for restoring progress in the space shuttle program toward achieving routine and reliable access to space for all planned users; continued investments to further improve the reliability and performance of the shuttle fleet; and the continued development of an orbital maneuvering vehicle to help ferry spacecraft in low-Earth orbit to and from the shuttle." (Ibid, p. 5-28)
- "It begins to look as if something greater than the lone space shuttle Challenger exploded devastatingly over the Atlantic. The intervening two weeks offer evidence that America's space agency is also in danger of disintegration. At the least, potentially irreparable harm is being done to public confidence in that crucially important U.S. institution—a fact that [NASA] belatedly has recognized with yesterday's decision to make available previously withheld internal documents... The agency that for years provided the government's most glowing example of successful public relations, a model of how bets to win public support and thus funds, appeared to have adopted a policy of stonewalling the press. It even left the impression of not being entirely forthcoming with the presidential commission investigating the shuttle disaster... Just a year ago, Ronald Reagan's fourth State of the Union Address gave NASA an immense boost with his ringing pledge to accelerate the shuttle program and build a space station"

("NASA's Decaying Public Image," by Haynes Johnson, *The Washington Post*, February 12, 1986)

- "The report of the Challenger commission will prompt major changes by [NASA] that are likely to cause further delays in shuttle launches, and indefinite postponement of the 'citizens in space' program and an expensive redesign of shuttle hardware, according to agency officials, members of Congress and outside space experts. The report's sweeping recommendations, which extend beyond the technical causes of the accident, also will prompt a fundamental reassessment of the space program's goals, from NASA's planned exclusive reliance on the shuttle for satellite launches to its commitment to build an $8 billion manned space station by the mid-1990s, these officials said... [NASA Administrator] Fletcher pledged to adopt most of the report's recommendations as part of the broad, top-to-bottom review of NASA management and procedure that will tighten control over major space flight centers and "will not sacrifice safety concerns to budget limitations"... Fletcher also said he is "optimistic" that the administration will support funds for a new $2.8 billion orbiter to replace the destroyed Challenger, despite new questions being raised by the White House." ("NASA Has Long, Costly Task Ahead," by Michael Isikoff, *The Washington Post*, June 10, 1986)
- "The final figure included the transfer of $2.4 billion in budget authority from [DOD] to [NASA] to replace the space shuttle Challenger, which was destroyed during launch Jan, 28. However, only $100 million could be spent in fiscal 1987 to begin construction... A total of $10.4 billion was provided for the space agency, $2.7 billion more than fiscal 1986. The bulk of that increase—$2.4 billion—was the transfer of budget authority from the DOD for a new orbiter and related equipment to replace the Challenger... Of the $2.4 billion transfer, $2.1 billion was earmarked for construction of the orbiter, $36 million for replacement of the inertial upper-stage cradle equipment that was lost when Challenger blew up, and $33 million to build a new tracking and data relay satellite also lost on Challenger... In connection with the Challenger accident, the [House] committee urged a swift decision on building a fourth shuttle and ordered that none of the funds in the bill be spent for a new orbiter without a formal budget amendment or supplemental request being sent to Congress. ("$56 Billion in Funding Set Aside for Department of Housing and Urban Development (HUD), Assorted Agencies," *CQ Almanac 1986*, 42nd ed., 171-76. Washington, DC: Congressional Quarterly, 1987)

NASA R&D Appropriations for FY1988

Bill: Continuing Appropriations Act, 1988

Public Law: 100-202 **Enacted:** December 22, 1987 **Effective:** December 22, 1987

Nominal change		Real change		Classification
Millions ($)	YOY%	Millions ($2012)	YOY%	
-$1,861.7	-17.0%	-$3,446.6	-19.8%	Exogenous

Congress reversed course and appropriated significant decreases in both nominal and real aerospace R&D funding for FY1988, largely driven by deficit reduction efforts and the reversal of a surge in emergency funding the prior year in response to the Challenger space shuttle disaster. NASA was still working on safety testing and development of rockets in response to the explosion, but the rest of the space shuttle fleet remained grounded, impeding other programs such as unmanned space exploration, further decreasing NASA's funding needs.

The manned space station that President Reagan had prioritized was running over cost and behind schedule, and increasingly drawing ire; the scientific community was concerned that the project would consume too much of NASA's energy and funding, depriving other space exploration programs with greater scientific merit, while international partners were concerned about the military's involvement and planned use of the orbiter. The Reagan administration proposed another sizable increase in NASA's budget in their FY1988 request, largely related to space station development and rehabilitating the shuttle program in the aftermath of the Challenger explosion. But the Omnibus Budget Reconciliation Act of 1987 (PL 100-203), enacted in October 1987, forced deep discretionary spending cuts to reduce the budget deficit; both appropriations committees had initially approved less funding for NASA than the administration requested, but the deficit reduction legislation forced the conference committee to make deeper cuts, instead of splitting the difference, and they ended up appropriating $1.88 billion less than they had for FY1987. This decrease in aerospace R&D funding appears to have been driven by the repercussions of the Challenger explosion and long-term deficit reduction efforts. We find no evidence that cyclical motives, such as concerns about unemployment or inflation, influenced the decrease in appropriations. As such, we classify this policy event as exogenous. Most pertinent narrative evidence:

- "But a major threat to our future prosperity remains: the Federal deficit. If this deficit is not brought under control by limiting Government spending, we put in jeopardy all we have achieved. Deficits brought on by continued high spending threaten the lower tax rates incorporated in tax reform and inhibit progress in our balance of trade. We cannot permit this to happen. Therefore, one of the major objectives of this budget is to ensure a steady reduction in the deficit until a balanced budget is reached... Despite the very tight overall fiscal environment, this budget provides adequate funds for maintaining and, in selected cases, expanding high-priority programs in key areas of national interest. For example... a new civil space technology initiative, together with previously planned increases to construct a space station, develop a national aerospace plane, and foster the commercial development of space, are provided in this budget" (Budget Message of the President, FY1988, January 5, 1987, pp. M-4-5)
- "The ability of the Nation to meet global competition, to provide for national security, and to improve the quality of life for all citizens depends in part upon national investments in science and technology... To satisfy these needs, the administration proposes continued increases in federally supported basic research, including... an increase of about 22% in basic research activities of [NASA], including the initiation of two new science and technology programs" (Budget of the United States, FY1988, pp. 2-20-21)
- "[NASA's] budget would increase substantially, as the space program continues its struggle to recover from the Challenger disaster. Spending by NASA would rise 21% or $1.66 billion, to $9.53 billion. Increases for space flight reflect efforts to correct flaws in the shuttle's solid-fuel booster rockets and to implement other safety measures proposed by the Challenger Commission. The budget also includes money to continue work on a new orbiter; Congress already has appropriated $2.1 billion for the spacecraft, and NASA may begin spending the funds next August. The budget also provides for spending increases for the space station and the aerospace plane." ("How President's Fiscal '88 Budget Affects Programs; Education, Transportation, Housing Face Reduction," *The Wall Street Journal*, January 6, 1987)
- "One traumatic year after the explosion of the space shuttle Challenger, the American space program is facing a momentous 12 months that will decide not only whether

the redesigned shuttle is fit to fly again soon, but also whether the space program has any larger purpose beyond getting the stricken shuttle fleet back into the air. Crucial ground tests this fall will give the first real indication of whether repairs to the flawed booster rockets that caused the accident have any chance of working, or whether as some experts fear, the recovery program will fail, leaving the shuttle fleet grounded for another year or more while radically different rockets are developed. At the same time, crucial policy decisions that must be faced soon will determine whether the nation moves ahead into a new and more ambitious phase of space activity or shrinks from the enormous costs and risks of space exploration... Even before the fate of the shuttles is clear, the agency will have to reach a new decision on how to develop its next big project, a space station that would remain permanently by rotating crew. President Reagan has endorsed such a station for deployment about 1994. But the original cost estimates of $8 billion are far too low, Dr. Fletcher said, and some unofficial estimates put the cost of the currently favored plan at $13 billion or higher" ("NASA Faces Year of Crucial Decisions," by Philip M. Boffey, *New York Times*, January 28, 1987)

- "[NASA] suggested today that [DOD] should consider building its own space station, a move that could ease growing concerns over possible military uses of NASA's proposed space station... foreign governments have balked at cooperating in the space station project if it is to be used for clearly military purposes... Shirley M. Green, director of public affairs for NASA, said the suggestion was "not a response" to the outcry over the alleged militarization of the space station. Instead, she said, it was a recognition that the Air Force space program has been growing rapidly and that the proposed NASA space station, to be launched starting in 1994, may not be able to meet all the needs envisioned by military planners" ("NASA Urges Space Station for the Pentagon," by Philip M. Boffey, *New York Times*, May 22, 1987)
- "With so many spacecraft grounded indefinitely by the Challenger disaster and support for future programs uncertain, American scientists are growing increasingly frustrated and angry over their diminishing prospects for space research and exploration. The destruction of the space shuttle in January 1986 is causing delays of at least two to five years in important science missions, cancellations of some flights and postponement of any major new projects... At the same time, the Soviet Union emboldened by successful expeditions last year to observe Halley's comet, is aggressively pursuing plans for a succession of ambitious unmanned missions to Mars, beginning next summer, and is enlisting many Western European participants who in previous years would probably have been associated with American projects. The huge Soviet Energia rocket, introduced last month, provides a greatly expanded capability to launch major planetary missions and larger Earth-orbiting space stations... Scientists are less united in their attitude toward NASA's newest undertaking, the space station. Many argue that the orbiting facility would be of marginal value in scientific research and that the cost would divert money from other projects. The station, originally estimated to cost $8 billion and planned for operation in 1992, is now projected to cost $14 billion to $20 billion and be in orbit no earlier than 1995... [CBO] estimates the total cost may reach $30 billion" ("Research in Space Falls Further behind, And Scientists are Alarmed," by John N. Wilford, *New York Times*, June 23, 1987)
- "The cost of NASA's proposed space station—at least $32.8 billion—is more than twice the previous estimate of $16 billion, according to an independent panel report released yesterday... The interim seven-page report was prepared by a panel of outside

experts set up by the National Research Council, an arm of the National Academy of Sciences, at the request of the White House in order to get a better assessment of the soaring space station costs... The space station is a system of "unprecedented complexity" that will "absorb most of NASA's energy and funding" for the next two or three decades, the board said... The program ran into trouble in January when NASA told the administration that the estimated price tag had nearly doubled from the original $8 billion estimate." ("Space Station Cost Estimate is Doubled," by Kathy Sawyer, *The Washington Post*, July 7, 1987)

- "Hungry for more funding for space, science, housing, and urban renewal programs, the Senate Appropriations Committee rebelled against the restraints of the budget process Oct. 1 and, through a bookkeeping maneuver, produced a hitherto unseen $504 million to apply to those programs... The biggest beneficiary of the [Senate] committee action was NASA's proposed space station, which received $563.5 million in new budget authority. The space station had received no funds in the bill as it emerged Sept. 25 from a panel subcommittee" ("Housing and Urban Development (HUD), Related Agencies Get $57 Billion for Fiscal 1988," *CQ Almanac 1987*, 43rd ed., 433-38. Washington, DC: Congressional Quarterly, 1988)
- "But this was not a usual conference, where House and Senate appropriations leaders simply "split the difference" between the two chambers' amounts. This conference report reflected the conferees' need to reduce appropriations below the amounts previously approved by either chamber. It did so because overall appropriations had to conform to a budget-reconciliation bill (PL 100-203) that cut previously budgeted spending to comply with an agreement reached in a November budget summit... The biggest loser appeared to be NASA, which received $9.4 billion in the House bill and $9.1 billion in the Senate. It emerged from conference with $8.86 billion, which was $1.88 billion less than enacted for the space agency in fiscal 1987. The big cut for NASA was in its proposed "permanent orbiter," or space station, for which Reagan originally had sought $767 million. The conferees approved only $425 million and delayed delivery of most of the funds, which were to be made available after NASA reported on "rescoping and rescheduling" the space station project in view of budget constraints. Until that report was reviewed by the appropriating committees, new budget authority for the space station was to be capped at $200 million... the conferees warned the agency not to cannibalize other priorities for the sake of the space station" (Ibid)

NASA R&D Appropriations for FY1989

Bill: Department of Housing and Urban Development–Independent Agencies Appropriations Act, 1989

Public Law: 100-404 **Enacted:** August 19, 1988 **Effective:** October 1, 1988

Nominal change		Real change		Classification
Millions ($)	YOY%	Millions ($2012)	YOY%	
$1,907.5	21.1%	$2,361.4	17.0%	Exogenous

Congress again wildly reversed course and appropriated significant increases in both nominal and real aerospace R&D funding for FY1989, largely driven by the Reagan administration pushing for more funding for the space station and revamping the shuttle program. The administration's budget request again proposed substantial increases in "essential funding"

for NASA's manned space station, safe resumption of space shuttle flights, and unmanned scientific activities; the request was designed to prioritize funding without running afoul of spending restrictions imposed by the Gramm–Rudman–Hollings (G-R-H) Balanced Budget and Emergency Deficit Control Act of 1985 (PL 99-177). The more significant change of priorities came from congressional democrats, who approved nearly the entire requested increase in NASA's budget. Democratic presidential nominee Michael Dukakis was courting votes in the space-sensitive states of Texas, California, and Florida, and came out in favor of the manned space station; Democratic allies in the House of Representatives even cut social programs to boost funding for the space station, blunting budget cuts proposed by the Senate Appropriations Committee and providing enough funds to keep the project on track. Republican nominee Vice President George H.W. Bush had previously endorsed the space station, and the 1988 Republican Party Platform adopted the Republican National Convention in August 1988 had promised to "reestablish U.S. preeminence in space," citing "our manifest destiny" and pledging support for the space station and a host of other Reagan Administration priorities for NASA. Adding to geopolitical pressures to progress with space station development was the Soviet Union's Mir space station, which had been constructed in orbit starting in early 1986 and permanently manned since early 1987. This increase in aerospace R&D funding appears to have been driven by geopolitical pressure to develop a manned U.S. space station, easing concerns about long-term deficit reduction efforts, and ongoing repercussions of the Challenger explosion and trying to safely resume space shuttle flights. We find no evidence that cyclical motives, such as concerns about unemployment or inflation, influenced the increase in appropriations. As such, we classify this policy event as exogenous. Most pertinent narrative evidence:

- "In formulating this budget, I have endeavored to meet national priorities while keeping to the terms of the Bipartisan Budget Agreement and the G-R-H Act. In essence, the Agreement limits the 1988-to-1989 increase in domestic discretionary program budget authority to 2 percent. To address urgent national priorities insofar as possible within this overall 2 percent limit, my budget proposes that some programs—such as those for education, drug enforcement, and technology development—receive larger funding increases, while others are reduced, reformed, or, in some cases, terminated. High-priority programs must be funded adequately... I would provide $11.5 billion for space programs, including... essential funding for continued development of America's first permanently manned Space Station..." (Budget of the United States, FY1989, pp. 1-8)
- "Support for space activities meets both the direct needs of the Federal Government and broader national needs. After the Apollo project to put a man on the moon was completed in the early 1970s, expenditures for space activities steadily declined. This administration has recognized the economic and scientific value of space research, as well as its importance for national security. Real Federal outlays for non-defense space activities have risen from $5.4 billion in 1980 to $5.9 billion in 1987, an increase of 10 percent. The space shuttle and manned space station are necessary first steps for major new environmental initiatives, such as the ocean topography experiment to learn more about the effect of ocean circulation on the climate of the Earth. They also will support possible future missions beyond Earth's orbit, into the solar system." (Budget of the United States, FY1989, pp. 2a-13-14)
- "Budget authority of $10.6 billion is proposed for the space-related activities of NASA, a $2.4 billion increase from the 1988 level. This increase would allow NASA to continue the buildup of safe flight of the space shuttle while initiating the development of a

new advanced solid rocket motor to improve the shuttle's performance, reliability, and safety. NASA would also significantly expand development activities for the manned space station, leading to operating capabilities in the mid-1990s, and initiate a major new space science project, the Advanced X-ray Astrophysics Facility. For the space station, the President's budget proposes providing funding for 1989 through 1991 this year and, later this year, legislation to establish a ceiling on total program costs. These measures would provide program stability as well as necessary discipline in controlling costs. A continued national commitment to a permanently manned space station is essential if the nation is to maintain its leadership in space. The space station is planned for development in cooperation with our friends and allies. This multi-purpose facility will advance not only our capability in space research and technology, but will also serve to foster commercial and entrepreneurial space activities." (Ibid, pp. 2b-6-7)

- "U.S. preeminence in critical areas of manned space flight is ensured through programs to improve the space shuttle and to develop, deploy, and use the space station. Commitment to the use of commercial goods and services, and private sector investment and involvement in the space station, encourage greater commercial use of space. Budget authority of $6.4 billion is proposed for these programs in 1989, compared to $4.7 billion in 1988, an increase of about 36 percent... The proposed budget calls for the continuation of modifications and redesigns identified by post-Challenger accident reviews, particularly the solid rocket motor. The recommendations of the Rogers Commission would continue to be implemented in order to enhance the safe and effective operation of the shuttle fleet... Work on the replacement orbiter would continue, with delivery scheduled for 1991. A new advanced solid rocket motor would be initiated in 1989 to improve the safety, reliability, and performance of the shuttle fleet. The first delivery of the new motor is planned for 1993. The requested funding would also allow for the initiation of an improvement to the shuttle for extending the stay time in orbit... The advanced launch system, a joint program of NASA and DOD, would explore new approaches to meet national space transportation needs." (Ibid, pp. 5-30-31)
- "The Senate approved legislation that would provide $59.1 billion in the upcoming fiscal year for the Housing and Urban Development Department and various other agencies, and would give the space station the bare minimum it needs to survive... The Senate Appropriations Committee report accompanying the HUD funding bill designates that $200 million of NASA's $3.6 billion [R&D] budget would go for the space station next fiscal year. Lawmakers estimate that would be enough to maintain the program for about four months. But Congress may find more money than that for the space station. A separate Pentagon spending bill pending in the Senate would provide $600 million for NASA activities associated with the military; lawmakers believe that would free an equal amount of NASA funds to sustain the space station through the coming fiscal year... the House-passed bill that includes NASA's budget designates $902.4 million for the space station" ("Senate Votes $59.1 Billion for HUD, Others; Gives Minimum for NASA Plan." by John E Yang, *The Wall Street Journal*, July 14, 1988)
- "In a surprising move for an election year, the Democratic-controlled Congress last week agreed to cut funding for some social and environmental programs in order to provide $10.7 billion for the space program next year, almost what the Reagan administration asked for. The proposed space station, regarded as the most vulnerable and controversial item in NASA's original $11.5 billion request, gets $902 million in the new appropriations bill. This is enough for the project to proceed, for now, on its

current schedule calling for assembly in orbit to begin in early 1995 and was a pleasant surprise for space advocates who had been braced for cuts that would delay, cripple or kill it... Several weeks ago, the Senate approved an appropriations bill that provided only $200 million for the space station, an amount so low, station managers said, that the program, would have been killed... [The conference bill] resulted in a total $255 million cut in the space shuttle program. However, the bill allows for a possible transfer of $100 million from the Defense Department to the space shuttle, if the language is agreed to in the Defense appropriations bill. "It was the best possible outcome NASA could get in this climate," said one key congressional aide. "Actually, I'm shocked that in an election year, Democrats would cut" those social programs in favor of the space program" ("Congress Surprises NASA With $10.7 Billion," by Kathy Sawyer, *The Washington Post*, August 14, 1988)

- "The Republican Party will reestablish U.S. preeminence in space. It is our nation's frontier, our manifest destiny. President Reagan has set ambitious goals for a space comeback. We are determined to meet them and move on to even greater challenges. We support further development of the space station, the National Aerospace Plane, Project Pathfinder, a replacement shuttle, and the development of alternate launch vehicles. We endorse Mission to Planet Earth for space science to advance our understanding of environmental and climatic forces." Republican Party Platform of 1988, Adopted August 16, 1988 (*The American Presidency Project*, by Gerhard Peters and John T. Woolley, https://www.presidency.ucsb.edu/node/273433)
- "Today I signed into law [the FY1989 HUD-Independent Agencies appropriations bill]... The Act contains necessary funding for the Space Station "Freedom." The Space Station will advance the frontiers of scientific knowledge and strengthen cooperation in space among the United States and its Allies. The Act also provides important funding needed to restore the Nation's Space Shuttle capability, which is essential to national security and the effective use of space to meet our economic needs. Although the Act permits the transfer of a specified amount of Department of Defense funds to [NASA] to fund certain space activities, it does not require such transfer and therefore does not mandate action inconsistent with the Bipartisan Budget Agreement to which the Congressional Leadership and I agreed last November." Ronald Reagan, Statement on Signing the Department of Housing and Urban Development-Independent Agencies Appropriations Act, 1989, August 19, 1988 (*The American Presidency Project*, by Gerhard Peters and John T. Woolley, https://www.presidency.ucsb.edu/node/255461)
- "Compared with what the agencies received in fiscal 1988, the $59.4 billion bill allowed slightly less for HUD, significantly more for NASA and NSF, and only modest increases for most other agencies. President Reagan Aug. 19 signed the measure (PL 100-404) although he and his aides had complained that it provided too little for science and space and too much for almost everything else. Many members were not completely satisfied with the end result, either... But their desire to begin the actual construction of NASA's proposed manned space station and to fund other science-related endeavors forced them into submission. They were constrained by the previous year's budget agreement with the administration, which put a cap on total domestic spending. Their sacrifices on other treasured domestic programs, however, were limited and by themselves not enough to save the $20 billion-plus space station. To increase NASA's budget authority enough to begin building the station and to get the space shuttle program back off the ground, appropriators had to do some fancy legislative footwork. The

resulting caveats in the bill gave the next president an easy shot at killing the station. The bill withheld the release of $515 million of the space station's $900 million fiscal 1989 budget authority until after May 15, 1989—and it allowed the next president to block the money permanently simply by sending Congress a "special message" to that effect. The provision was designed to delay actual spending in fiscal 1989, thus keeping the bill within so-called "outlay" limits while allowing enough budget authority to keep the project on track for a mid-1990s deployment." ("Space Station Survives in Bill Granting $59.4 Billion to the Department of Housing and Urban Development (HUD)," *CQ Almanac 1988*, 44th ed., 728-33. Washington, DC: Congressional Quarterly, 1989)

- "Advocates contended that the station was needed to help the United States catch up to the Soviets— whose Mir space station had been manned permanently since early 1987—and to provide the country with a necessary stepping stone to Mars." (Ibid)
- "Dukakis needed California, Texas, and Ohio to win the election, while Florida and Louisiana would be good insurance. Each of those states had sizable pockets of voters dependent one way or another on NASA's budget... [Rep.] Jack Brooks, D-Texas, known for his brash style, was the most blunt. According to two members, Brooks' message went something like this: "If you want to carry Texas, then you better stop couching your space position with language like, quote: 'We will consider the space station...' You want to carry Texas, you better be for the space station." On Aug. 15, Dukakis announced that he supported the development of a manned space station. Earlier in the campaign, Republican nominee George Bush had expressed support..." (Ibid)

NASA R&D Appropriations for FY1990

Bill: Departments of Veterans Affairs and Housing and Urban Development, and Independent Agencies Appropriations Act, 1990

Public Law: 101-144 **Enacted:** November 9, 1989 **Effective:** November 9, 1989

Nominal change		Real change		Classification
Millions ($)	YOY%	Millions ($2012)	YOY%	
$1,344.7	12.3%	$1,545.7	9.5%	Exogenous

Congress again appropriated significant increases in both nominal and real aerospace R&D funding for FY1990, largely driven by the incoming Bush administration prioritizing funds for developing the space station, revamping the shuttle program, and expanding unmanned space exploration. Newly elected President George H.W. Bush proved to be NASA's most ardent White House advocate in decades; he declared that "the space program should always go 'full throttle up'" in his first State of the Union Address and the FY1990 budget request that followed days later proposed a hefty $2.3 billion increase in budget authority for NASA, relative to FY1989 levels. Continuing space program policies of the Reagan administration, development and launch of the manned space station and continued work on safety redesigns of the shuttle program remained top priorities. While NASA was terrified about another shuttle accident and spending billions on improving the program's safety, shuttle launches had recently resumed for the first time since the Challenger accident, opening the door for a resumption of more ambitious unmanned space explorations programs that had been paused while the shuttles were grounded. While the appropriators were working on the FY1990 bill, the space shuttle Atlantis launched the Magellan planetary explorer toward

Venus; the probe would soon provide the first imaging of the planet's entire surface. And in July, on the 20th anniversary of the Apollo 11 moon landing, President Bush reaffirmed his support for manned space exploration—touting NASA as receiving the largest funding increase in his FY1990 budget—and proposed new missions to the Moon and Mars; the plans were quickly dubbed the human space exploration initiative and in November the President approved a national space policy involving a permanent return to the moon and exploration of mars (jointly dubbed "Moon-Mars"). The appropriations committees modestly pared back the administration's budget request for NASA, but given the magnitude of the requested increase, still delivered a substantial increase for the space program. This increase in aerospace R&D funding appears to have been driven by the policy priorities of the Bush administration and geopolitical pressure to catch up with the Soviets by launching a manned U.S. space station, ongoing repercussions of the Challenger explosion, and expanded opportunities for unmanned deep space exploration programs with the resumption of space shuttle launches. We find no evidence that cyclical motives, such as concerns about unemployment or inflation, influenced the increase in appropriations. As such, we classify this policy event as exogenous. Most pertinent narrative evidence:

- "I request funding for NASA and a strong space program, an increase of almost $2.4 billion over the current fiscal year. We must have a manned space station; a vigorous, safe space shuttle program; and more commercial development in space. The space program should always go "full throttle up." And that's not just our ambition; it's our destiny." George H.W. Bush, State of the Union Address, February 9, 1989 (*The American Presidency Project*, by Gerhard Peters and John T. Woolley, https://www.presidency.ucsb.edu/node/254269)
- "One of our highest priorities is to strengthen U.S. technology and make America more competitive. For example... Our space program will provide $13.1 billion for continued development of America's first permanently manned space station; for increased support for improving the performance and reliability of the space shuttle; for initiation of two major new international planetary space science missions; and for support to encourage the commercial development of space." (Budget of the United States, FY1990, p. 1-8)
- "Budget authority of $12.2 billion is proposed for space-related activities of NASA, a $2.3 billion increase above the 1989 level. The administration continues to place a high priority on a safe and sustainable space shuttle flight rate. The budget request would allow for the completion of modifications and redesigns identified by post-Challenger accident reviews. The total cost of these activities will be about $3.6 billion through 1991. Continued development of a new advanced solid rocket motor is also proposed to improve the safety, reliability, and performance of the shuttle fleet. Improvements to the shuttle that would extend the length of time in orbit would also be continued with private-sector financing sought for elements of this program. A continued national commitment to a permanently manned space station is essential to technological and economic progress. The budget provides for continued expansion of the manned space station, which is to become operational in the mid-1990s..." (Ibid, pp. 2-21)
- "The space agency is worried that another catastrophic space shuttle accident seems almost inevitable in the next decade, so it is improving the winged spaceships still more and considering a switch to unmanned rockets for some missions... The grim assessment of risk to the shuttle holds true despite the successes of the three flights since the 1986 Challenger disaster... The risk is becoming a major policy issue as

NASA begins work on its proposed $25 billion space station, which would rely on the shuttle for transportation material and astronauts and for maintenance. Altogether, more than 100 shuttle missions are scheduled through the late 1990s, when the 508-foot-long station would be assembled high above the Earth... NASA is struggling to improve the shuttle's reliability to minimize the chance of a blow to the manned space program. The agency has spent $2.4 billion on improvements since the Challenger explosion and plans expenditures of an additional $1.1 billion to further strengthen the spaceship. Another shuttle program seeks to build advanced solid-fuel rocket boosters at a development cost of $1.5 billion. The rockets are seen as far safer than the current boosters..." ("High Risk of New Shuttle Disaster Leads NASA to Consider Options," by William J. Broad, *New York Times*, April 9, 1989)

- "If all goes well today, the space shuttle Atlantis will rumble into orbit from Florida and drop off a precious cargo, the Magellan planetary explorer. Then, late tonight, the unmanned Magellan will rocket from its orbit toward Venus and begin the first journey by a U.S. spaceship to another world in nearly 11 years... Space officials hope Magellan will revive U.S. planetary exploration, which nearly collapsed in recent years as attention shifted to the space shuttle. Planetary scientists grew old waiting to launch spacecraft that were endlessly delayed: graduate students deserted the field... NASA vows that the hard times are over. The agency plans to launch probes of Venus, Mars, Jupiter, and the sun in the next three years, and to build two more craft for journeys to Saturn and the comet Kopff. But to win public and political support, Magellan must be a success." ("In Mission to Venus, NASA Sees a Renewal Of Planetary Flights," by Bob Davis, *The Wall Street Journal*, April 28, 1989)
- "As you might expect from a former Navy pilot who lived much of his adult life in Houston, I, too, am a longtime supporter of the space program and the fine work of the men and women gathered here. In our administration's first budget proposal, the largest single percentage increase is for the space agency. And thanks to you and your colleagues at NASA, 20 years after Apollo 11, we still live in a world that is alive with wonder. Two weeks ago, Voyager 2 discovered a new moon around Neptune. And we're still getting acquainted with neighborhoods that we didn't even know about... My commitment today to forge ahead with a sustained, manned exploration program, mission by mission—the space station, the Moon, Mars, and beyond—is a continuing commitment to ask new questions, to seek new answers, both in the heavens and on Earth." George H.W. Bush, Remarks at a White House Barbecue on the 20th Anniversary of the Apollo 11 Moon Landing, July 20, 1989 (*The American Presidency Project*, by Gerhard Peters and John T. Woolley, https://www.presidency.ucsb.edu/node/262964)
- "As in previous years, the [HUD-Independent Agencies] bill gave the administration less than it wanted for space and science programs and more than it asked for most other domestic programs. But the measure provided enough for the president's top priorities—notably $1.8 billion of the $2.05 billion requested for NASA's planned space station—to make the Bush administration relatively happy... The space agency's requested budget was cut by close to $900 million, to $12.4 billion, which was still a big increase over 1989's $10.7 billion. Much of the increase was for the space station. A proposal to build a super-fast National Aerospace Plane, which the Senate declined to fund, got up to $60 million..." ("Spending Bill Totals $67 Billion for Housing and Urban Development (HUD), Veterans Affairs (VA)," *CQ Almanac 1989*, 45th ed., 715-21. Washington, DC: Congressional Quarterly, 1990)

- "HUD and NASA received the biggest increases, 19 percent and 15 percent, respectively [in the House bill]... Members gave NASA enough to continue development of the space station but took a hefty cut from its requests for that project and from a proposal to build a hypersonic-speed space plane... The increase was enough to keep alive the space station, but it would receive $395 million less than the president's $2 billion request... the production-and-development budget request for the space shuttle was cut to roughly $3.5 billion, from about $3.9 billion. Members decided to begin funding two new unmanned interplanetary probes—one a comet-flyby mission, the other a flight to Saturn—at a fiscal 1990 cost of $30 million. The subcommittee directed NASA to cap the total development costs for the two probes—scheduled for launching in mid-decade—at $1.6 billion." (Ibid)
- "An amendment by Rep. Charles E. Schumer, D-N.Y., would have shifted $714 million from NASA to the bill's other main domestic programs. It was defeated 125–291, with pro-NASA forces aided by a healthy dose of parochial interests... Many of those opposing the amendment had home-district economic interests in keeping the space station alive. Among them were members from Texas, Florida, Alabama, and parts of Ohio—states to which large amounts of NASA money flowed. Such parochial interests, however, were never mentioned during the debate. Instead, members stressed the need for America to win the space race. "If this nation ever stops its space program . . . we would become a second-rate nation," said Bill Nelson, D-Fla., a former space shuttle passenger and chairman of the Science Committee's Space Subcommittee." (Ibid)
- "In most major programs, the Senate committee's spending bill differed only somewhat from the House-passed version. The panel: Provided $1.85 billion for the space station, about $195 million more than the House. The committee also gave NASA a $217 million transfer from the Air Force, effectively raising its total funding to roughly $12.6 billion, or about $718 million less than requested. Other transfers from defense programs endorsed in concept earmarked another $485 million." (Ibid)
- "Today I signed into law [the FY1990 HUD-Independent Agencies appropriations bill]... I am also pleased that the Act includes funding that will help maintain America's leadership in space. This commitment to space is important to our national security, our economic growth, and our quality of life. In particular, the funding provided for the Space Station Freedom, a keystone of the Nation's space policy, will enable us to continue a stable and sustainable program. This level of funding will allow for the development of the Space Station Freedom on a schedule leading to permanently manned capability in the mid-1990s." George H.W. Bush, Statement on Signing the Departments of Veterans Affairs and Housing and Urban Development, and Independent Agencies Appropriations Act, 1990, November 9, 1989 (*The American Presidency Project*, by Gerhard Peters and John T. Woolley, https://www.presidency.ucsb.edu/node/264747)
- "On November 2, 1989, the President approved a national space policy that updates and reaffirms U.S. goals and activities in space... The policy reaffirms the Nation's commitment to the exploration and use of space in support of our national well-being. United States leadership in space continues to be a fundamental objective guiding U.S. space activities. The policy recognizes that leadership requires U.S. preeminence in key areas of space activity critical to achieving our national security, scientific, technical, economic, and foreign policy goals. The policy also retains the long-term goal of expanding human presence and activity beyond Earth's orbit into the solar system. This goal provides the overall policy framework for the President's human space exploration

initiative, announced July 20, 1989, in which the President called for completing space station Freedom, returning permanently to the Moon, and exploration of the planet Mars." George H.W. Bush, White House Fact Sheet on the National Space Policy, November 16, 1989 (*The American Presidency Project*, by Gerhard Peters and John T. Woolley, https://www.presidency.ucsb.edu/node/263545)

NASA R&D Appropriations for FY1991

Bill: Departments of Veterans Affairs and Housing and Urban Development, and Independent Agencies Appropriations Act, 1991

Public Law: 101-507 **Enacted:** November 5, 1990 **Effective:** November 5, 1990

Nominal change		Real change		Classification
Millions ($)	YOY%	Millions ($2012)	YOY%	
$1,690.5	13.7%	$1,817.5	10.2%	Exogenous

Congress again appropriated significant increases in both nominal and real aerospace R&D funding for FY1991, largely driven by the Bush administration's prioritization of the space station and space exploration initiative. In his State of the Union Address, President Bush emphasized federal investments in R&D and pledged that "the money is there" for the space program in his budget; true to his word, the FY1991 budget request proposed a whopping $2.9 billion (24%) increase for NASA over FY1990 levels, again touted as "the largest increase for any major agency." The president had recently and ambitiously committed to manned spaceflight missions to the Moon and Mars, but frustrations were mounting with the delays and soaring costs of the Space Station Freedom; a growing chorus of experts doubted the scientific value of a manned space station and worried that the costs would crowd out more valuable unmanned space missions. With the recent resumption of space shuttle flights, paused in the aftermath of the Challenger explosion, Congress was more keen on funding launches of new deep space exploration missions. On April 25, NASA launched the Hubble Space Telescope, which revolutionized data collection, and, unlike other space telescopes, was designed to be maintained, repaired, and upgraded in space. Congress substantially cut into the requests for the space station and Moon-Mars mission, but given the magnitude of the requested increase and lobbying by the administration, nonetheless delivered a very substantial budgetary increase for the space program overall. The appropriators provided a 13.5% increase for NASA's budget, but President Bush still lamented the budget cuts for the space station, "a high priority" of his. This increase in aerospace R&D funding appears to have been driven by the policy priorities of the Bush administration and geopolitical pressure to launch a manned U.S. space station, continued repercussions of the Challenger explosion, and expanded opportunities for unmanned deep space exploration programs with the resumption of space shuttle launches. We find no evidence that cyclical motives, such as concerns about unemployment or inflation, influenced the increase in appropriations. As such, we classify this policy event as exogenous. Most pertinent narrative evidence:

- "We'll do what it takes to invest in America's future. The budget commitment is there. The money is there. It's there for [R&D], R&D—a record high... It's there for space exploration." George H.W. Bush, State of the Union Address, January 31, 1990 (*The American Presidency Project*, by Gerhard Peters and John T. Woolley, https://www.presidency.ucsb.edu/node/263819)

- "Since the beginning of civilization, humankind has sought to explore the frontier and increase its knowledge of the world. Humans have endeavored to discover the innermost secrets of living cells, indeed, to discover what particles make up all matter; and to explore our world from the deepest oceans to the outermost boundaries of our solar system and beyond. Today there are unprecedented opportunities to expand the frontier of knowledge and to expand human presence and activity. The budget places a priority on three of the most exciting frontiers now being explored: space, to unlock the secrets of the universe; biotechnology, to unlock the secrets of life itself and apply them for the benefit of all; and high-energy physics, including the development of the Superconducting Super Collider, to unlock the secrets of matter and energy." (Budget of the United States, FY1991, p. 49)
- "The exploration of space has benefits for the United States that go far beyond the quantifiable. There are specific payoffs in the form of new materials, technological discoveries, and microgravity research. The eventual commercialization of space will stimulate economic growth and improve life on Earth. But no price can be put on the lifting of the spirit of people everywhere, like that which occurred at the time of the Apollo landings on the Moon. No value can be calculated for the wonder engendered by the pictures of Jupiter, Saturn, Uranus and, in August of 1989, of Neptune, sent back over millions of miles by Voyager. And no quantitative measure of any kind can capture the benefit of expanding human horizons, human dreams, and the human domain... The 1991 budget is concrete evidence of the firm commitment by the President to a continuing, active, and exciting American presence in space—indeed, to America's leadership in space science and exploration. The 1991 budget proposes to allocate $15.8 billion for space activities... NASA's total budget of $15.2 billion represents an increase of $2.9 billion or 24 percent over 1990. This is the largest increase for any major agency of the Government" (Ibid, pp. 49-50)
- "The President has proposed that the United States undertake an ambitious mission of manned exploration of the solar system. This will not be a journey of 10 or even 20 years, but one that will continue for decades, perhaps even centuries. This journey will require a long-term commitment—of resources, both financial and human, and of national will. The Government has taken the first step toward expanded manned exploration with the development of Space Station Freedom. The 1991 budget also funds a new initiative to support the robotic science missions and to develop the "pacing technologies" that will be needed in the coming decade to enable the next steps in the journey... The President has lifted the sights of the space program with his call for the establishment of a manned presence on the moon and a manned mission to Mars. The budget reflects the Administration's commitment to this mission by proposing an increase of $408 million, or 47 percent above fiscal year 1990 levels, for space exploration activities." (Ibid, pp. 53-54)
- "America's planned space station, sold to Congress in 1984 as an $8 billion project, will actually cost at least $120 billion when operating and other expenses are counted, and even then it will not meet what has become the Government's top objective in space... Achieving that goal, sending Americans to the Moon and Mars as planned by President Bush, would mean adding costly new elements to the station, or perhaps building a separate spaceport in orbit... Some experts even question its importance for the advancement of knowledge... Many scientists fear that in the competition for Federal dollars, the station will drain money from highly productive small-scale

research, especially as its budget rises" ("How the $8 Billion Space Station Became a $120 Billion Showpiece," *New York Times*, June 10, 1990)

- "As in past years, housing and space programs were pitted against each other in the annual fight over the spending bill. Despite significant increases in funds for both programs, last-minute jockeying to boost NASA's bottom line ended up taking away from subsidized housing for the poor. President Bush had requested a 24 percent increase for NASA to proceed with major projects such as the space station and the moon-Mars initiative. Congress, however, provided NASA with $13.9 billion in fiscal 1991—nowhere near the $15.1 billion that the administration requested. The space station, which had encountered numerous technical problems, was funded at $1.9 billion, $313 million more than the Senate-passed bill and approximately $350 million less than the House level. The administration had requested $2.45 billion. The moon-Mars program, to send astronauts to the moon and Mars, was virtually zeroed out." ("Bill for Veterans Affairs, Housing and Urban Development Trims Housing, Boosts NASA," *CQ Almanac 1990*, 46th ed., 854-60. Washington, DC: Congressional Quarterly, 1991)
- "Shortly before the [Senate Appropriations] markup, [Vice President] Quayle telephoned [Committee Chair Barbara] Mikulski to ask for more money to send astronauts to the moon and Mars, one of Bush's top space priorities. Quayle, chairman of the National Space Council, also asked for more money for a space station and for NASA in general... While both the House and the Senate subcommittees agreed to increase spending for space programs, neither came close to the president's request. The Senate wanted to spend $13.5 billion in fiscal 1991—$855 million less than the House level. The Senate also provided $1.6 billion for a space station, which was $863.6 million less than Bush's budget request and $162 million less than in fiscal 1990." (Ibid)
- "I am pleased that NASA was provided nearly a 13.5 percent increase over its fiscal year 1990 budget. While I am disappointed that Congress would not provide the small amount of funding requested for technology development to enable future manned missions to the Moon and Mars, I am pleased that Congress recognized the inevitability of human space exploration. NASA has the flexibility to reprogram funds to continue current in-house mission studies and synthesis activities. The human exploration of space is our destiny—we must continue to move forward. I am greatly concerned over the significant budget reduction in the Space Station Freedom (SSF) program. SSF remains, for me, a high priority. However, I am instructing NASA to reassess its current design and try to restructure a development effort within the funding envelope recommended by Congress. The revised program will seek to achieve a permanently manned presence, to maintain a balance among science objectives, and to preserve our commitments to our international partners and to other users" George H.W. Bush, Statement on Signing the Departments of Veterans Affairs and Housing and Urban Development, and Independent Agencies Appropriations Act, 1991, November 5, 1990 (*The American Presidency Project*, by Gerhard Peters and John T. Woolley, https://www.presidency.ucsb.edu/node/265571)

NASA R&D Appropriations for FY1995

Bill: Departments of Veterans Affairs and Housing and Urban Development, and Independent Agencies Appropriations Act, 1995

Public Law: 103-327 **Enacted:** September 28, 1994 **Effective:** October 1, 1994

Nominal change		Real change		Classification
Millions ($)	YOY%	Millions ($2012)	YOY%	
-$717.8	-4.9%	-$1,559.5	-8.1%	Exogenous

Congress appropriated significant decreases in both nominal and real aerospace R&D funding for FY1995, largely driven by broader deficit reduction efforts and the space program falling from a high priority of the Bush administration to a much lower priority of President Clinton. The Clinton administration remained focused on a long-term budget policy and economic program prioritizing deficit reduction while also trying to shield high-priority public investments from budget cuts; see "Energy R&D Appropriations for FY1995" for more details. And in a major departure from the previous administration, President Clinton had decided that NASA would cooperate with the Russian Federation and other nations on an international space station—both to advance foreign policy objectives (supporting Russia's economy and political transition) and because the collaborative project would notionally be cheaper and faster. The Clinton administration also shelved President Bush's planned manned missions to the Moon and Mars, opting for cheaper and faster unmanned space exploration programs. The FY1995 budget request proposed $14.24 billion for the agency, a reduction of $287 million (2.0%) from FY1994 levels. The House Appropriations Committee approved cutting $240 million deeper in NASA's budget, but their Senate counterparts restored more funding for NASA in the conference bill. This decrease in aerospace R&D funding appears to have been driven by the policy priorities of the Clinton administration, notably deficit reduction and cooperation with Russia in space, and related decreased funding needs for an international space station. We find no evidence that cyclical motives, such as concerns about unemployment or inflation, influenced the decrease in appropriations. As such, we classify this policy event as exogenous. Most pertinent narrative evidence:

- "As we take these steps together to renew our strength at home, we cannot turn away from our obligation to renew our leadership abroad. This is a promising moment. Because of the agreements we have reached this year, last year, Russia's strategic nuclear missiles soon will no longer be pointed at the United States, nor will we point ours at them. Instead of building weapons in space, Russian scientists will help us to build the international space station" William J. Clinton, State of the Union Address, January 25, 1994 (*The American Presidency Project*, by Gerhard Peters and John T. Woolley, https://www.presidency.ucsb.edu/node/219941)
- "America has always sought to be the world's leader in science and technology. In some arenas in recent years, we have lost that status. But in the remainder of this decade and in the 21st century, we must be sure that the United States is on the cutting edge of research and technological advances. To that end, the 1995 budget proposes critical investments in the National Institute of Standards and Technology's Advanced Technology Program; NASA's research, space, and technology programs; the National Science Foundation; the information superhighway, on which the Vice President has worked so hard; and energy [R&D]." (Budget Message of the President, FY1995, February 7, 1994, pp. 6-7)
- "Not surprisingly, given that total discretionary spending is cut, the 1995 budget reduces budget authority in dollar terms—without any increase for inflation—in at least 300 programs, including at least 115 terminations... Low-priority and less-efficient programs are cut or eliminated, to reduce the deficit and to finance investments that strengthen the economy... However, even some programs in the President's general

investment areas are cut to free funds for more efficient programs that pursue the same high-priority objectives better. These include... three program terminations and numerous reductions in [NASA]." (Budget of the United States, FY1993, p. 16)

- "Congress had demonstrated in 1993 that big-science projects were not immune to budget-cutting fervor when it killed [DOE's] superconducting super collider. The House had served notice that the space station could be next to go when members failed by just one vote to end its authorization and by 24 votes to ax its FY1994 appropriation... Besides touting the station's scientific merit and foreign policy implications, supporters asserted that a series of redesign efforts had made the project more efficient... Opponents argued that the Russian agreement was unreliable and that the space station was drawing funds from more worthy NASA projects." ("Tempers Flare Over Appropriations and Special Projects for Veterans Affairs, Housing and Urban Development," *CQ Almanac 1994*, 50th ed., 541-47. Washington, DC: Congressional Quarterly, 1995)
- "By a surprisingly comfortable margin of 155–278, members first rejected an attempt by [Representatives] Zimmer and Roemer to kill the space station. [President] Clinton, Vice President Al Gore, and NASA Administrator Daniel S. Goldin personally lobbied members to support the station. They argued that the 1993 agreement with Russia to cooperate on the project—and international agreements with other countries—were essential to the administration's foreign policy goals, and that the project's redesign would keep costs under control. Opponents blasted the project as being too expensive, unfocused in its mission, dependent on unreliable agreements with Russia, and too reliant on job creation for its political support." (Ibid)
- "[NASA] is merging many of its leading activities with those of the Russian space program, its preeminent foe and rival during the long decades of the Cold War. The East-West partnership involves much more than building an orbital outpost for astronauts, which is to be assembled piecemeal in space between 1997 and 2002. The two sides are also cooperating in manned space flights, monitoring and are talking about joining forces to fire robotic probes toward such distant and mysterious worlds as Pluto. "We're merging our program's even more," Daniel S. Goldin, NASA's Administrator, said in a recent interview. "Given the tight budgets, it would be very wasteful to duplicate efforts. So we're trying to bring them together"... As the competitive frenzy of the Cold War ended, President George Bush in March 1992 appointed a new NASA administrator, Mr. Goldin, who pledged an era in which the agency's endeavors would be 'smaller, cheaper, faster, better,' ending a trend to bigness and complexity that marked many aspects of NASA's rivalry with Moscow. The Clinton Administration married this cost-cutting goal with a broad initiative to join the Russians in cooperative space projects. Last year, it hammered out a plan to have the Russians become partners in the space station project, which was mired in design studies after expenditures of more than $10 billion. The White House said the East-West outpost, in addition to rewarding Russia for good behavior and helping stabilize the Russian economy, would do more, cost less, and be in orbit faster than it would if America did the project exclusively with its Western partners, Europe, Japan and Canada." ("NASA's New Ploy: Meld With Moscow," by William J. Broad, *New York Times*, July 19, 1994)
- "Today I have signed into law [the FY1995 VA-HUD-Independent Agencies appropriations bill]... The Act also provides funding for the redesigned Space Station and other programs that will set a new direction for the Nation in space exploration, science, and technology. The Act includes about $260 million for cooperative activities with Rus-

sia, with about half of that going directly for joint space station, human space flight, and scientific cooperation" William J. Clinton, Statement on Signing the Departments of Veterans Affairs and Housing and Urban Development, and Independent Agencies Appropriations Act, 1995, September 28, 1994 (*The American Presidency Project*, by Gerhard Peters and John T. Woolley, https://www.presidency.ucsb.edu/node/217923)

NASA R&D Appropriations for FY2000

Bill: Departments of Veterans Affairs and Housing and Urban Development, and Independent Agencies Appropriations Act, 2000

Public Law: 106-74 **Enacted:** October 20, 1999 **Effective:** October 20, 1999

Nominal change		Real change		Classification
Millions ($)	YOY%	Millions ($2012)	YOY%	
-$53.0	-0.4%	-$514.0	-3.1%	Exogenous

Congress appropriated a modest reduction in nominal aerospace R&D funding for FY2000, resulting in a significant decline in real terms, one largely driven by broader fiscal restraint and the space program being a relatively low priority of the Clinton administration. The decision to cooperate with Russia on the International Space Station was not producing the cost savings or accelerated timeline anticipated; Russia's economic crisis had roiled its ability to meet its commitments to the program, leading to delays, and the FY2000 budget requested increased funding for the space station to pick up the slack. While President Clinton had clear diplomatic objectives for the agency, manned spaceflight remained a lower priority, unlike fiscal retrenchment, and the White House was perceived as trying to "downsize" the agency. The administration requested $13.58 billion for NASA, $86 million (0.6%) below the enacted funding level for FY1999, which the Senate Appropriations Committee approved in full; Senator Barbara A. Mikulski (D-MD), the ranking Democrat on the VA-HUD-Independent Agencies Subcommittee, was an effective advocate for NASA, particularly for the Goddard Space Flight Center in her home state. The Republican-led House Appropriations Committee, on the other hand, was quite frustrated that Russia was not pulling its weight with the space station and with cost overruns more broadly, and cut $1.0 billion below the administration's request for NASA, but the conference bill ended up restoring most of that funding. This decrease in aerospace R&D funding appears to have been driven by the policy priorities of the Clinton administration, notably long-term fiscal restraint and cooperating with Russia in space. We find no evidence that cyclical motives, such as concerns about unemployment or inflation, influenced the decrease in appropriations; as such, we classify this policy event as exogenous. Most pertinent narrative evidence:

- 'My budget strengthens basic research programs, which are the foundation of the Government's role in expanding scientific knowledge and spurring innovation. Through the 21st Century Research Fund, the budget provides strong support for the Nation's two largest funders of civilian basic research at universities: the National Science Foundation and the National Institutes of Health. My budget provides a substantial increase for [NASA's] Space Science program, including a significant cooperative endeavor with Russia." (Budget Message of the President, FY2000, February 1, 1999, p. 7)
- "As we prepare to enter the next century, we must keep sight of the source of our great success. We enjoy an economy of unprecedented prosperity due, in large measure, to our commitment to fiscal discipline. In the past six years, we have worked together

as a Nation, facing the responsibility to correct the mistaken deficit-driven policies of the past. Balancing the budget has allowed our economy to prosper and has freed our children from a future in which mounting deficits threatened to limit options and sap the country's resources. . . " (Ibid, p. 8)

- "The budget funds several ongoing and new activities in support of NASA's missions, including $2.48 billion for the International Space Station, which began assembly in orbit in 1998 with the launch of the first U.S. and Russian elements. The Russian economic situation has increased uncertainty about Russia's ability to meet future critical milestones in this international development program. While the Administration remains committed to Russia's participation in this multi-national partnership, the budget reflects key steps taken to help ensure the ultimate success of this complex international program. By increasing funding for the Space Station, the Administration will help to maintain the construction schedule and enable the development of backup capabilities in the event of potential shortfalls in Russian contributions." (Budget of the United States, FY2000, p. 114)
- "Launching of the next section of the International Space Station, a Russian-made module with laboratory and crew space, will be delayed until at least September because of technical problems with the component, NASA officials said today... The Russian effort has been repeatedly delayed by money troubles, but officials of [NASA] attributed this delay to the need for further ground testing and to problems with computer software for the unit... Sixteen nations, led by the United States and Russia, are involved in building the space station, which is expected to take five years to complete at a cost $40 billion to $60 billion... Construction of the space station is more than a year and a half behind schedule, primarily because cash-strapped Russia hasn't had enough money to finish the critical service module. Last fall, NASA agreed to provide Russia with $60 million in exchange for future services aboard the station to help in completing the service module" ("Russia Again Delays Space Station Project," by Warren E. Leary, *New York Times*, January 30, 1999)
- "The [House Appropriations] Committee recommends a total of $5,388,000,000 for the human space flight account in fiscal year 2000. The recommendation is a decrease of $250,000,000 from the budget request and $92,000,000 below the fiscal year 1999 enacted appropriation... the Committee remains concerned that continued progress may be hampered if Russian assets continue to be diverted to the MIR space station. It is imperative that the MIR space station not become a drain on the limited financial resources of Russia. It is also vital that the infrastructure in central Asia, as well as Russian Soyuz and Progress vehicles, remain dedicated to the priority of supporting the assembly and operation of the International Space Station. NASA is directed to take all action necessary to ensure that the MIR station does not become a liability to the International Space Station program and that Russia lives up to its previous commitments to assist in the assembly and operations of the International Space Station. The Committee continues to be concerned about increasing requirements and costs in the International Space Station program." (H Rpt. 106-286, August 3, 1999, pp. 79-80)
- "[The Senate Appropriations] Committee continues to be very troubled by cost overruns and unrealistic budgeting by NASA, especially those associated with the development and construction of the Space Station... Many of these additional costs have been unfairly borne through budget reductions in other NASA programs and activities,

most particularly programs and activities designed to add to our understanding of the space and earth sciences... Because of these concerns... the Committee has established a separate account for the International Space Station and an account for space shuttle activities." (S. Rpt. 106-161, September 16, 1999, p. 108)

- "While Democrats planned to seek more money for low-income housing in the Senate, defenders of NASA deflected a series of attacks on the International Space Station... Support for the space station was striking in the wake of two General Accounting Office studies last month. The office questioned Russia's ability to participate in the project and found a "high degree of uncertainty" in NASA's original estimate for total operating costs of $13 billion from 2005 to 2014. If Russia cannot meet its obligations, the burden would fall on the United States and other partners in the project, including Canada and Japan. The project is still five years from completion, but it enjoys broad support in part because construction contracts create jobs across the country. While the space station survived challenges on the floor, NASA supporters lost their battle to save other parts of the agency's budget from deep cuts." ("Compromise Boosts Funds For Veterans' Health Care, Provides Hurricane Relief," *CQ Almanac 1999*, 55th ed., 2-135-2-146. Washington, DC: Congressional Quarterly, 2000.)
- "Senators gave NASA more money than the House or the administration sought, enabling the final House-Senate conference figure to be in line with the administration's initial request. To accomplish the task, however, Barbara A. Mikulski of Maryland, the Senate VA-HUD Appropriations Subcommittee's ranking Democrat, said the 1997 spending caps will need to be increased. "I don't want to go below last year's funds," said Mikulski, a longtime protector of NASA's Goddard Space Flight Center in her state... members have wondered if NASA has become a victim of its own success by faithfully demonstrating it can do more with less. Goldin has been criticized for not objecting more strenuously to previous White House efforts to downsize his agency, a situation that some lawmakers have attributed to Clinton's lack of leadership on space. The situation with the president, the lawmakers said, has been offset by NASA's presence in many members' districts across the country, including such politically powerful states as Texas and Florida. In the past, it also drew support from former House Speaker Newt Gingrich, R-Ga. (1979-99), a space enthusiast" (Ibid)
- "Under the final bill, NASA would receive $13.7 billion, $12.3 million less than in fiscal 1999. The measure includes about $5.5 billion in funding for two of the agency's main programs, space shuttle missions and the International Space Station. The space station remains under scrutiny because of possible cost overruns and concern that Russia may be unable to finance its share of the project. The bill would delay the launch of the $75 million Triana satellite program until early 2001. The satellite is part of a science and education program strongly endorsed by Vice President Al Gore, but it is viewed by Republicans as an example of wasteful spending." (Ibid)
- "Today I have signed into law [the FY2000 VA-HUD-Independent Agencies appropriations bill]... The Act also adequately funds the Nation's investment in space and science programs. It provides $13.65 billion for NASA and $3.9 billion for the NSF, including $126 million for my Administration's Information Technology in the 21st Century Initiative. If we want to maintain our current economic prosperity, it is essential that we sustain our investment in long-term research across all the scientific and engineering disciplines. This Act maintains the Nation's investments in science, technology, and learning..." William J. Clinton, Statement on Signing the Department

of Veterans Affairs and Housing and Urban Development, and Independent Agencies Appropriations Act, 2000, October 20, 1999 (*The American Presidency Project*, by Gerhard Peters and John T. Woolley, https://www.presidency.ucsb.edu/node/229443)

NASA R&D Appropriations for FY2007

Bill: Revised Continuing Appropriations Resolution, 2007; Science, State, Justice, Commerce and Related Agencies

Public Law: 110-5 **Enacted:** February 15, 2007 **Effective:** February 15, 2007

Nominal change		Real change		Classification
Millions ($)	YOY%	Millions ($2012)	YOY%	
-$373.0	-2.2%	-$698.0	-3.8%	Exogenous

Congress appropriated a modest decrease in nominal aerospace R&D funding for FY2007, leading to a more significant decline in real terms, one largely driven by fiscal restraint and the space program being a relatively low priority of the George W. Bush administration. NASA funding was prioritized toward keeping the International Space Station operational and fallout from the Space Shuttle Columbia disaster and away from other scientific missions and broader aerospace R&D work. In February 2003, the Columbia had disintegrated while reentering Earth's atmosphere, killing all astronauts on board, the first and only space shuttle catastrophe since the Challenger explosion. A year later, President Bush announced plans to establish a Moon base by 2020 to then be used as a launching pad for a manned mission to Mars—perhaps honoring his father's Moon-Mars mission that was axed by the Clinton administration.[29] But President George W. Bush's budget requests did not propose anything resembling his father's double-digit increases for NASA's budget. The FY2007 budget requested a $195.8 million (1.2%) increase in NASA funding over FY2006 funding levels; the House Appropriations Committee shaved $83.2 million off their request while the Senate Appropriations Committee proposed a heftier $1.2 billion (7.2%) increase over FY2006 levels. The Senate bill designated $1 billion of that approved increase as "emergency funding" for rehabbing the space shuttle program and rebuilding NASA facilities in the aftermath of Hurricane Katrina in 2005. But the George W. Bush administration was again trying to freeze nondefense discretionary spending to address re-emergent chronic budget deficits, and the appropriations process broke down in FY2007; continuing resolutions funded NASA through Feb. 15, 2007, at levels approved in the House-passed bill or FY2006 levels, whichever was lower, before the new Democratic majorities in the House and Senate pushed through a full-year CR providing funds for the rest of the year; see "Energy R&D Appropriations for FY2007" for more details. In the aftermath of the Columbia disaster, the Bush administration was increasingly keen on outsourcing space travel and resupply to the commercial sector, which was growing more competitive and affordable. This decrease in aerospace R&D funding appears to have been driven by a renewed focus on fiscal restraint and the breakdown of the appropriations process, fallout from the Columbia disaster, and other NASA priorities and operations taking priority over R&D activities. We find no evidence that cyclical motives, such as concerns about unemployment or inflation, influenced the decrease in appropriations. As such, we classify this policy event as exogenous. Most pertinent narrative evidence:

[29] "Bush Backs Goal of Flight to Moon to Establish Base," by David E. Sanger and Richard W. Stevenson, *New York Times*, January 15, 2004.

- "Last year, I proposed to hold overall discretionary spending growth below the rate of inflation—and Congress delivered on that goal. Last year, I proposed that we focus our resources on defense and homeland security and cut elsewhere—and Congress delivered on that goal. The 2007 Budget builds on these efforts. Again, I am proposing to hold overall discretionary spending below the rate of inflation and to cut spending in non-security discretionary programs below 2006 levels. My Administration has identified 141 programs that should be terminated or significantly reduced in size." (Budget Message of the President, FY2007, February 6, 2006, pp. 1-2)
- "Recognizing the need to reinvigorate the Nation's civil space program and keep [NASA] focused on compelling and inspiring goals, President Bush outlined a bold, new vision for human and robotic space exploration on January 14, 2004. The United States will extend human presence across the solar system, starting with a human return to the Moon by the year 2020, in preparation for human exploration of Mars and other destinations." (Budget of the United States, FY2007, p. 268)
- "In support of the President's goal to make Government spending more effective, some NASA programs that are not directly relevant to the exploration mission or other agency priorities, have underperformed, or are financially unsustainable, will be reformulated or terminated to allow for greater focus on the Agency's high-priority programs... The 2006 Budget terminated the Jupiter Icy Moons Orbiter, the flagship mission of NASA's space nuclear power program, because it was costly and not well aligned with the new focus on exploration. The 2007 Budget further trims the space nuclear program, which will continue as a [R&D] effort until its technologies are needed in later years. NASA's aeronautics research program is also being refocused to improve its effectiveness and to yield greater benefits for the Nation with a leaner budget." (Ibid, p. 270)
- "Following the tragic loss of the Space Shuttle Columbia, the International Space Station relied on Russian crew and cargo delivery services to continue operating. NASA has since implemented a program intended to allow U.S. companies to compete commercially to deliver cargo, and eventually crew, to the International Space Station. If this program is successful, it will reduce the cost of space operations, freeing NASA to focus on exploration, and may encourage the growth and diversification of the U.S. commercial launch industry" (Ibid, p. 270)
- "Through his company, Space Explorations Technology, or SpaceX, Mr. [Elon] Musk wants to send things to space for one-third of the going rate or less—even bringing down the price to $7 million for small payloads to low Earth orbit—with a series of simple rockets of his own design. His goal is to build a Volkswagen of the cosmos, a bare-bones and dirt-cheap rocket that will go into space and return, to be used again and again. Commercial launchings currently cost $5,000 to $10,000 per pound of payload; Mr. Musk says his simple rockets could do it for $1,000 a pound... Mr. Musk says he wants to develop an all-American option that will be price-competitive and break the duopoly of Lockheed and Boeing on contracts with the federal government." ("A Bold Plan to Go Where Men Have Gone Before," by Leslie Wayne, *New York Times*, February 5, 2006)
- "Some of the most highly promoted missions on NASA's scientific agenda would be postponed indefinitely or perhaps even canceled under the agency's new budget, despite its administrator's vow to Congress six months ago that not "one thin dime" would be taken from space science to pay for President Bush's plan to send astronauts to the

Moon and Mars... Among the casualties in the budget, released last month, are efforts to look for habitable planets and perhaps life elsewhere in the galaxy, an investigation of the dark energy that seems to be ripping the universe apart, bringing a sample of Mars back to Earth and exploring for life under the ice of Jupiter's moon Europa—as well as numerous smaller programs and individual research projects that astronomers say are the wellsprings of new science and new scientists. The agency's administrator, Michael D. Griffin, says NASA needs the money to keep the space shuttle fleet aloft, complete the International Space Station, and build a new crew exploration vehicle to replace the shuttle... As a result of the new cuts, NASA's expenditures for space and earth science will grow about 1 percent a year from now to 2011, far less than inflation..." ("Much-Promoted NASA Missions Would Be Threatened Under Agency's Budget," by Dennis Overbye, *New York Times*, March 2, 2006)

- "On behalf of all Americans, I welcome home the crew of the space shuttle Discovery from a safe and successful mission. Your courage and commitment to excellence have inspired us all, and a proud Nation sends its congratulations on a job well done. The men and women of NASA have dedicated themselves to putting our space program back on track and implementing our Nation's vision for human and robotic space exploration. America's space program is a source of great national pride, and this mission has been another important accomplishment in advancing space science, human space flight, and space exploration." George W. Bush, Statement on the Landing of the Space Shuttle Discovery, July 17, 2006 (*The American Presidency Project*, by Gerhard Peters and John T. Woolley, https://www.presidency.ucsb.edu/node/267217)
- "Like all the other domestic spending bills for fiscal 2007, legislation to fund the Commerce and Justice departments, NASA, and several independent agencies was put on hold by the Republican leadership at the end of the 109th Congress... In December, Congress cleared a continuing resolution (PL 109-383) that funded all of the programs through Feb. 15, 2007, at the lower of the House-passed or fiscal 2006 spending levels... Aside from State Department funding, the biggest difference between the House and Senate bills was an extra $1 billion in emergency funding added in the Senate bill for NASA. Because the money was designated as emergency funding, it did not count against the discretionary spending limit for the bill... The Senate amount included $1 billion in emergency spending for the costs of returning the space shuttle to flight after the Columbia disaster and $40 million for repairs from Hurricane Katrina." ("Senate Seeks Disaster Aid for NASA," *CQ Almanac 2006*, 62nd ed., edited by Jan Austin, 2-8-2-10. Washington, DC: Congressional Quarterly, 2007

NASA R&D Appropriations for FY2009

Primary Bill: Omnibus Appropriations Act, 2009; Commerce, Justice, Science, and Related Agencies Appropriations Act, 2009

Public Law: 111-8 **Enacted:** March 11, 2009 **Effective:** March 11, 2009

Secondary: American Recovery and Reinvestment Act of 2009

Public Law: 111-5 **Enacted:** February 17, 2009 **Effective:** February 17, 2009

Nominal change		Real change		Classification
Millions ($)	YOY%	Millions ($2012)	YOY%	
$1,399.0	8.1%	$1,325.0	7.3%	Endogenous

Congress appropriated a significant increase in both nominal and real funding for aerospace R&D funding for FY2009, both through the regular appropriations process and through ARRA, the largest fiscal stimulus bill enacted in response to the Great Recession. The appropriations process again broke down during the lame duck period of the Bush administration, and Democrats bet that delaying spending bills until after the November 2008 election would secure more of the "spending boosts they wanted" if Barack Obama were elected; see "Energy R&D Appropriations for FY2009" for more details. The outgoing Bush administration remained largely focused on manned space exploration, notably for the International Space Station and a replacement system for the space shuttle, which was scheduled to retire in 2010, due to safety concerns following the Columbia disaster. The Senate Appropriations Committee expressed concerns that lofty goals for manned space exploration were crowding out funding for a "balanced science program" and instead prioritized funding for programs demonstrating greater "scientific and technical merit," providing additional funding for the Science, Aeronautics, and Exploration budget accounts while merely approving the request for Space Operations. The Bush administration had proposed $17.61 billion for NASA, up $212.3 million (1.2%) from FY2008 funding levels; the FY2009 omnibus appropriations bill, enacted shortly after President Obama was inaugurated, instead gave the agency a $380.5 million (2.2%) increase over FY2008, ignoring emergency supplemental appropriations (CQ 2010). ARRA also provided NASA with an additional $400 million for the Science account, $150 million for Aeronautics, $400 million for Exploration, and $52 million in other supporting funds for FY2009; the accompanying appropriations committee reports stressed the estimated number of additional jobs that would be supported with these emergency funds for NASA's R&D functions. Moreover, the short title of the bill read "Making supplemental appropriations for job preservation and creation, infrastructure investment, energy efficiency, and science, assistance to the unemployed, and State and local fiscal stabilization, for the fiscal year ending September 30, 2009, and for other purposes" (Pub. L. 111-5, p. 1). The increases in aerospace R&D funding levels for FY2009 appear to have been largely intended as a form of fiscal stimulus to combat the economic downturn and boost employment; as such, we classify this policy event as endogenous. Most pertinent narrative evidence:

- "The [House Appropriations] Committee recommendation includes $17,768,967,000 for NASA, $154,767,000 above the request and $459,567,000 above the fiscal year 2008 enacted level. Funding included in this Act provides for continued efforts to fly the Shuttle as safely as possible until its retirement in 2010; to complete the international space station; continue the lunar return program having the maximum possible utility for later missions to Mars and other destinations; to advance knowledge in the fundamental disciplines of aeronautics and develop technologies for safer aircraft and higher capacity air systems; to further understanding of the Earth, its climate, its connections among the other planets and stars, and the origin and evolution of planetary systems and the origin and distribution of life in the universe; and to inspire and educate students at all levels to pursue careers in the fields of science, technology, engineering and mathematics." (H. Rpt. 110-919, December 10, 2008, pp. 114-115)
- "The [Senate Appropriations] Committee's recommendation provides $17,814,000,000 for [NASA]. The recommendation is $504,600,000 above the fiscal year 2008 enacted level, and $199,800,000 above t1he budget request... NASA's vision for space exploration maps out an aggressive role for the United States in manned space exploration. However, the potential costs are substantial and will likely be very difficult to maintain

at the current estimated funding levels. In addition, the The committee feels strongly that NASA must show its commitment to those human spaceflight activities already underway. The Shuttle program and the construction of the International Space Station [ISS] continue to be the primary focus of the Nation's manned space flight activities. Nevertheless, the replacements for the Space Shuttle's manned and heavy lift capabilities must also be considered as part of any plan for continued human access to space but not to the detriment of existing obligations. The Committee is concerned that NASA will neglect areas that only tangentially benefit, or do not fit within, the exploration vision. The Committee believes that NASA must work diligently to balance existing programs and priorities with its plans for the future. Counterbalancing future priorities against current programs places existing research and expertise in jeopardy and risks squandering significant Federal investments that may be essential to the exploration vision. In addition, the Committee is concerned that the strong, balanced science program that has served the Nation so successfully for many years is being left behind rather than being nurtured and sustained. That science program has been based on a set of carefully crafted scientific strategies that are founded on scientific and technical merit, relevance to overall national needs, and broad consultation with the scientific community." (S. Rpt. 110-397, June 23, 2008, pp. 87-88)

- "During his campaign, Mr. Obama expressed support for NASA and criticized the five-year gap between the scheduled end of the space shuttle program in 2010 and the planned debut of the first components of the new system, which NASA has given the overall name Constellation, in 2015. (During the pause in American flights—a Bush administration plan to conserve money during the development process—the United States will depend on Russia and its Soyuz spacecraft for trips to the International Space Station.) But NASA, which has a $17 billion annual budget... will be competing for money as the new administration faces urgent and expensive crises." ("The Fight Over NASA's Future," by John Schwartz, *New York Times*, December 30, 2008)
- "NASA Science Recovery funding: $400 million: Investments in the areas of Earth science, planetary science, heliophysics and astrophysics seek to answer fundamental questions concerning the ways the Earth's climate is changing; the comparison of the Earth with other planets in the solar system and around other stars; and the connections among the Sun, Earth and heliosphere. These investments are critically important to understanding climate change and mitigation... It is estimated by NASA that these [ARRA] investments will support in excess of 2,600 jobs." (H. Rpt. 111-4, January 26, 2009, p. 22)
- "NASA Aeronautics Recovery funding: $150 million: The NASA Authorization Act of 2008 requires system-level research, development, and demonstration activities related to aviation safety, environmental impact mitigation, and the Next Generation Air Transportation System (NextGen). Investments in environmentally- friendly or "green" aviation, supersonic testbeds, and development of aerospace systems and technologies require substantial participation by the aerospace industry and intergovernmental agencies, and result in significant job creation. NASA believes it is possible to expend all of these funds by the end of the second fiscal year after receipt and estimates that nearly 1,000 jobs will be supported." (Ibid, p. 23)
- "The Committee recommends a total of $1,502,000,000 for [NASA]. NASA is one of the Nation's premier innovation agencies. Funding recommended for NASA is estimated to create over 10,000 jobs, including 8,000 high-tech jobs." (S. Rpt. 111-3, January 27,

2009, pp. 19-20)

NASA R&D Appropriations for FY2010

Bill: Consolidated Appropriations Act, 2010; Commerce, Justice, Science, and Related Agencies Appropriations Act, 2010

Public Law: 111-117 **Enacted:** December 16, 2009 **Effective:** December 16, 2009

Nominal change		Real change		Classification
Millions ($)	YOY%	Millions ($2012)	YOY%	
-$524.0	-2.8%	-$863.1	-4.4%	Endogenous

Congress appropriated significant decreases in both nominal and real aerospace R&D funding for FY2010, entirely driven by the reversal of a surge in emergency ARRA stimulus funding provided for NASA in FY2009. NASA was at a crossroads between administrations, and former President Bush's costly vision for renewed manned space exploration was running up against unmanned space exploration programs deemed of higher value by the scientific community and budget deficits swollen by the Great Recession and related policy responses. The Obama administration and congressional democrats were particularly interested in funding NASA's unmanned earth science programs related to climate change. In the FY2010 budget, the Obama administration proposed $18.7 billion for NASA, roughly $900 million more than appropriated for FY2009 when excluding emergency funding from ARRA, but less than the total FY2009 appropriation. The House Appropriations Committee initially tried to cut back at this requested increase in regular order funding, but Senate Appropriations Subcommittee chair Barbara Mikulski (D-MD)—an advocate for NASA and the Goddard Space Flight Center in her home state—negotiated much higher funding levels in the conference bill. Funding priorities for FY2010 included the International Space Station and unmanned scientific exploration, while funding levels were projected to fall in the coming years as the space shuttle program approached permanent retirement; a blue ribbon panel recommended outsourcing space transport and resupply missions to the commercial sector and axing costly rocket programs that the Bush administration had wanted to develop as a replacement to the shuttle system. But broader than budget and policy decisions about the merits of manned versus unmanned space exploration or outsourcing space missions, the decrease in aerospace R&D funding for FY2010 was largely driven by the reversal of a one-off fiscal stimulus appropriated for FY2009 to combat the recession, and as such, we classify this policy event as endogenous. Most pertinent narrative evidence:

- "[NASA's] investment in Earth science research satellites, airborne sensors, computer models, and analysis has revolutionized scientific knowledge and prediction of climate change and its effects. Using the National Research Council's recommended priorities for space-based Earth science research as its guide, NASA will develop new space-based research sensors in support of the Administration's goal to deploy a global climate research and monitoring system." (Budget of the United States, FY2010, p. 103)
- "NASA will fly the Space Shuttle to complete the International Space Station and then retire the Shuttle in 2010; an additional flight may be conducted if it can safely and affordably be flown by the end of 2010. Funds freed from the Shuttle's retirement will enable the Agency to support the development of systems to deliver people and cargo to the International Space Station and the Moon. As part of this effort, NASA will stimulate private-sector development and demonstration of vehicles that may support

the Agency's human crew and cargo space flight requirements... NASA will continue to assemble and utilize the International Space Station, the permanently crewed facility orbiting Earth that enables the Agency to develop, test, and validate critical space exploration technologies and processes. NASA also will continue to coordinate with international partners to make this platform available for other government entities, commercial industry, and academic institutions to conduct research." (Ibid, p. 104)

- "The [House Appropriations] Committee recommendation includes $18,203,300 for NASA, $482,700,000 below the request and $420,915,000 above the comparable fiscal year 2009 enacted level. Funding included in this Act provides for continued efforts to fly the Shuttle as safely as possible until its retirement in 2010; to complete the international space station; continue to advance human space flight activities; to advance knowledge in the fundamental disciplines of aeronautics and develop technologies for safer aircraft... ; to further understanding of Earth, its climate and global environment, the connections among the other planets and the Sun, and the origin and evolution of planetary systems and the origin and distribution of life in the universe; and to inspire and educate students at all levels to pursue careers in the fields of science, technology, engineering and mathematics." (H. Rpt. 111-149, June 12, 2009, p. 132)
- "NASA's program to send astronauts back to the Moon by 2020 is often called "Apollo on steroids." ... But with trillion-dollar federal budget deficits and a blue ribbon panel now re-evaluating the United States' human space flight program, there is some question whether the lunar designs that NASA has drawn up over the past five years will be built. The agency could be told to focus on robotic missions, to undertake cheaper alternatives for getting to the Moon, or to shift its target to something else, like an asteroid. If NASA does not go to the Moon, it is not clear anyone else would go, either. Some Chinese and Russian officials have talked about establishing a Moon base sometime around 2025, but neither China nor Russia has made any official pronouncements, and their current rockets are too small for the task... After increases in the current year and for fiscal year 2010, Mr. Obama's proposed spending on human exploration in years 2011 through 2013 was several billion dollars less than what President Bush proposed last year. That essentially cut the money to turn the Altair and the Ares V from paper concepts to detailed designs and real spacecraft" ("Grand Plans for Moon and Mars, Budget Permitting," by Kenneth Chang, *New York Times*, July 14, 2009)
- "Setting the stage for a major overhaul of the nation's human spaceflight program, a blue-ribbon panel said Thursday that [NASA] should consider scrapping the rocket it had been developing to replace the space shuttles and bypassing the Moon for now. In a 157-page report titled "Seeking a Human Spaceflight Program Worthy of a Great Nation," most of the options proposed by the 10-member panel turn to private companies to provide astronauts with the ride to low-Earth orbit and replace Moon landings with the "flexible path" approach—flybys of the Moon and Mars and visits to asteroids and deep-space locales that do not require development of complicated landers... Beyond dissatisfaction with NASA's current course, the Obama administration has given little indication of which options it might choose, whether it would support a budget increase for NASA or even when it will decide... For NASA to continue operating the space station through 2020, five years longer than currently planned, and still reach the Moon, the current program would require $159 billion from 2010 to 2020, the panel calculated, far more than the $100 billion that the current budget guidance from the Obama administration lays out... The panel did not call Ares I an engineering fail-

ure but rather more a casualty of changing circumstances and of budgets one-third smaller than originally planned for. "With time and sufficient funds, NASA could develop, build and fly the Ares I successfully," the panel wrote. "The question is, Should it?" ("For NASA, Possible Shifts in Direction," by Kenneth Chang, *New York Times*, October 23, 2009)

- "With Democrats in charge of both chambers and the White House, debate on the Commerce-Justice-Science bill was largely free of the policy fights that had bedeviled it in previous years... The biggest funding difference between the earlier House and Senate versions of the measure was over NASA, with the Senate supporting the president's $18.7 billion request and the House trimming $483 million from that pending release of the independent report. The final bill provided more than either chamber proposed—$521 million above the House figure and $38 million more than the Senate sought." ("C-J-S Spending Bill Sets Tone for Year," *CQ Almanac 2009*, 65th ed., edited by Jan Austin, 2-17-2-19. Washington, DC: CQRoll Call Group, 2010)
- "[Senate Subcommittee Chairwoman Barbara] Mikulski noted that the [NASA] total included $1.4 billion for earth sciences programs, which she said would fund "80 percent of all federal climate change science" (Ibid)

NASA R&D Appropriations for FY2011

Bill: Department of Defense and Full-Year Continuing Appropriations Act, 2011; Title III—Commerce, Justice, Science, and Related Agencies

Public Law: 112-10 **Enacted:** April 15, 2011 **Effective:** April 15, 2011

Nominal change		Real change		Classification
Millions ($)	YOY%	Millions ($2012)	YOY%	
-$223.0	-1.2%	-$711.8	-3.8%	Exogenous

Congress again appropriated a modest decrease in nominal funding for aerospace R&D for FY2011, resulting in a more significant decline in real terms, as the regular order budget process broke down in late 2010 and the newly elected House Republican majority demanded sharp cuts to nondefense discretionary spending in early 2011; see "Energy R&D Appropriations for FY2011" for more details. In a controversial move, President Obama's FY2011 budget canceled President Bush's Constellation manned spaceflight program, in part because a blue ribbon panel advised that it had "little chance of success under existing budget conditions" and was diverting funds from projects with greater scientific value. The administration wanted to pivot to relying on the commercial space sector for transportation and launching satellites and to invest more in unmanned scientific exploration projects and NASA's science programs, particularly those related to monitoring climate change; the international space station also remained a high priority for both research and diplomatic objectives. Despite canceling the Constellation program, the administration proposed a $275.7 million (1.5%) increase for the agency, which the appropriators approved despite significant disagreements between the House and Senate on where the space program should be headed. But with the collapse of the regular appropriations process and intensified partisan budgetary disputes after the 2010 midterms, FY2011 appropriations for NASA ended up being cut back rather than increased. Congress nearly avoided a series of government shutdowns and limped along with a series of CRs, each incrementally cutting spending, until a bipartisan agreement was struck in April 2011 cumulatively cutting discretionary

spending by $40 billion for FY2011. The Commerce-Justice-Science appropriations bore $10.9 billion of that $40 billion spending cut, a decline of 17% from FY2010 funding levels; only the Transportation-HUD appropriations saw a steeper absolute or relative reduction for the year. The decrease in nondefense aerospace R&D funding appears to have been driven by concerns about long-term deficit reduction and partisan disagreement about the appropriate size and role of the federal budget, and appears unrelated to any concerns about inflation, unemployment, or other short-run macroeconomic prerogatives. The President's budget request and Senate appropriators had initially framed their proposed increases in NASA funding as good for jobs, but the budget cuts that were actually enacted do not appear to have been motivated by such cyclical concerns. As such, we classify this policy change as exogenous. Most pertinent narrative evidence:

- "To foster job growth across the economy, the Budget will... Reinvigorate Space Science and Exploration. Leaving the boundaries of our planet has helped to spur innovation and push the boundaries of scientific knowledge across many fields. Recognizing the importance of space science and exploration, the Administration is proposing to cancel [NASA's] Constellation program—which is based largely on existing technologies and was over budget, behind schedule, and lacking in innovation—and replace it with a bold, new approach to human space flight that embraces commercial industry, forges international partnerships, and invests in the building blocks of a more capable approach to space exploration. This includes: [R&D] to support future cost-effective, heavy-lift rocket systems; a vigorous new technology development and test program that aims to increase the capabilities and reduce the cost of future exploration activities; and the development of precursor robotic exploration missions to scout locations and demonstrate technologies to increase the safety and capability of future human missions... To support this effort, the Budget adds $6 billion to NASA's budget over the next five years." (Budget of the United States, FY2011, pp. 21-22)
- "NASA's Constellation program—based largely on existing technologies—was begun to realize a vision of returning astronauts back to the Moon by 2020. However, the program was over budget, behind schedule, and lacking in innovation due to a failure to invest in critical new technologies. Using a broad range of criteria, an independent review panel determined that even if fully funded, NASA's program to repeat many of the achievements of the Apollo era, 50 years later, was the least attractive approach to space exploration as compared to potential alternatives. Furthermore, NASA's attempts to pursue its Moon goals had drawn funding away from other NASA programs, including robotic space exploration, science, and Earth observations. The President's Budget cancels Constellation and replaces it with a bold new approach that invests in the building blocks of a more capable approach to space exploration" (Ibid, p. 130)
- "Commercial launch vehicles have for years carried all U.S. military and commercial—and most NASA—satellites to orbit. The Budget funds NASA to contract with industry to provide astronaut transportation to the International Space Station as soon as possible, reducing the risk of relying solely on foreign crew transports for years to come. A strengthened U.S. commercial space launch industry will bring needed competition, act as a catalyst for the development of other new businesses capitalizing on affordable access to space, help create thousands of new jobs, and help reduce the cost of human access to space." (Ibid, p. 130)
- "NASA's Earth science program conducts first-of-a-kind demonstration flights of sensors in air and space in an effort to foster scientific understanding of the Earth sys-

tem and to improve the ability to forecast climate change and natural disasters. The Budget accelerates the development of new satellites the National Research Council recommended as Earth science priorities. The Budget also supports several research satellites currently in development, a campaign to monitor changes in polar ice sheets, and enhancements to climate models. In addition, the Budget provides funds for NASA to develop and fly a replacement for the Orbiting Carbon Observatory, a mission designed to identify global carbon sources and sinks that was lost when its launch vehicle failed in 2009." (Ibid, p. 131)

- "The [Senate Appropriations] Committee's recommendation provides $19,000,000,000 for NASA... The recommendation is $275,700,000 above the fiscal year 2010 enacted level and equal to the budget request." (S. Rpt. 111-229, July 22, 2010, pp. 5, 115)
- "This funding is recommended to support a balanced space program that will reinvest in scientific discovery to: improve our understanding and ability to predict changes in the Earth and its climate; make air travel safer and more efficient; and make the highest and best use of the International Space Station [ISS] laboratory for discoveries that will improve life on Earth. The bill makes a real investment in the scientists, engineers, and supporting workforce inside NASA and its partners. It supports the transition of the current human spaceflight workforce to a restructured program that will build a heavy lift rocket and capsule to reach beyond low-Earth orbit, as well as the growing commercial workforce that will deliver cargo, and possibly astronauts, to the ISS. These investments in NASA will inspire and teach our next generation of scientists, engineers and entrepreneurs, create jobs today and fuel the discoveries of new products tomorrow... [the] bill protects our planet by funding the science used to monitor and predict changes in Earth's climate. Through the science conducted at [NASA], the [NSF], and the National Oceanic and Atmospheric Administration, this bill funds over 80 percent of Federal climate change science. Several satellites that provide critical climate and weather information are on borrowed time. For this reason, the Committee has recommended over $1,800,000,000 for NASA's Earth science missions" (Ibid, p. 5)
- "During July 2009, the Nation marked the 40th anniversary of the Apollo Moon landing. Since that time, many have debated the future of NASA's human spaceflight program. The Review of U.S. Human Spaceflight Plans Committee, better known as the Augustine Committee, reported that the plans for future human spaceflight were untenable. The administration's budget request offered a vision for human spaceflight that relied on commercial providers in the near term and invested now in technology development before making major investments in building the next generation of human spaceflight vehicles... From the outset, this Committee has sought a human spaceflight program that the President, the Congress, and the American people can support. The Committee believes that the restructured program called for in this act should be sustainable from one administration to the next. The United States cannot reinvent its space program every four years." (Ibid, p. 115)
- "Congress sent President Obama a three-year NASA authorization bill at the end of September after months of negotiations over the administration's plan to restructure the agency's manned spaceflight program. Obama signed the measure into law on Oct. 11 (PL 111-267). The bill authorized $58.4 billion for [NASA] for fiscal 2011 through 2013. It directed NASA to retain its shuttle-related workforce through fiscal 2011, but it also authorized the agency to foster the development of commercial capabilities in

keeping with the administration's push to shift the U.S. human spaceflight program toward commercial carriers... Obama initially provoked hostility in Congress when he sought to end NASA's Constellation human spaceflight program and foster commercial carriers instead. The Constellation program was begun as part of President George W. Bush's plans to send astronauts to the space station, then to the moon, and ultimately to Mars and beyond... Obama laid out his proposal for NASA as part of his fiscal 2011 budget, following the receipt of a report on the future of manned spaceflight from an independent committee that he had established in 2009. The panel, known as the Augustine Committee, concluded that the Constellation program... had little chance of success under existing budget conditions. The committee also noted that NASA had siphoned funding from other important programs, such as robotic exploration and technology development, in an effort to keep the elements of the exploration program on track. In light of the International Space Station's value for research and international collaboration, the panel said the administration should consider extending the life of the space station beyond 2015..." ("Bill Restructures NASA Programs, Boosts Commercial Spaceflight," *CQ Almanac 2010*, 66th ed., edited by Jan Austin, 13-3-13-4. Washington, DC: CQ-Roll Call Group, 2011)

- "Much of the debate on the Commerce-Justice-Science bill centered on the future of NASA. While both measures met President Obama's request of $19 billion for the space agency, they differed on the manned spaceflight program. Senate appropriators included money to set the stage for restructuring NASA and investing in commercial spaceflight, which was the direction Obama wanted to take. House appropriators chose to leave the future of NASA's manned spaceflight in the hands of the authorizing committee, withholding $4.3 billion for the program until enactment of a NASA authorization bill... The panel took no position on the administration's plan to scrap NASA's Constellation spaceflight program and to replace the space shuttle with commercial carriers." ("Action Aborted on all FY 2011 Bills," *CQ Almanac 2010*, 66th ed., edited by Jan Austin, 2-5-2-14. Washington, DC: CQ-Roll Call Group, 2011)

NASA R&D Appropriations for FY2012

Bill: Consolidated and Further Continuing Appropriations Act, 2012; Commerce, Justice, Science, and Related Agencies Appropriations Act, 2012

Public Law: 112-55 **Enacted:** November 18, 2011 **Effective:** November 18, 2011

Nominal change		Real change		Classification
Millions ($)	YOY%	Millions ($2012)	YOY%	
-$730.0	-4.1%	-$807.1	-4.5%	Exogenous

Congress appropriated a decrease in both nominal and real aerospace R&D funding for FY2012, largely motivated by long-term deficit reduction objectives, partisan budget fights between the Obama administration and House Republicans, and newly imposed discretionary spending caps; see "Department of Defense R&D Appropriations for FY2012" for more details. The Obama administration was prioritizing long-term deficit reduction while trying to increase funding for high-priority public investments, but the needle was proving hard to thread; House Republicans were trying to cut as deeply into nondefense discretionary spending as possible. The space program was far from the top of the administration's priorities when it came to science and technology in an era of fiscal restraint; President Obama

declared that this was "our generation's Sputnik moment" in his State of the Union address, but the focus for innovation was "biomedical research, information technology, and especially clean energy technology," not the space program. The Obama administration requested $18.72 billion for NASA, a modest increase of $276.3 million (1.5%) over FY2011 funding levels, but the conference bill instead appropriated $648 million (-3.5%) less for the agency—still $1 billion more than had been approved by the House Appropriations Committee. In July, in the midst of deliberations over NASA's FY2012 appropriations, the Atlantis flew what would be the final mission of the space shuttle program, closing a chapter in manned space flight. The decrease in aerospace R&D funding appears to have been driven by concerns about long-term deficit reduction and partisan disagreement about the appropriate size and role of the federal budget, and does not appear to have been influenced by concerns about inflation, unemployment, or other short-run macroeconomic prerogatives. As such, we classify this policy event as exogenous. Most pertinent narrative evidence:

- "Half a century ago, when the Soviets beat us into space with the launch of a satellite called Sputnik, we had no idea how we would beat them to the Moon. The science wasn't even there yet. NASA didn't exist. But after investing in better research and education, we didn't just surpass the Soviets, we unleashed a wave of innovation that created new industries and millions of new jobs. This is our generation's Sputnik moment. Two years ago, I said that we needed to reach a level of [R&D] we haven't seen since the height of the space race. And in a few weeks, I will be sending a budget to Congress that helps us meet that goal. We'll invest in biomedical research, information technology, and especially clean energy technology, an investment that will strengthen our security, protect our planet, and create countless new jobs for our people." Barack Obama, State of the Union Address, January 25, 2011 (*The American Presidency Project*, by Gerhard Peters and John T. Woolley, https://www.presidency.ucsb.edu/node/289120)
- "Today Americans across the country watched with pride as four of our fellow citizens blasted off from the Kennedy Space Center in the Space Shuttle Atlantis, and America reached for the heavens once more... Today's launch may mark the final flight of the space shuttle, but it propels us into the next era of our never-ending adventure to push the very frontiers of exploration and discovery in space. We'll drive new advances in science and technology. We'll enhance knowledge, education, innovation, and economic growth. And I have tasked the men and women of NASA with an ambitious new mission: to break new boundaries in space exploration, ultimately sending Americans to Mars." Barack H. Obama, Statement on the Launch of the Space Shuttle Atlantis, July 8, 2011 (*The American Presidency Project*, by Gerhard Peters and John T. Woolley, https://www.presidency.ucsb.edu/node/290791)
- "The mission of [NASA] is to drive advances in science, technology, and exploration to enhance knowledge, education, innovation, economic vitality, and stewardship of the Earth. To support this mission, the President's Budget provides $18.7 billion, which is roughly the same amount as in 2010. Funding focuses on areas that will improve the Nation's aviation and space capabilities, drive the growth of new industries, strengthen our competitive edge in human spaceflight and scientific research and prepare the next generation of leaders in the field. To maximize funding in a fiscally-constrained time, the Budget also reflects boosts to the efficiency of NASA facilities and operational streamlining." (Budget of the United States, FY2012, p. 151)
- "The funding allocation for the [House's] fiscal year 2012 bill reflects the critical need to rein in government expenditures in the face of record-high deficits. Spending reductions

are an essential component of putting the Nation on the path of economic recovery, job creation, and financial security." (H. Rpt. 112-169, July 20, 2011, p. 2)

- "The [House Appropriations] Committee recommends $16,810,257,000 for [NASA], which is $1,637,771,000 below fiscal year 2011 and $1,914,043,000 below the request... NASA needs to develop and pursue new and different ways of operating that will promote efficiency and economy; annual budget increases can no longer be counted on as the means for achieving mission goals. The new reality of constrained budgets, however, does not mean that NASA cannot or will not continue to make significant achievements in science, exploration, and other areas... NASA often blames its cost overruns on the complex and unique development work conducted by its mission directorates, but, with proper cost estimation, the inherent risk in NASA's work can be accounted for and its budgets controlled... Without improvements in project management, NASA will be unable to hold to even its most rigorous cost estimates." (Ibid, pp. 68-69)
- "The [House Appropriations] Committee recommends $16,810,257,000 for [NASA], which is $1,637,771,000 below fiscal year 2011 and $1,914,043,000 below the request... NASA needs to develop and pursue new and different ways of operating that will promote efficiency and economy; annual budget increases can no longer be counted on as the means for achieving mission goals. The new reality of constrained budgets, however, does not mean that NASA cannot or will not continue to make significant achievements in science, exploration, and other areas... NASA often blames its cost overruns on the complex and unique development work conducted by its mission directorates, but, with proper cost estimation, the inherent risk in NASA's work can be accounted for and its budgets controlled..." (Ibid, pp. 68-69)
- "With both parties determined to finish the FY2012 appropriations bills before the end of the session, lawmakers assembled the 12 annual spending measures into two packages, clearing them with relative ease. The lack of drama stood in sharp contrast to the fight that accompanied the enactment of the first short-term continuing resolution... The need to pass a temporary spending bill by Oct. 1 in the absence of the unfinished FY2012 appropriations bills gave lawmakers the opportunity to engage in their third close encounter with a severe fiscal crisis. In April, Congress narrowly averted a government shutdown when it cleared legislation to fund the government for the rest of FY2011. In August, lawmakers nearly ran out of time in a dispute over raising the government's debt ceiling." ("FY 12 Bills Bundled After CR Fight," *CQ Almanac 2011*, 67th ed., edited by Jan Austin, 2-13-2-14. Washington, DC: CQ-Roll Call Group, 2012)
- "Two prominent programs that House Republicans had hoped to zero out, one for neighborhood policing and another for a NASA space telescope, got a reprieve under the fiscal 2012 Commerce-Justice-Science (C-J-S) bill... The House version would have eliminated funding... for NASA's James Webb Space Telescope, the successor to the Hubble Space Telescope and a main component of NASA's plans for the next decade... Major components of the [enacted] package included: $17.8 billion for NASA, $648 million less than in fiscal 2011, and $924 million less than requested." ("Conferees Spare Some Key Accounts," *CQ Almanac 2011*, 67th ed., edited by Jan Austin, 2-18-2-19. Washington, DC: CQ-Roll Call Group, 2012)

NASA R&D Appropriations for FY2013

Bill: Consolidated and Further Continuing Appropriations Act, 2013; Commerce, Justice, Science, and Related Agencies Appropriations Act, 2013

Public Law: 113-6 **Enacted:** March 26, 2013 **Effective:** March 26, 2013

Nominal change		Real change		Classification
Millions ($)	YOY%	Millions ($2012)	YOY%	
-$1,034.0	-6.0%	-$1,147.7	-6.7%	Exogenous

Congress enacted deep cuts to both nominal and real appropriations for aerospace R&D programs for FY2013, entirely because the legislative resolution to the 2011 debt ceiling crisis had capped discretionary spending, and further automatic "sequestration" spending cuts were unexpectedly triggered in FY2013; see "Department of Defense R&D Appropriations for FY2012-2013" for more details. In the post-Great Recession era of partisan budget fights and fiscal austerity, President Obama was still trying to push for targeted increases in certain research budgets, but NASA was conspicuously missing from the short list of the administration's priorities for science and technology: Unlike recent years, the Obama administration proposed a modest nominal cut for NASA's budget in FY2013, and House Republicans proposed a more significant reduction below the budget request. But it was the blunt sequestration spending cuts triggered in March 2013 that really took the hatchet to NASA's budget, along with most federal agencies save DOD. The decrease in aerospace R&D funding appears to have been driven by concerns about long-term deficit reduction, a breakdown in the regular appropriations process, and partisan disagreement about the appropriate size and role of the federal budget, and appears unrelated to any cyclical concerns about inflation, unemployment, or other short-run macroeconomic prerogatives. As such, we classify this policy change as exogenous. Most pertinent narrative evidence:

- "In this Budget, we are sustaining our level of investment in non-defense [R&D] even as overall spending declines, thereby keeping us on track to double R&D funding in the key R&D agencies. We are supporting research at the National Institutes of Health that will accelerate the translation of new discoveries in biomedical science into new therapies and cures, along with initiatives at the Food and Drug Administration that will speed the approval of new medicines. We make important investments in the science and research needed to tackle the most important environmental challenges of our time, and we are investing in fields as varied as cyber-security, nano-technology, and advanced manufacturing. This Budget also puts an emphasis on the basic research that leads to the breakthroughs of tomorrow, which increasingly is no longer being conducted by the private sector, as well as helping inventors bring their innovations from laboratory to market." (Budget Message of the President, FY2013, February 12, 2012, p. 2)
- "[For NASA:] $17.7 billion, a decrease of 0.3 percent, or $59 million, below the 2012 enacted level. While making difficult choices, the Budget builds on our existing space infrastructure, continues efforts to streamline agency operations, and preserves innovative capabilities and technologies to sustain American leadership in space; Implements a lower-cost program of robotic exploration of Mars that will advance science and will also help lay the foundation for future human exploration; ...Funds the highest priority astronomical observatories and robotic solar system explorers, including a successor to the Hubble telescope and a mission to return samples from an asteroid, while delaying unaffordable new missions; Streamlines agency operations, resulting in over $200 million in savings." (Budget of the United States, FY2013, p. 183)

- "The funding allocation for the fiscal year 2013 bill reflects the critical need to rein in government expenditures in the face of record-high deficits. Spending reductions are an essential component of putting the Nation on the path to economic recovery, job creation and financial security. Reductions in discretionary spending such as those included in the [House Appropriations] Committee recommendation are one part of the overall effort that will be required to avoid an economic crisis. The Committee recommendation terminates 37 programs, resulting in savings of more than $300,000,000 from the fiscal year 2012 level and more than $140,000,000 from the President's request for these programs." (H. Rpt. 112-463, May 2, 2012, p. 2)
- "The [House] Committee recommends $17,573,800,000 for [NASA], which is $226,200,000 below fiscal year 2012 and $137,600,000 below the request." (Ibid, p. 63)
- "The [Senate Appropriations] Committee's recommendation provides $19,399,647,000 for [NASA]. The recommendation is $1,599,647,000 above the fiscal year 2012 enacted level and $1,688,247,000 above the budget request. The large increase is derived from a reorganization that moves responsibility for purchasing operational weather satellites from NOAA, the client agency, to NASA, which had been NOAA's contracting agency... Without the new account, the total recommendation for NASA is $41,500,000 below the fiscal year 2012 enacted level and $47,100,000 above the budget request." (Ibid, p. 86)
- "After the appropriations measure was enacted, the scheduled across-the-board sequester was still applied to appropriated amounts for 2013, reducing the aggregate discretionary total to an estimated $984 billion. Under the terms of the fiscal-cliff law, President Barack Obama ordered the sequester to take effect on March 1, before the final bill for 2013 was complete. Most of the sequestered money was taken from discretionary spending, and half of it came from Defense, under the terms of the 2011 debt limit law... For the Commerce-Justice-Science title, the omnibus provided a total of $59.9 billion, about $100 million less than in 2012. That included $50.2 billion in discretionary appropriations, 5 percent less than fiscal 2012, before the sequester. The measure provided increases for the National Oceanic and Atmospheric Administration, the National Institute of Standards and Technology, FBI cybersecurity programs, the Community Oriented Policing Services program and the National Science Foundation" ("Bipartisan Hybrid Bill Finances 2013," *CQ Almanac 2013*, 69th ed., 2-34-2-35: 2014)

NASA R&D Appropriations for FY2016

Bill: Consolidated Appropriations Act, 2016; Commerce, Justice, Science, and Related Agencies Appropriations Act, 2016

Public Law: 114-113 **Enacted:** December 18, 2015 **Effective:** December 18, 2015

Nominal change		Real change		Classification
Millions ($)	YOY%	Millions ($2012)	YOY%	
$1,278.0	7.3%	$1,335.1	7.8%	Exogenous

Congress appropriated significant increases in nominal and real funding for aerospace R&D programs for FY2016, enabled by Congress growing frustrated with the spending limits imposed by the BCA of 2011 and reaching a bipartisan deal that relaxed the spending caps for FY2016-17, avoiding another government shutdown; see "Energy R&D Appropriations for FY2016" for more details. The Obama administration requested $18.53 billion for NASA,

a modest increase of $518.9 million (2.9%) over FY2015 funding levels, but the conference bill instead appropriated $19.29 billion for the agency, up 7.1% for the year. The House Appropriations Committee report had initially approved the President's budget request in full and their Senate counterparts had approved a little more than half of the proposed increase over FY2015 funding levels, but that was before the Bipartisan Budget Act of 2015 (Pub. L. 114-74), which was enacted in November, revised up the discretionary caps for FY2016-17. The appropriators used the loosened budget constraint to benefit NASA and advance a range of priorities, with development work on the heavy-lift Space Launch System and science exploration programs receiving particularly large increases above and beyond the budget request. The increase in aerospace R&D funding appears to have been largely driven by easing concerns about long-term deficit reduction, frustration with the BCA, and a breakdown in the regular appropriations process, and appears unrelated to any cyclical concerns about inflation, unemployment, or other short-run macroeconomic prerogatives. As such, we classify the policy change as exogenous. Most pertinent narrative evidence:

- "I want Americans to win the race for the kinds of discoveries that unleash new jobs: converting sunlight into liquid fuel; creating revolutionary prosthetics so that a veteran who gave his arms for his country can play catch with his kids again; pushing out into the solar system not just to visit, but to stay. Last month, we launched a new spacecraft as part of a reenergized space program that will send American astronauts to Mars. And in 2 months, to prepare us for those missions, Scott Kelly will begin a year-long stay in space. So good luck, Captain... We're proud of you." Barack H. Obama, State of the Union Address, January 20, 2015 (*The American Presidency Project*, by Gerhard Peters and John T. Woolley, https://www.presidency.ucsb.edu/node/308225)
- "The [House Appropriations] Committee believes that additional investment is needed to maintain American leadership in space exploration and science and for NASA to successfully execute all of its activities and missions. A bold space exploration program that engages the nation will inspire new generations of scientists and engineers, and contribute to the economic success the process of addressing this by funding NASA at $18,529,100,000, an increase of $518,900,000 over fiscal year 2015 and equal to the budget request. The bill advances space exploration and ensures our nation remains the world's leader in space exploration and technology, aeronautics research, and discovery in space and science. The bill provides for the continued development of the Orion crew vehicle, Space Launch System, and Exploration Ground Systems that will one day send astronauts beyond low Earth orbit. The bill continues funding for critical scientific missions and technology programs" (H. Rpt. 114-130, May 27, 2015, pp. 2-3)
- "Well, last week, Democrats and Republicans came together to set up a responsible, long-term budget process, and what we now see is a budget that reflects our values, that grows our economy, creates jobs, keeps America safe. It's going to strengthen the middle class by investing in critical areas like education and job training, basic research... And by locking in two years of funding, it should finally free us from the cycle of shutdown threats and last-minute fixes. It allows us to, therefore, plan for the future... And my hope is now that they build on this agreement with spending bills that also invest in America's priorities without getting sidetracked by a whole bunch of ideological issues that have nothing to do with our budget." Barack H. Obama, Remarks on Signing the Bipartisan Budget Act of 2015, November 2, 2015 (*The American Presidency Project*, by Gerhard Peters and John T. Woolley, https://www.presidency.ucsb.edu/node/311328)

- "The [Senate Appropriations] Committee's recommendation provides $18,289,500,000 for [NASA]. The recommendation is $279,300,000 above the fiscal year 2015 enacted level and $239,600,000 below the budget request... For Science, the Committee's recommendation strives to keep NASA's near-term launches on track to continue progress in exploring our solar system and the universe, understanding the sun, and observing and protecting our planet... The Committee believes this bill represents a solid path forward for human spaceflight that reaches beyond low-Earth orbit with affordable crew and launch vehicles; invests in the burgeoning domestic launch industry that is bringing cargo, and eventually crew, to the International Space Station; and supports NASA science and technology programs." (S. Rpt. 114-66, June 16, 2015, p. 94)
- "Discretionary spending for Commerce-Justice-Science programs for fiscal 2016 was set at $55.7 billion in the omnibus appropriations bill (PL 114-113). The spending level was an increase of $5.6 billion from the $50.1 billion in fiscal 2015... NASA, the biggest single component within the bill's science spending, received $19.3 billion, an increase of $1.3 billion" ("Budget Boosted for C-J-S Agencies," *CQ Almanac 2015*, 71st ed., edited by CQ-Roll Call, 2-10-2-11. Washington, DC: CQRoll Call, Inc., 2016)
- "The omnibus spending bill, released by House and Senate appropriators early Dec. 16 after extended negotiations, allocates $19.285 billion to NASA for fiscal year 2016. That total is $756 million above the administration's requested budget and the total provided the agency in a House spending bill passed in August. It is nearly $1 billion above a Senate bill that appropriators approved in June but was never passed by the full Senate. That increased spending, enabled by a budget bill passed in October that raised overall spending caps for discretionary programs, allowed appropriators to avoid long-standing debates about agency spending priorities by funding most programs at, or in some cases well above, the administration's request. One big winner in the bill is the Space Launch System. The heavy-lift launch vehicle receives $2 billion in the omnibus spending bill, nearly 50 percent more than administration's request of $1.36 billion and higher than levels in the House and Senate bills... Another agency program winning a significant budget increase is NASA's planetary sciences program. The omnibus bill provides $1.631 billion for the program, $270 million above the administration's request and $74 million above the House bill." ("NASA Receives $19.3 Billion in Final 2016 Spending Bill," by Jeff Loust, *Space News*, December 16, 2015)

4.4 Narrative Analysis of NIH R&D Appropriations

The origins of the NIH date back to the Hygienic Laboratory established with the Marine Hospital Service in 1887. The Hygienic Laboratory was relocated from Staten Island, NY to Washington, DC in 1891 and was renamed and reorganized as the National Institute of Health (NIH) by the Ransdell Act (Pub. L. 71-251) in 1930; the bill also authorized new research fellowships for biological sciences and medicine as well as the construction of two new buildings for an NIH campus in Washington. The institute quickly grew into a network of health research institutes, first with the existing Rocky Mountain Laboratory in Hamilton, Montana folded into the NIH in 1937; the same year, a new National Cancer Institute (NCI) was created, which would soon be incorporated into the NIH. In 1938, Congress moved the NIH's main research campus to Bethesda, MD, where it remains today, and authorized the construction of larger, more modern research facilities. Reflecting its growing size and importance, in 1943 the NIH was made a bureau within the U.S. Public Health Service (PHS), an agency that had also grown out of the Marine Hospital Service.

During World War II, the NIH pivoted to developing vaccines and medical treatments for the armed forces, notably yellow fever and typhus vaccines, as well as anti-malarial drugs; the NIH also helped with military aviation efforts, researching oxygen supply and human physiology for high altitude missions. Beyond the success of the Manhattan Project, such wartime scientific research and development efforts, largely organized under the OSRD, were perceived as instrumental in turning the tide of the war in the Allies' favor. Near the end of the war, OSRD Director Vannevar Bush urged President Roosevelt to build on the successes of wartime R&D and expand the federal government's role in supporting non-military basic research (Bush 1945); this push contributed both to significant growth of the NIH in the early post-war era as well as the creation of the NSF, as detailed in Section 4.5. Shortly before the war's end, the Public Health Service Act of 1944 (Pub. L. 78-410) consolidated various existing public health services and merged the NCI into the NIH; the act also authorized the NIH to conduct clinical research and established the Warren Grant Magnuson Clinical Center as a clinical research hospital to be built and operate on the NIH's Bethesda campus.[30] After the war's end, the administration of wartime OSRD health research projects was transferred to a newly created NIH Research Grants Office in 1946, and the NCI's research grant model was expanded to the entire NIH; congressional appropriations for NIH-funded health research grants grew rapidly for many years to come.

The scope and number of NIH-affiliated research centers and institutes also rapidly expanded in the early post-war years, particularly as new medical research priorities emerged. Cardiovascular and circulatory diseases and cancer were the leading two causes of death in the early post-war era and were thus focal points for expanded health research. In 1948, the National Heart Act authorized the creation of a new National Heart Institute (NHI) as part of the NIH, and the rapidly growing NIH was renamed in the plural as the National Institutes of Health. The Rocky Mountain Laboratory, Biologics Control Laboratory, NIH's Division of Infectious Diseases, and NIH's Division of Tropical Diseases were also merged into a new National Microbiological Institute in 1948, and the National Institute of Dental Research (NIDR) and Experimental Biology and Medicine Institute were authorized and established the same year. A year later, the National Institute of Mental Health (NIMH) was established, absorbing the NIH's existing Division of Mental Hygiene. In 1950, the Omnibus Medical Research Act (Pub. L. 81-692) authorized and established the National Institute of Neurological Diseases and Blindness (NINDB) and the National Institute of Arthritis and Metabolic Diseases (NIAMD), the latter absorbing the Experimental Biology and Medicine Institute; the act also empowered the Surgeon General to create new NIH institutes without congressional authorization. In 1955, the National Microbiological Institute was renamed the National Institute of Allergy and Infectious Diseases (NIAID) to reflect its growing scope of research into allergies and immunology. Along with new institutes, the NIH Center for Aging Research was established in 1957, the Center for Research in Child Health in 1961. In 1962, the Public Health Service Act amendment (Pub. L. 87-838) authorized and established the National Institute of Child Health and Human Development (NICHHD) and the National Institute of General Medical Sciences (NIGMS).

In step with his Great Society domestic program, President Lyndon Johnson was determined to apply scientific research to addressing social problems. During his administration, a Division of Environmental Health Sciences was established within the NIH in 1966, in response to growing concerns about pollution and the environment. The NIMH was also separated from the NIH and elevated to a bureau of the PHS in 1967 (it would eventually

[30]This overview is based in part on the NIH (2023) and the NIH Almanac Chronology of Events timeline as well as the primary sources cited below in this chapter.

be merged back into the NIH). In 1967, the NHI was renamed the National Heart and Lung Institute (NHLI) as the scope of its research program had expanded; sickle cell anemia was another area of growing concern at the time, designated to the jurisdiction of the NHLI, which was soon renamed the National Heart, Lung, and Blood Institute (NHLBI) in 1976. A new National Eye Institute (NEI) was split off from the research programs of the NINDB, which was simultaneously renamed the National Institute of Neurological Diseases (NIND). There were a total of 15 NIH institutes by 1970. President Richard Nixon declared a "war on cancer," the second leading cause of U.S. deaths at the time, and pushed for legislation to increase cancer research and health care; the resulting National Cancer Act of 1971 (Pub. L. 92-216) vastly increased federal resources for cancer research, and directed the NCI to establish 15 cancer research, training, and demonstration facilities across the country (there are currently 71 NCI Cancer Centers). Substance abuse and mental health research also emerged as top public health priorities in the early 1970s, leading to the creation of the National Institute on Alcohol Abuse and Alcoholism (NIAAA) and the National Institute on Drug Abuse (NIDA). In 1973, the NIMH, NIAAA, and NIDA were reorganized under the umbrella of the new Alcohol, Drug Abuse, and Mental Health Administration (ADAMHA), a separate PHS bureau with its own appropriations, but which we treat as part of the NIH for consistency (the NIMH, NIAAA, and NIDA were reorganized back under the umbrella of the NIH in the early 1990s). Hand in hand with new concerns about mental health, particularly dementia and Alzheimer's disease, was growing concern about the health of the elderly, and in 1974, the National Institute on Aging (NIA) was established, building from the Center for Aging Research. As concerns grew about sickle cell anemia and other blood diseases, the NHLI was renamed the National Heart, Lung, and Blood Institute (NHLBI) in 1976. As diabetes became a growing public health concern, the National Institute of Arthritis, Metabolic, and Digestive Diseases was renamed the National Institute of Arthritis, Diabetes, and Digestive and Kidney Diseases (NIADDK) in 1981; five years later, the NIADDK was split into a National Institute of Arthritis and Musculoskeletal and Skin Diseases (NIAMS) and National Institute of Diabetes and Digestive and Kidney Diseases (NIDDK).

Priorities for health research began shifting as the Cold War drew to a close, as did the funding landscape. After initially being dismissive of the human immunodeficiency virus (HIV)/acquired immunodeficiency syndrome (AIDS) epidemic, the Reagan administration prioritized large increases in NIH funding for HIV/AIDS research in the late 1980s. The National Center for Human Genome Research (NCHGR) was established in 1989 and the Human Genome Project, intended to map and sequence human DNA, was launched in 1990 after half a decade of planning; the multinational research project was spearheaded and largely funded by the NIH and DOE. Before long, the NCHGR was elevated to institute status and renamed the National Human Genome Research Institute (NHGRI) in 1997. The Cold War "peace dividend" from reduced defense spending helped increase the NIH's budget under President George H.W. Bush, but the Clinton administration's early pivot to deficit reduction then led to real NIH funding holding relatively flat in the mid-1990s. That abruptly changed in the late 1990s, when the U.S. Senate made a bipartisan commitment to double the NIH's budget in the five years between FY1998-2003; the successes of the Human Genome Project were perceived as breaking open a new era of biomedical research and innovation in medicine, and the Clinton administration was also supportive of significantly expanding the NIH's budget in the moment, instead pledging to increase it by 50% over five years. The U.S. Senate successfully prioritized increasing the NIH's budget by roughly 15% or more for five straight years, aided in part by newly elected President George W.

Bush joining their cause. The Bush administration also pushed for significant increases in NIH funding for bioterrorism research and anthrax vaccine development following the 9/11 terrorist attacks and the 2001 anthrax attacks. In 2003, the Human Genome Project was successfully concluded two years ahead of schedule and below cost, having finished a "first draft" from sequencing three billion DNA letters. The NIH's budget was indeed doubled over FY1998-2003. After this deliberately rapid growth in NIH funding, appropriations for NIH remained fairly stable in real terms for the following five years, none of which are significant policy event years.

Mirroring national politics, NIH funding has been unusually volatile since the onset of the Great Recession. The Obama administration secured a record-breaking $10 billion increase in NIH funding included in ARRA; the administration viewed this increase as a down-payment on sustained increases in NIH funding, but the ensuing pivot to deficit reduction precluded such plans. The reversal of ARRA's NIH funding increase, partisan budget fights, and the 2011 debt ceiling crisis all resulted in the NIH budget continuously falling in real terms over FY2010-2013, the longest such streak in the postwar era. But the BCA that had resolved the 2011 debt ceiling crisis proved deeply unpopular, and Congress repeatedly found bipartisan resolve to ease up on those discretionary spending caps and sequestration budget cuts, enabling a renewal of significant real growth in the NIH's budget over FY2016-2018. Congress passed the 21st Century Cures Act on a sweeping bipartisan basis in 2016, an authorization that turbocharged NIH research initiatives in cancer, precision medicine, and neurology, among other areas; renewed bipartisan support for increasing NIH appropriations followed suit in both houses of Congress, overcoming opposition from the Trump administration.

In its early years, annual appropriations for NIH research were made through the Labor-Federal Security appropriations bills, as the PHS—and within it the NIH—had been part of the Federal Security Agency (FSA). The FSA was disbanded and replaced by a newly established U.S. Department of Health, Education, and Welfare (HEW) in 1953, and the PHS and NIH were absorbed into the new cabinet-level department; annual NIH appropriations were then made through the Departments of Labor, and Health, Education, and Welfare appropriations bills. In 1979, the education functions of HEW were transferred to the newly created Department of Education, and the remaining functions were renamed the U.S. Department of Health and Human Services (HHS); since then, annual NIH appropriations have been made through the Departments of Labor, Health and Human Services, and Education, and Related Agencies appropriations bills. While the vast majority of federal funding for health and biomedical research has been funded by the NIH (or related agencies later absorbed into the NIH), complementary funding has at times been channeled through other agencies covered in this narrative analysis, e.g., cancer research funding in part channeled through the AEC or the National Naval Medical Center and human genome project funding in part channeled through DOE's national laboratories. We ignore health and biomedical research funded by other agencies within the PHS, HEW, or HHS that have never been associated with the NIH, such as the Centers for Disease Control or Food and Drug Administration, because of their relatively limited role in funding health research.

NIH R&D Appropriations for FY1948

Bill: Labor-Federal Security Appropriation Act, 1948

Public Law: 80-165 **Enacted:** July 8, 1947 **Effective:** July 8, 1947

Nominal change		Real change		Classification
Millions ($)	YOY%	Millions ($2012)	YOY%	
$16.6	205.0%	$95.8	186.5%	Exogenous

Congress appropriated significant increases in both nominal and real NIH research funding for FY1948, largely motivated by long-run public health concerns, notably heart disease and cancer. President Truman was highly supportive of Vannevar Bush's push to increase civilian basic research programs and scientific training, as evidenced by his support of creating the NSF, and his FY1948 budget message underscored that federal investments in new frontiers of science and technology were key for improving living standards, fueling economic growth, and complementing investments of the private sector. Top health policy priorities of the Truman administration included increased funding for new research grant programs studying cancer and mental health; the administration requested a significant $2.9 million (47%) increase for NIH operating expenses and a $5.5 million (318%) increase in funding for the NCI, both over FY1947 funding levels. The House Appropriations Committee recommended the full budget request for the NIH, noting that it was "doing a very commendable job," and for its allowance proposed $6 million in additional NCI funding over the budget request, noting that cancer had risen to become the second highest cause of death. The Senate Appropriations Committee was skeptical that such a large increase for the NCI was prudent before a "more comprehensive plan" was worked out, and significantly trimmed the House allowance but still modestly added to the budget request; the Senate committee also recommended an additional $500,000 increase for NIH operating expenses in their allowance. The conference committee split the difference between the House and Senate allowances for the NCI, providing $14.5 million for FY1948, resulting in a highly significant increase in NIH health research funding for the year. Nevertheless, the American Cancer Association had been lobbying for a larger increase in federal support, noting that cancer would kill nearly 190,000 Americans that year, and was critical of the more modest appropriation enacted. The increases in NIH research funding appear to have been motivated by long-run public health concerns and unrelated to any short-run macroeconomic prerogatives, such as concerns about inflation or unemployment. As such, we classify this policy event as exogenous. Most pertinent narrative evidence:

- "It has always been the Government's duty to provide whatever assistance is required to afford private enterprise a chance to prosper... Today, our great new frontiers are in river-valley developments, in air transport, in new scientific discoveries, and in the application of new science and technology to human progress. These new frontiers can be developed only with the cooperation of Government and private enterprise. Our expenditures on developmental projects are a good investment for the Government. They increase the productive power of the country and make for higher living standards... We cannot risk retarding our growth by lack of roads, electric power, air-navigation facilities, engineering data, maps, education, surveys of resources, weather reports, protection against disease, or any other necessary instrument of progress. There is a multitude of Government activities which the whole Nation takes for granted and on which our prosperity depends." (Budget Message of the President, FY1948, January 3, 1947, p. M10)
- "Many agencies of the Federal Government carry on research as a part of their regular programs. But we need a central agency to correlate and encourage the research activities of the country. While freedom of inquiry must be preserved, the Federal Government should accept responsibility for fostering the flow of scientific knowledge

and developing scientific talent in our youth. To accomplish this, I recommend again that a National Science Foundation or its equivalent be established." (Ibid, p. M33)

- "The [PHS] promotes the development of research in two ways: Through research carried on by the [PHS] itself, mainly at the [NIH] and the [NCI] (to which will be added, when facilities are constructed, the [NIMH]); and through research grants-in-aid to universities, scholars, and various other recipients other than the [PHS]. Experience with Federal aid to research during the war indicates that this is a highly desirable channel for the expenditure of Federal funds for this purpose. In 1948, a total of $10,500,000 is recommended for research grants-in-aid for the [NIH, NCI], and for mental health activities, compared with a little over $3,500,000 appropriated in 1947. Funds for direct research operations of the [NIH, NCI, and NIMH] total $6,200,000 in 1948, compared with approximately $4,500,000 estimated to be available in 1947. In connection with research activities, the [PHS] engages in the manufacture of vaccines for certain diseases, particularly yellow fever, typhus, and Rocky Mountain spotted fever, and in the control of the manufacture and sale of viruses, serums, toxins, and similar products." (Budget of the United States, FY1948, p. 162)
- "The [House Appropriations] committee has granted the full amount of the budget estimate of $9,126,000 for [NIH operating expenses], representing an increase of $2,923,303 above the comparable 1947 amount. The increase includes $1,947,000 for research grants, which will bring the total for this category up to $5,100,000... the committee has approved the full amount of the budget estimate because of its intense interest in the health problems of the country and in the conviction that the institute is doing a very commendable job" (H. Rpt. 80-178, March 21, 1947, p. 25)
- "The [House] committee had before it a budget estimate of $7,169,000 for operating expenses of the [NCI]. This amount represented an increase of $5,454,592 above the comparable amount for 1947, the largest part of the increase being for grants-in-aid to qualified research workers in the various research institutions throughout the country. The $7,169,000 estimate consists of $5,000,000 for research grants, $500,000 for research fellowships and trainees, and $1,669,000 for direct use by the Institute in its research work. The committee has given a great deal of consideration to the question of the amount of public funds that could be wisely and effectively utilized during the next fiscal year in the cancer research program. Because of the tremendous interest on the part of Congress in this vital problem, it has deemed it advisable to bring together under this heading all funds included in the bill for work on cancer... These sums added to the $7,169,000 estimate bring the total to $11,328,291, to which the committee has added $6,000,000 bringing the total recommended to $17,328,200... The committee hopes and believes that its recommendation to exceed the budget in order more adequately to provide for work on the cancer problem will be given full support by Congress. The importance of greatly enlarging the resources devoted to this work is emphasized by the simple reminder that in the last 30 years, cancer has risen from seventh to second place as the chief cause of death." (Ibid, p. 26)
- "The [Senate Appropriations] committee recommends an increase of $500,000 for operating expenses of the [NIH], to provide a total of $9,626,000. Of this total amount, the committee recommends earmarking $1,000,000 to provide through grants-in-aid for a clinical and laboratory research program in tuberculosis therapy involving the use of streptomycin... The committee recommends a reduction of $5,328,200 from the large increase granted by the House in the amount provided for salaries and expenses for

the [NCI]. The appropriations available last year were $1,714,408; the budget estimate requested $7,169,000, and the House committee transferred $4,159,291 from other budget items, in addition to a large increase over the budget estimate, resulting in a total amount of $17,328,200, Statements made before the committee revealed that other funds and services are being provided from private sources, and the committee believes a more comprehensive plan should be worked out before adding any largo sums to this important work. The committee is convinced that the $12,000,000 recommended is adequate provision for 1948." (S. Rpt. 80-146, April 21, 1947, pp. 5-6)

- "The conferees agreed upon $14,500,000 for cancer research, as against $17 million provided by the House and $12 million by the Senate. A million dollars was designated for research in the use of streptomycin." ("Labor-Federal Security Appropriation," *CQ Almanac 1947*, 3rd ed., 03-399-03-400. Washington, DC: Congressional Quarterly, 1948)
- "Government appropriations and private donations to the fight against cancer reached a record high of $31,000,000 in the last year but, "measured against the job that must be done, present private and Government funds are still inadequate." This was asserted yesterday by Douglas Poteat, executive vice president of the American Cancer Society... The Government this year has appropriated $14,000,000 to the [NCI] for cancer control and research and $5,000,000 additional to the [AEC] for similar purposes... "Cancer is killing about 188,000 Americans this year," he said... "It is second only to heart and circulatory conditions as the nation's most lethal diseases." ("U.S. Cancer Funds Held Inadequate," October 28, 1947, *New York Times*)

NIH R&D Appropriations for FY1949

Bill: Labor-Federal Security Appropriation Act, 1949

Public Law: 80-639 **Enacted:** June 14, 1948 **Effective:** July 1, 1948

Nominal change		Real change		Classification
Millions ($)	YOY%	Millions ($2012)	YOY%	
$3.9	15.9%	$19.8	13.5%	Exogenous

Congress appropriated significant increases in both nominal and real NIH research funding for FY1949, largely motivated by long-run public health concerns, notably heart disease and cancer. President Truman was highly supportive of Vannevar Bush's push to increase civilian basic research programs and scientific training, as evidenced by his support of creating the NSF, and top health policy priorities of the administration included increased funding for new research grant programs studying mental health and cancer. The administration also requested increased funds for the construction of a new NIH clinical research hospital that was to research cancer and cardiovascular disease. The House Appropriations Committee readily approved the entirety of the administration's requested increase in NIH funding and added further funding for ulcer research; the committee also emphasized that recently increased and sustained cancer research funding was an "absolute necessity for making a concerted attack on a problem which ranks second among the leading causes of death." Just days before the appropriations bill was enacted, Congress also passed the National Heart Act (Pub. L. 80-655) and the Dental Research Act (Pub. L. 80-755), which established the National Heart Institute and National Institute of Dental Research, respectively. The increases in NIH research funding appear to have been motivated by long-run

public health concerns and unrelated to any short-run macroeconomic prerogatives, such as concerns about inflation or unemployment. As such, we classify this policy event as exogenous. Most pertinent narrative evidence:

- "The Budget estimates also assume the creation of a National Science Foundation. In the Budget Message last year, I recommended the establishment of an agency to encourage fundamental scientific research. Congress passed a bill to create [the NSF], but the bill included unacceptable administrative provisions and I was obliged to disapprove it. I hope that Congress in this session will pass a bill for this purpose in keeping with the principles of responsible and efficient administration... " (Budget Message of the President, FY1949, January 6, 1948, pp. M34)
- "Appropriations for research and training under the [NIH, NCI, and NIMH] (the last constituting a part of the mental health activities appropriation) provide both for direct Federal research and for grants-in-aid to universities, scholars, and other recipients. Grant funds are used for research and training purposes, including fellowships. About twice as much money will be obligated in 1949 for grants as will be obligated for direct Federal research. During the past year the research grant program was established on a major scale and research activities conducted directly by the [PHS] were increased in recognition of the importance of research in the field of medicine. In the current fiscal year 1948, further expansion of both intramural research and research grants are accompanied by the inauguration of a research grant program in mental health and by the development of grants for training of medical and scientific personnel in mental health and in cancer. Some additional expansion of these programs in research and training is provided in 1949. Following an initial appropriation in 1948 for the purchase of the site and preparation of plans for a clinical research hospital for general medical research, including cancer and cardiovascular diseases, and a similar appropriation for a National Mental Health Institute, the 1949 estimates provide under "Construction of research facilities" for the initiation of construction work on a single combined project to be undertaken for the [PHS]" (Budget of the United States, FY1949, pp. 165-166)
- "The budget estimate of $13,570,000 for [the NIH] embraces an overall increase of $2,567,125 which the [House Appropriations] committee has unhesitatingly approved in full, and added $100,000 to provide for some expansion of research in peptic ulcer. In addition to providing for direct research by the institute in a host of special medical fields, the estimate includes $7,682,000 for research grants-in-aid to support a greater quantity and a better quality of research in the medical and allied fields through individual scientists in universities, hospitals, laboratories, and clinics. A total of $400,000, or $250,000 more than for the current year, is earmarked in the estimate for research fellowship grants in order to enlarge the supply of trained research personnel... The budget estimate for all work in the field of cancer research and control amounts to $14,000,000, which is identical with the amount available for the current fiscal year... in the 1948 bill, the [House] committee recommended, and the Congress approved a very substantial increase in the appropriation for cancer work in recognition of the absolute necessity for making a concerted attack on a problem which ranks second among the leading causes of death." (H. Rpt. 80-15-19, March 5, 1948, pp. 27-28)
- "The House today passed the National Heart Act and the Dental Research Act, both of which would set up new institutes in the [PHS]. Both require further action by the Senate, which has passed a heart research bill but in a different form. It has not acted on the dental health bill. Health service institutes already set up include research in

cancer, mental health, venereal diseases and tuberculosis." ("Two Health Acts Passed," *New York Times*, June 9, 1948)

- "Under the National Heart Act—Public Law No. 655—Congress established a program comparable to that administered by the [PHS] in the fields of cancer and mental health. The law authorized the Surgeon General to conduct research on the diagnosis and treatment of heart diseases and to coordinate research and experiments of other groups, make grants-in-aid for research projects, and establish an information center. In addition to establishing a [NHI] within the [PHS], the law also created a National Advisory Heart Council" ("Health," *CQ Almanac 1948*, 4th ed., 151-53. Washington, DC: Congressional Quarterly, 1949)
- "The Dental Research Act—Public Law No. 755—followed the pattern of other disease-research legislation. It authorized research projects, grants-in-aid, and collection of information on studies made here and abroad. The Surgeon General was authorized to cooperate with state health agencies in the prevention and control of dental diseases. A National Advisory Dental Research Council, similar to the Heart Council, was established to advise the Surgeon General. In addition, the Act authorized the expenditure of up to $2 million for buildings and facilities for the National Institute of Dental Research in or near Washington." (Ibid)

NIH R&D Appropriations for FY1950

Bill: Labor-Federal Security Appropriation Act, 1950

Public Law: 81-141 **Enacted:** June 29, 1949 **Effective:** July 1, 1949

Nominal change		Real change		Classification
Millions ($)	YOY%	Millions ($2012)	YOY%	
$24.2	84.7%	$140.3	84.0%	Exogenous

Congress again appropriated significant increases in both nominal and real NIH research funding for FY1950, largely motivated by long-run public health concerns and a post-war pivot to prioritizing civilian basic research efforts. Mental health and cancer research programs remained top health policy priorities of the Truman administration, which also requested funding for the newly established NHI and NIDR, authorized a year earlier; in his budget message, President Truman argued that expanding NIH research funding and facilities would greatly benefit the "health and longevity of our people." The House Appropriations Committee again readily approved the entirety of the administration's requested increase in NCI funding and added further funding for research grants, noting that more funding was needed for cancer research to "move forward at a more optimum rate." The committee approved $7.7 million for the new NHI, nearly double the administration's "wholly inadequate" $4 million request, arguing that cardiovascular research "has been sadly neglected." The Senate committee concurred with that sentiment, adding an additional $1 million for the NHI in their allowance, while also increasing grant funding for ulcer research and cancer research. Shortly after the appropriations committees reported their respective bills, President Truman delivered a special address to Congress on the nation's health needs and implored the need to "add to the program of medical research through new scientific techniques." The increases in NIH research funding appear to have been motivated by long-run public health concerns and unrelated to any short-run macroeconomic prerogatives, such as concerns about inflation or unemployment. As such, we classify this policy event as exogenous. Most pertinent narrative evidence:

- "Funds are included for the necessary strengthening of our economy through the development and conservation of the Nation's productive resources. Increased emphasis is placed on the provision of badly needed measures to promote the education, health, and security of our people... New facilities for medical and related research to be carried on directly by the [PHS] are in the process of construction. As these are completed and staffed, we shall achieve a substantial expansion of specialized types of research which will contribute significantly to the health and longevity of our people." (Budget Message of the President, FY1950, January 3, 1949, p. M5, M37)
- "The estimates relating to research and training provide for continued activities of the [NIH, NCI, and NIMH]. They also provide, for the first time in the annual budget, for the [NHI] and [NIDR] established pursuant to the National Heart Act and the National Dental Research Act. Activities include direct Federal research and grants-in-aid to universities and other institutions and to individuals for research and training purposes. Rapid expansion of research and training activities has occurred in the past few years and is continued in the current year. The estimates for 1950 contemplate generally that the established activities will continue at 1949 levels, and provide some increases for the newer heart and dental programs. Limited contract authority for forward financing of research grants extending beyond the fiscal year is included. Substantial progress will be made during the current year in the early phases of construction of the clinical research hospital begun under funds and contract authority granted in 1948 and 1949 appropriations." (Budget of the United States, FY1950, pp. 167-168)
- "The [House Appropriations] committee considered a [NCI] budget estimate of $16,100,000 direct appropriation and $900,000 contract authority for limited forward financing of research project grants which compare with 1949 amounts of $14,180,000 direct appropriation and $8,000,000 contract authorization... The committee has carefully reviewed the budget proposal... [and] has concluded it to be essential to exceed the budget recommendation if the total effort directed at the cause and cure of cancer is to move forward at a more optimum rate... It is said that cancer is one of the most difficult and challenging problems in medicine.. It stands second on the list of causes of death and has ranked in that position for many tears. Through the cooperative efforts of [PHS], the [AEC], and voluntary organizations such as the American Cancer Society, the fight against cancer has assumed the proportions of a mass attack which must be adequately sustained and supported." (H. Rpt. 81-228, March 8, 1949, pp. 18-19)
- "The [House] committee had before it for consideration a total budget request of $4,630,000 for implementing the provisions of the National Heart Act of June 16, 1948, which provides for a program of research, training, and control activities relating to cardiovascular disease comparable to that of the National Cancer and Mental Health Acts... This field of research has been sadly neglected and ranks at the top in terms of the need for vigorous support. While the budget estimate provides some increase, it is comparatively small and in the committee's opinion wholly inadequate. Accordingly, the committee is recommending a total of $11,575,000, of which $7,725,000 is direct appropriation..." (Ibid, p. 20)
- "The [Senate Appropriations] committee recommends an increase of $225,000 in the operating expenses for the [NIH], to provide the full amount of the supplemental estimate requested in the Senate Document No. 34, for funds for the production, storage, and distribution of a yellow-fever vaccine. The committee also recommends an increase of $50,000 in the operating expenses of the Institutes to provide an additional

amount for research grants and fellowships to be used in gastroenterology on peptic ulcer research. The committee understands that $150,000 is included in the estimates as allowed by the house for this purpose and that the $50,000 increase recommended will provide a total amount of $200,000 for peptic ulcer research. The committee recommends an increase of $627,000 in the funds for the [NCI]... The committee recommends an increase of $1,000,000 in the research grants for the [NHI], to provide for a total of $3,300,000 for that purpose. In recommending the additional amount for research grants, the committee agrees with the House committee that this field of research has been sadly neglected and ranks at the top in terms of the need for vigorous support." (S. Rpt. 81-265, April 11, 1949, p. 6)

- "The [House] Committee cited several items on which they had exceeded budget estimates. Among them were sums for the [NHI], mental health activities, and the [NCI]... The Senate took up consideration of the bill on April 26... Another proposal by several [Senate] Democrats to increase funds for the [NCI] was approved April 27 after an impassioned appeal by Matthew M. Neely (D-WV)—"We are quibbling over the question of increasing the totally inadequate appropriation provided by the bill to $37,000,000, with which to combat a more aggressive, relentless and deadly foe than ever fought us at home or abroad on any field of battle"... A proposal was also accepted to add $7.7 million for the [NHI]" ("Labor—Federal Security Agency," *CQ Almanac 1949*, 5th ed., 03-215-03-218. Washington, DC: Congressional Quarterly, 1950)
- "Another essential step, if we are to continue to improve our medical care system, is to continue to improve our medical research as more facilities and scientific personnel become available. The Government is already contributing substantially to the advancement of medical knowledge by conferring fellowships for research in many specialized fields, providing grants for research by public and non-profit agencies, and through its own research activities. We must keep alert to every opportunity to add to the program of medical research through new scientific techniques, such as the use of the products of atomic energy, and through the wise and balanced expansion of research into diseases that have not so far been conquered" Harry S. Truman, Special Message to the Congress on the Nation's Health Needs, April 22, 1949 (*The American Presidency Project*, by Gerhard Peters and John T. Woolley, https://www.presidency.ucsb.edu/node/230191)
- "The [PHS] announced $3,250,000 in grants today to aid nine institutions build cancer research facilities... Dr. Leonard A Scheele, Surgeon General, approved the grants made by the [NCI]. "These grants will tend to strengthen the medical schools, by forging a closer link between medical research and medical education," said Dr. Scheele. "Our chief aim in making grants is to further cancer research by helping provide more adequate facilities for cancer investigators but the strengthening of medical education, especially in regard to the cancer training of future physicians, is an important by-product." ("$3,250,000 Granted for Cancer Study," *New York Times*, September 19, 1949)

NIH R&D Appropriations for FY1951

Bill: General Appropriation Act, 1951

Public Law: 81-759 **Enacted:** September 6, 1950 **Effective:** September 6, 1950

Nominal change		Real change		Classification
Millions ($)	YOY%	Millions ($2012)	YOY%	
$12.0	22.8%	$47.7	15.5%	Exogenous

Congress again appropriated significant increases in both nominal and real NIH research funding for FY1951, again motivated by long-run public health concerns and a post-war pivot to prioritizing civilian basic research efforts. The Truman administration requested significant increases for NIH research, placing particular emphasis on cardiac health and arthritis research in the FY1951 budget request. In keeping with recent trends, the House Appropriations Committee readily approved the administration's entire budget request for health research institutes—including a $3.3 million increase for the NHI—and added $2.5 million in additional funding for research grants relayed to developing drugs from the recently discovered adrenocorticotropic hormone and cortisone. The Senate Appropriations Committee also approved significant increases in funding for the NIH, NCI, NHI, and NIMH over their respective budget requests, resulting in large net increases in the conference bill. The increases in NIH appropriations appear to have been motivated by long-run public health concerns and unrelated to any concerns about unemployment or other short-run macroeconomic prerogatives. As such, we classify this policy event as exogenous. Most pertinent narrative evidence:

- "the Budget proposes total funds of 2.1 billion dollars for social welfare, health, and security, and 434 million dollars for education and general research, about one-sixteenth of total Federal expenditures. These, too, are investments in the future of our country... The direct research activities of the [PHS] and the grants to individuals and institutions for research, teaching, and training, will require an estimated 47 million dollars in 1951, a moderate increase over 1950. No provision is made in this Budget for further expansion of [PHS] grants to medical schools for undergraduate teaching and for construction of additional research facilities" (Budget Message of the President, FY1951, January 3, 1950, pp. M12, M46)
- "Operating Expenses, [NIH]: The purpose of the activities financed from this appropriation is to foster and conduct research in fundamental problems in microbiology, communicable diseases, community health, pathology and pharmacology, physiology, biochemistry and nutrition, chemistry and chemotherapy, physical biology, and other fields... The 1951 estimate contemplates expansion of studies of the causes and possible cures for the crippling diseases of the bones and joints, with particular emphasis on rheumatoid arthritis, including research in cortisone, ACTH, and related compounds. Proposed increases are partially offset by the discontinuation of yellow fever vaccine production by 1951." (Budget of the United States, FY1951, p. 232)
- "For operating expenses of the [NIH] the committee has adopted the budget estimate of $13,250,000 and, in addition, has added $2,500,000 to the $1,100,000 increase set out in the budget for grants for research exclusively in the new field of medicine opened up by the development of adrenocorticotropic hormone, commonly referred to as ACTH, and cortisone, usually referred to as compound E, including compounds related to these two new drugs. All manner of basic medical research is financed under this item. The relatively recent development of the new drugs ACTH and compound E opened up a whole new field of medicine. The Director of the Institute stated that in his opinion the development of these two drugs has placed in the hands of medical research tools with possibilities even greater and wider in scope than developments made possible by Pasteur in the field of bacteriology." (H. Rpt. 81-1797, March 21, 1950, pp. 99-100)

- "Notwithstanding the urgent need for economy, the committee has not imposed any reduction against the budget estimate of $20,086,000 for work in the field of cancer. The overall program is provided for at the current level except for the omission of further provision of contract authority for grants for the construction of research facilities... As in the case of the programs for cancer and mental health, the committee recommends approval of the full budget estimate of $14,150,000 [for the NHI], an increase of $3,338,500 over the corresponding 1950 appropriation. Diseases of the heart and circulatory system for many years have headed the national list of causes of death." (Ibid, pp. 100-101)
- "The [Senate Appropriations] committee recommends for the [PHS] appropriations totaling $270,779,030, which is an increase of $70,920,679 over 1950 appropriations, a decrease of $32,748,870 below the budget estimates, and an increase of $1,306,000 over the amounts allowed by the House. The principal items of increase, in comparison with 1950 appropriations, are $60,000,000 for liquidation cash for the hospital, construction program, and $11,000,000 for the [NIH, NCI, NHI], and mental health activities... The [PHS] program, particularly that part of it dealing with cancer, heart disease, and mental health, is one with which the committee is in full accord, and the modest sums provided for the betterment of our health standards and to combat the ravages of diseases seem paltry in comparison with funds provided for other purposes." (S. Rpt. 81-1941, July 1, 1950, pp. 72-73)
- "[PHS] grants to finance 155 research projects costing a total of $4,708,766 were announced today by Oscar R. Ewing, Federal Security Administrator. The grants will be shared by 144 institutions in thirty-nine states... Projects include a study of the growth and aging of a selected group of persons from the prenatal period to death; radium treatment for the prevention of deafness; the investigation of an unidentified nutritional element that may turn out to be a new vitamin, and a study to determine whether the use of an artificial kidney may prevent death..." ("Medical Grants Made: Federal Funds Are Allotted for Health Research Projects," *New York Times*, September 21, 1950)

NIH R&D Appropriations for FY1952

Bill: Labor-Federal Security Appropriation Act, 1952

Public Law: 82-134 **Enacted:** August 31, 1951 **Effective:** August 31, 1951

Nominal change		Real change		Classification
Millions ($)	YOY%	Millions ($2012)	YOY%	
-$7.8	-12.1%	-$59.1	-16.6%	Endogenous

Congress reversed course and appropriated a significant decrease in both nominal and real NIH research funding for FY1952, entirely motivated by the Korean War and related resource pressures trumping long-run public health concerns; see "Department of Defense R&D Appropriations for FY1952" for more details. The administration's FY1952 budget request proposed "reductions in other expenditures, in order to divert a maximum of resources to the overriding requirements of national security." Reflecting the pivot in priorities, the House Appropriations Committee cut from the administration's budget requests for the NHI, NCI, NHI, and NIMH, instead of approving the entire request and then some, as it had been doing in recent years; the committee emphasized the need for more health

research funding, placing particular emphasis on cerebral palsy and multiple sclerosis, but wartime cuts to health research were deemed necessary "in light of the critical fiscal situation." Their Senate counterparts modestly restored some of the budget cuts from the House allowance, but also recommended less funding for health research than the administration had requested. In resolving differences over the Labor–Federal Security Agency appropriations bill, conferees settled on whichever House or Senate funding level was lower—also reflecting the budget-cutting imperative of the day. The decrease in NIH appropriations appears to have been largely motivated by short-run macroeconomic concerns about the wartime budget deficit and related inflationary pressures. As such, we classify this policy event as endogenous. Most pertinent narrative evidence:

- "In our drive to build up our defenses, we and the countries associated with us have a twofold goal—first, military forces strong enough to provide a powerful deterrent to those who may be contemplating new aggression; second, readiness for immediate mobilization of all our power if that becomes necessary. This Budget reflects our determination. First, it incorporates our expenditures for military purposes—to build swiftly an active force of highly trained men, equipped with the most modern weapons... Third, it embodies our Government programs for the expansion of productive capacity and the concentration of needed capacity on defense requirements—at the expense where necessary of normal civilian purposes. Fourth, it contains expenditures for programs that will maintain and develop our national strength over the long run, keeping in mind that the present emergency may be of long duration and we must therefore be prepared for crises in the more distant as well as in the immediate future. Fifth, it reflects reductions in other expenditures, in order to divert a maximum of resources to the overriding requirements of national security." (Budget Message of the President, FY1952, January 15, 1951, pp. M5-6)
- "When the American people resolved to undertake the defense program now underway, they also accepted the necessity for the increases in their taxes that the new level of expenditures requires... High taxes are indispensable to our successful mobilization. They are required to preserve confidence in the integrity of the Government's finances, to distribute the heavy financial costs of defense fairly among all the people, to reduce excessive demand for raw materials and industrial products required for national defense, and to choke off inflationary pressures. We cannot as a Nation buy a defense establishment of the size that is now being constructed and still as individuals expect to spend our money to the same degree as before for normal peacetime purposes... Bidding for manpower and materials, which pushes prices upward, begins as soon as procurement contracts to be paid from these authorizations are signed, even though expenditures may not take place for a year or more. Other positive stabilization measures, including allocations, and credit, price and wage controls, are essential to offset the inflationary pressures which are not reflected in the single figure of the budget deficit" (Ibid, p. M11)
- "The 82nd Congress, in its first session, appropriated a war-weighted $97,695,376,891, more money than had ever before been voted by a "peacetime" Congress... about $74 billion went directly to the military for the Korean war and the nation's new rearmament drive... Another $6 billion was provided for military aid to foreign nations. While the remaining $17 billion was appropriated to departments and agencies nominally having no military functions, the sum was loaded with items growing out of the costs of World War II and other wars, or indirectly bearing upon the buildup

of military potential in the country [including] appropriations for the maintenance of economic controls to support mobilization for military production and to prevent inflation... There was little disagreement anywhere in Congress about providing the military with the full amount of its budget requests. But one of the obstacles that delayed action on the year's appropriations bills was Congressional determination to reduce federal expenditures for non-military purposes. Government payrolls, it was agreed, were the best point of attack against civilian spending. But the House and Senate differed on methods of doing this." ("Summary," *CQ Almanac 1951*, 7th ed., 03-109-03-110. Washington, DC: Congressional Quarterly, 1952)

- "For all purposes and activities embraced by [the NIH], the budget estimate is $15,800,000. The [House] committee recommends $15,500,000, a reduction of $300,000. All manner of basic medical research is financed under this appropriation. The committee cut is applicable to the general category of research and training grants... Much more research is urgently needed to determine some of the answers with respect to cerebral palsy and multiple sclerosis. The facts in connection with these health problems—and the committee has had the benefit of the testimony of people expert in these fields—are persuasive justification for support of this research... The sum of $19,500,000 is recommended for all purposes under the [NCI] program, which is $447,000 less than the budget estimate of $19,947,000 and a net reduction of $386,000 below the current appropriation... For some years the committee has been very much interested in adequate and sustained support of this important program but has felt it necessary to make some savings in the expenditure proposals presented" (H. Rpt. 82-322, April 13, 1951, pp. 14-15)
- "For [the NIMH] the [House] committee recommends $10,300,000. This is $500,000 below the budget estimate, as follows: $250,000 against the liquidation cash item on the basis of information that this much will not be needed; $200,000 against the general category of research and training grants; $44,000 against direct research; and $6,000 against general administration... The sum of $10,000,000 is recommended for [the NHI], a reduction of $150,000 below the estimate and a net decrease of $4,554,400 below current funds... The committee's reduction consists of $91,000 against research and training grants and $59,000 against direct research. These committee reductions are without prejudice to the merits of the items, but it was felt necessary to show some retrenchment in light of the critical fiscal situation." (Ibid, pp. 15-16)
- "The [Senate Appropriations] committee recommends $15,559,973 [for the NIH], an increase of $59,973 over the House allowance and $240,027 under the budget estimate. The committee feels that none of the reduction should be applied against research and training, but should be taken out of administration and review and approval of research and training grants. The committee recommends $19,805,171 [for the NCI], $141,829 under the budget estimate, and an increase of $305,171 over the House allowance... The committee recommends $10,072,982 [for the NHI], $77,018 under the budget estimate, and $72,982 more than was allowed by the House. The additional allowance will permit the financing of continuing research projects and corollary work in direct research in the effort to attain advances in the detection and successful treatment of this primary cause of death." (S. Rpt. 82-386, June 6, 1951, pp. 7-8)
- "The Senate took up the [Labor-FSA] bill June 7, and promptly added numerous economy amendments... The major victory of the economy bloc came June 12 when the Senate approved by a 58 to 24 roll call a rider sponsored by [Senator] Ferguson

raising to 10 per cent the Committee-approved reduction in personal service items. [Senator] Cordon, who had worked out the five percent reduction plan in the Appropriations Committee, took the floor to oppose Ferguson's 10 percent cut. He said a five percent reduction was enough. On the other hand, Kenneth McKellar (D Tenn.), chairman of the Senate Appropriations Committee, opposed his own Committee which had approved the Cordon plan and spoke in support of Ferguson. "Let's cut these non-military bills as much as we can," he urged... Both Sens. Herbert H. Lehman (D-NY) and Matthew M. Neely (D-WV) tried to exempt from the personnel reduction a variety of public health activities including heart disease and cancer research. On June 12, the Senate voted against Lehman's proposal, 38 to 42. And on June 14, the Senate voted down Neely, 31 to 50." ("Labor-FSA," *CQ Almanac 1951*, 7th ed., 03-125-03-129. Washington, DC: Congressional Quarterly, 1952)

- "The total appropriation in the [Labor-FSA] conference bill was... below the amount appropriated by either House or Senate. This resulted because the conferees chose between the House and Senate appropriations on each item according to which figure was lower." (Ibid)
- "Medical science has won victory after victory over the deadliest diseases of a generation ago. During the first half of the 20th century, it is safe to say that we successfully conquered infectious diseases. Now, in the second half of the century, we are facing an even greater challenge—the battle against chronic diseases... Modern medicine must find ways of detecting these diseases in their early stages and stopping their destructive force. That will be the major work of this clinical research center. There could be no more useful expenditure of the taxpayers' funds... It will be the home of one of the greatest groups of scientists ever gathered together for basic and applied medical research. Basic research has been at the core of the great advances in medicine during the last half-century, and the scientists of the [PHS] have been at the forefront of this research. Scientists of the [PHS] were the first to discover that pellagra was caused by a dietary deficiency, and they devised the means for its prevention and cure. They found the cause of Rocky Mountain spotted fever and how to vaccinate against it. They developed the use of fluorides for the protection of teeth, opening the way to the major reduction of dental decay. Public health research workers right here at Bethesda developed a vaccine against typhus. Their vaccine has kept our forces in Korea free from typhus... Today there is a growing awareness that medical research needs support from the Federal Government, from State and local governments, and from industry, endowment funds, and private contributions. It will take support from all these sources to give us the rapid progress we need." Harry Truman, Address at the Dedication of the NIH Clinical Center, June 22, 1951 (*The American Presidency Project*, by Gerhard Peters and John T. Woolley, https://www.presidency.ucsb.edu/node/230211)

NIH R&D Appropriations for FY1954

Bill: Department of Labor and Health, Education, and Welfare Appropriation Act, 1954

Public Law: 83-170 **Enacted:** July 31, 1953 **Effective:** July 31, 1953

Nominal change		Real change		Classification
Millions ($)	YOY%	Millions ($2012)	YOY%	
$12.2	20.8%	$60.8	20.2%	Exogenous

Congress appropriated significant increases in both nominal and real NIH research funding for FY1954, motivated by long-run public health concerns and facilitated by the ongoing demobilization from the Korean War; see "Department of Defense R&D Appropriations for FY1954" for more details. The outgoing Truman administration had requested significantly increasing the NIH's budget to $85 million, a $26 billion (44%) increase over FY1953 funding levels. But in April 1953, the incoming Eisenhower administration revised down their request for NIH funding to $56.3 million, less than the appropriations enacted for FY1953. The House Appropriations Committee provided modestly more funding for NIH research activities save dental and microbiology research and prioritized a very substantial increase in research funding for the recently created NINDB. The Senate Appropriations Committee was concerned that existing NIH funding was inadequately balanced, noting that research efforts were still lacking for many important public health concerns, notably diabetes, multiple sclerosis, and muscular dystrophy; the committee approved for the NIH an additional $10.6 million over the House allowance and $15.8 million over the revised budget request. Conferees roughly split the difference between the higher Senate allowances and lower House allowances for the eight NIH appropriations accounts, save approving the Senate's full recommendation for the NIDR; the conference bill thus resulted in a large net increase over FY1953 NIH funding levels. Shortly before the FY1954 Labor-HEW appropriations bill was enacted, the new NIH Clinical Center welcomed its first research participants, who were enrolling in a cancer study; the massive research hospital had been under construction for several years, and opening its doors would now facilitate significantly more intramural research by the various NIH institutes. The increases in NIH research funding appear to have been motivated by long-run public health concerns and unrelated to any short-run macroeconomic prerogatives, such as concerns about inflation or unemployment. As such, we classify this policy event as exogenous. Most pertinent narrative evidence:

- "Federal expenditures for all public health programs—exclusive medical care for military personnel and veterans—are estimated at 309 million dollars in the FY1954. About half of this amount will be for grants-in-aid to State governments and local communities... Other expenditures are for the operation of [PHS] hospitals, for payments to medical schools and universities for medical research and training, and for clinical and laboratory research conducted by the Federal Government. This Budget also includes appropriations for grants administered by the [NIH] to private and public institutions for construction or major alteration of medical research facilities... Construction outlays for health research facilities are expected to drop by 11 million dollars with the completion of the clinical research center during the current year. These decreases will be partly offset by increases in expenditures for research." (Budget Message of the President, FY1954, January 9, 1953, p. M45)
- "A new cabinet position, the tenth, was created April 11, 1953, ten days after President Eisenhower had signed legislation (H J Res 223) approving the establishment of a Department of Health, Education and Welfare. The new Department took over, intact, the functions of the Federal Security Agency... Reorganization Plan No. 1, Mr. Eisenhower's first, proposed setting up the new Department... Efforts to consolidate the educational, health, and welfare activities of the government, and to bring those functions to the departmental level, extended over a number of years. In the 75th Congress the House and Senate both passed bills to create a department in the general welfare field, but differences never were resolved. " ("Health, Education, Welfare Department," *CQ Almanac 1953*, 9th ed., 08-288-08-290. Washington, DC: Congressional

Quarterly, 1954)

- "The [House] bill includes $61,586,200 in total for the [NIH]. This is a reduction of $23,413,800 from the original request, but $2,555,450 over the appropriations for 1953 and $5,246,200 over the revised budget presented to the committee by the Secretary on April 14, 1953. The committee in general agrees with the Bureau of the Budget and the Department in their contention, in revising the budget, that greater emphasis should be placed on research activities and less on the related activities, especially grants to states for detection, diagnosis, and other similar control activities... The action of the committee will provide increases for research in each of the institutes and a very substantial increase in the relatively new Institute for Neurological Diseases and Blindness." (H. Rpt. 83-426, May 15, 1953, p. 13)
- "In considering all the items constituting the budget of the [NIH], the [Senate Appropriations] committee acted on the basis of two general assumptions. First, the country can expect returns in the form of decreased suffering of its people and in decreased costs of medical care from an expanded medical research program. Second, testimony before the committee has indicated clearly that support for medical research provided by the federal government is not balanced. In general, there are fields—such as diabetes and the metabolic disease area multiple sclerosis, and muscular dystrophy in the neurological disease areas—that are relatively weakly supported. The committee hopes that increases in such areas may be more substantial during the next few years. The revised budget estimates for the eight appropriations accounts in the [NIH] totaled $56,340,000... The committee recommends a total of $72,153,000, an increase of $10,566,800, all of which is specifically allowed for grants for research and training, over the House allowance, and $15,813,000 over the revised estimates, an increase of 28 percent..." (S. Rpt. 83-478, June 27, 1953, p. 13)
- "The Federal Government's $64,000,000 Clinical Center, described as a revolutionary stride in medical research, was dedicated today. The fourteen-story building includes a 500-bed hospital section and 1,100 scientific laboratories. The center, which will be devoted to conquering such killers as cancer and heart disease, is in nearby Bethesda, Md. It will receive on Monday its first patients—eight women who are suffering from cancer. Dr. W. Henry Sebrell Jr., head of the [NIH], said the women "will be the best-studied patients in the world." "This center is not a hospital," he added. "You don't get in by just being sick. You don't get in for medical care. You get in only for research."" ("Revolutionary Center for Medical Research Dedicated," *New York Times*, July 3, 1953)

NIH R&D Appropriations for FY1955

Bill: Departments of Labor, and Health, Education, and Welfare Appropriation Act, 1955
Public Law: 83-472 **Enacted:** July 2, 1954 **Effective:** July 2, 1954

Nominal change		Real change		Classification
Millions ($)	YOY%	Millions ($2012)	YOY%	
$10.4	14.6%	$49.8	13.8%	Exogenous

Congress again appropriated significant increases in both nominal and real NIH research funding for FY1955, motivated by long-run public health concerns and recent successes of NIH medical research programs. The Eisenhower administration had requested $71,128,000

for the NIH in FY1955, almost exactly the same level as enacted for the previous year; the administration was trying to prioritize public health, among other domestic policy objectives, while simultaneously restraining federal spending and trying to cut taxes. As in the previous year, congressional appropriators were greater advocates of health research and considerably increased NIH funding levels relative to the administration's request. The House Appropriations Committee provided $2.3 million more funding for NIH research activities than requested, decrying and reversing "very shortsighted" budget cuts to several program areas, and again championing research efforts of the relatively new NINDB. The Senate Appropriations Committee was impressed with recent NIH-funded breakthroughs in areas such as epilepsy and cancer detection and treatment, and was excited about research being conducted at the new NIH Clinical Center; the committee was also concerned that a present shortage of medical scientists and researchers would impede adequate health research in years to come, and proposed a sizable $7.8 million increase in NIH funding over the House allowance. The conference committee settled on $81.3 million for the NIH budget accounts, exactly splitting the difference between the House and Senate allowances, resulting in a large net increase over FY1954 funding levels. The increases in NIH appropriations appear to have been motivated by long-run public health concerns and unrelated to any short-run macroeconomic prerogatives, such as concerns about inflation or unemployment. As such, we classify this policy event as exogenous. Most pertinent narrative evidence:

- "I submit herewith for the consideration of the Congress recommendations to improve the health of the American people... In addition, the [PHS] should be strengthened in its research activities. Through its [NIH], it maintains a steady attack against cancer, mental illness, heart diseases, dental problems, arthritis and metabolic diseases, blindness, and problems in microbiology and neurology" Dwight D. Eisenhower, Special Message to the Congress on the Health Needs of the American People, January 18, 1954 (*The American Presidency Project*, by Gerhard Peters and John T. Woolley, https://www.presidency.ucsb.edu/node/231983)
- "The budget contains provisions for legislative recommendations for expanding the coverage and increasing the benefits of our social security system; for promoting better housing conditions and more widespread home ownership in the Nation; for improving our system of education; for conserving our natural resources; for helping prevent the ravages of floods and soil erosion; for encouraging the expansion of adequate health and hospital care for our people; and for other constructive domestic purposes designed to strengthen the foundations of a stable and prosperous economy... I emphasize that this budget carries out the policy of this administration to move toward reduced taxes and reduced Government spending as rapidly as our national security and well-being will permit... This budget proposes that such progressive economic growth will be fostered by a continuing emphasis on efficiency and economy in Government, reduced Government expenditures, reduced taxes, and a reduced deficit" (Budget Message of the President, FY1955, January 21, 1954, pp. M5, M14)
- "During the past several years there has been a most remarkable growth in both the private and public support for medical research and for training medical research manpower. This upsurge in support has been producing a number of very important accomplishments, and many leaders in the field of medical research think that we are in a period when remarkable progress is possible... In our Neurological Institute... they have already, in the short months they have been in existence, made what appears to be an outstanding advancement in the treatment of epilepsy. The neurologists and

biochemists, doctors in the Institute, have discovered through research in the Clinical Center, and this research was made possible by the Clinical Center facilities, a compound known as glutamine which appears at the moment to offer very great promise in this disease... In the field of nerve regeneration we are making progress, also. You know it has always been thought that once a spinal cord or a nerve was injured or severed it was impossible for this nerve to regenerate. People have been permanently paralyzed because of this failure of regeneration. Some of the men at the [NIH] are securing evidence that indicates that under proper conditions there may be nerve regeneration... In the field of cancer, important progress is being made also in the disease center of the cervix. They are now able, with newly developed techniques, to make a very early diagnosis of this condition when it is in its very early state. This offers hope of removing this type of cancer long before it has spread or becomes inoperable. This technique of making the very early diagnosis when this change first starts in this organ offers great hope for saving the lives of many women with this disease. In the field of leukemia... progress is being made in developing new drugs from the chemotherapeutic approach that that offers more hope in this field. There is no cure for leukemia yet, but some of the drugs are now able to definitely prolong life... There have been some new X-ray techniques developed by which it is possible, using new very high voltage X-ray machines, to see cancers in places where they were not visible before by the older techniques." Dr. W.H. Sebrell, Jr., NIH Director, April 16, 1954 (Senate Hearings on Labor-HEW Appropriations, FY1955, pp. 938-939)

- "The [House Appropriations] bill includes $73,393,000, an increase of $2,265,000 above the request, and $2,240,000 above the amount appropriated for 1954... the increases above the budget estimates, recommended by the committee are, with one exception, to restore cuts. The committee would be the first to recommend reductions in these funds or the elimination of federal appropriations for these programs if it were shown that we can now prevent or cure these diseases, or that the incidence of these diseases is substantially declining. In all the voluminous testimony received by the committee, there was no indication that any of these things has happened. It was demonstrated that advances have been made in gaining a much better understanding of the problems involved, which should be a basis for greater advances in finding preventatives and cures for these dread diseases. To start cutting back, right at the time when the prospect for really great discoveries is the brightest, seems very shortsighted. A concrete example of what really great discoveries may be in the offing has apparently been produced by the Neurology and Blindness Institute" (H. Rpt. 83-1756, June 24, 1954, p. 10-11)
- "Upon consideration not only of this testimony but of the general development of medical research in this country, the [Senate Appropriations] committee reaffirms what it believes to be the general policy guides upon which decisions of Federal appropriations for this purpose should rest. These are (1) adequate support for promising scientific investigations relating to knowledge of disease that cannot be aided from other sources, and (2) expansion of the national pool of trained medical scientists to permit an expanded medical research effort in the future. The committee is convinced that the direct economic gains to the Nation—entirely apart from more important human considerations—are such that a further immediate strengthening of the Nation's medical research program is called for" (S. Rpt. 83-1623, June 24, 1954, p. 7)
- "The budget estimates for the eight appropriations accounts in the [NIH] totaled $71,128,000. The House allowed $77,393,000, a net increase of $6,265,000 over the

estimates. The [Senate] committee recommends a total of $85,143,000, an increase of $7,750,000 over the House allowance and $14,015,000 over the budget estimates. Of this increase, the committee allows a total increase of $420,000 to sustain adequate supporting services, including maintenance of high-quality review of grants... The committee has heard convincing testimony demonstrating that the shortages of scientific manpower may seriously hamper medical research in years to come unless action is taken now to train investigators for the future... The committee has taken a special interest in the Clinical Center and is gratified that research in progress there is so promising. In particular, the possibility that a means of preventing epilepsy may be in the offing was most encouraging. The committee trusts that progress toward development of the fully integrated clinical-laboratory research program for which the Clinical Center was constructed will continue" (Ibid, p. 7)

- "Senate-House conferees June 29 reported (H Rept. 1998) a compromise $1,975,198,261 Labor-Welfare money bill with the following recommendations... Appropriate $81,268,000 for the [NIH] instead of the $77,393,000 voted by the House and $85,143,000 proposed by the Senate... The House and Senate agreed to the conference report on June 30" ("Labor-Health, Education, Welfare." (*CQ Almanac 1954*, 10th ed., 03-163-03-165. Washington, DC: Congressional Quarterly, 1955)

NIH R&D Appropriations for FY1956

Bill: Departments of Labor, and Health, Education, and Welfare, and Related Agencies Appropriation Act, 1956

Public Law: 84-195 **Enacted:** August 1, 1955 **Effective:** August 1, 1955

Nominal change		Real change		Classification
Millions ($)	YOY%	Millions ($2012)	YOY%	
$17.4	21.4%	$74.3	18.1%	Exogenous

Congress again appropriated significant increases in both nominal and real NIH research funding for FY1956, motivated by long-run public health concerns, recent successes of NIH medical research programs, and concerns about scientific manpower for future research efforts. The Eisenhower administration requested $89.1 million in FY1956 appropriations for the NIH, an increase of $7.9 million (9.6%) over enacted FY1955 funding levels. President Eisenhower had taken a particular interest in public health and delivered a special address to Congress proposing to invest more in health research and the training of health care professionals and medical researchers, in order to address a "serious shortage" of related manpower; research and training efforts in mental health was a particularly high priority of the administration, as was research on the health effects of air and water pollution. The House Appropriations Committee approved the top-line budget request for the eight appropriations accounts comprising NIH funding at the time, with funding prioritized for the NIH Clinical Center and research efforts in the areas of mental health, neurological diseases, and blindness. Unlike their House counterparts, the Senate Appropriations Committee viewed the administration's budget request for the NIH as wholly inadequate and proposed a $23.1 million (26.0%) increase in NIH funding over the House-approved budget request for FY1956. The Senate committee was particularly impressed with recent NIH research breakthroughs and proposed significant funding increases for research in chemotherapy, cervical cancer, mental health, psychiatric disorders, and cardiovascular disease to maintain momentum in

these research areas. The conference committee settled on $97.6 million for the NIH budget, slightly closer to the administration's request than the higher Senate allowance, but nonetheless resulting in a significant net increase over FY1955 funding levels. The increases in NIH appropriations appear to have been motivated by long-run public health concerns and unrelated to concerns about unemployment or other short-run macroeconomic prerogatives. As such, we classify this policy event as exogenous. Most pertinent narrative evidence:

- "The health of our people is one of our most precious assets. Preventable sickness should be prevented; knowledge available to combat disease and disability should be fully used. Otherwise, we as a people are guilty not only of neglecting human suffering but also of wasting our national strength. Constant advances in medical care are not available to enough of our citizens. Clearly, our nation must do more to reduce the impact of accidents and disease... To reduce the gaps in these services, I shall propose: New measures to facilitate construction of needed health facilities and help reduce shortages of trained health personnel; Vigorous steps to combat the misery and national loss involved in mental illness; Improved services for crippled children and for maternal and child health; Better consumer protection under our existing pure food and drug laws; and, finally, Strengthened programs to combat the increasingly serious pollution of our rivers and streams and the growing problem of air pollution. These measures together constitute a comprehensive program holding rich promise for better health for all of our people" Dwight D. Eisenhower, State of the Union Address, January 6, 1955 (*The American Presidency Project*, by Gerhard Peters and John T. Woolley, https://www.presidency.ucsb.edu/node/233954)
- "In this budget, I recommend increased appropriations for certain activities, including health research and the training of health personnel, and basic scientific research... Significant items in the 29-million-dollar increase of expenditures over 1955 are for expansion of the research and training activities of the [NIH], including special emphasis on mental health; construction of more health facilities; an intensified attack on problems of air and water pollution; and strengthened enforcement of the food and drug laws." (Budget Message of the President, FY1956, January 21, 1955, pp. M52-53)
- "Because the strength of our nation is in its people, their good health is a proper national concern; healthy Americans live more rewarding, more productive and happier lives. Fortunately, the nation continues its advance in bettering the health of all its people. Deaths from infectious diseases have diminished. During the past year, important progress has been made in dealing with such diseases as rheumatic fever, high blood pressure, poliomyelitis, and tuberculosis. Intensified research has produced more knowledge than ever before about the scourges of heart disease and cancer... Recent advances do not, however, represent our full capacity to wage war on illness and disability throughout the land. As a nation, we are doing less than what now lies within our power to reduce the impact of disease. Many of our fellow Americans cannot afford to pay the costs of medical care when it is needed and are not protected by adequate health insurance. Too frequently the local hospitals, clinics, or nursing homes required for the prevention, diagnosis, and treatment of disease, particularly in rural areas, either do not exist or are badly out of date. Finally, there are critical shortages of the trained personnel required to study, prevent, treat, and control disease." Dwight D. Eisenhower, Special Message to the Congress Recommending a Health Program, January 31, 1955 (*The American Presidency Project*, by Gerhard Peters and John T. Woolley, https://www.presidency.ucsb.edu/node/233834)

- "President Eisenhower's health message to Congress last Thursday paralleled his recommendation discussed here last Sunday for increasing the Federal Government's investment in medical research. In it, he recommended that Congress authorize a five-year $250,000,000 Federal program to expand construction of medical research and teaching facilities. Such a program is needed, the President said, because 'physical facilities of medical research and teaching institutions are inadequate to meet the human needs of the nation.' Citing what he termed a 'serious shortage' in such specialized fields as psychiatry, pediatrics, and in physical medicine and rehabilitation, the President warned: 'The rate at which physicians are being graduated from the nation's medical schools is barely keeping pace with the increase in population.'" ("Investment in Health: II: Analysis of Eisenhower Request for 5-year medical research fund prospects for years ahead," by Howard A. Rusk, *New York Times*, January 29, 1956)
- "The Surgeon General has recently reported to me on the state and progress of the Nation's health, as he will report to this committee when he appears before it. There is much to be thankful for in the marked improvement shown in the statistics on mortality as they relate to certain of the dread diseases such as tuberculosis. As we progress in our fight for improved health and our search for cures and treatments for man's most serious diseases, we open up new areas in need of attack or reach a point in our knowledge where it becomes feasible to increase our efforts or to take a new approach... The program of the [NIH] accounts for $89,138,000, an increase over the current year of $7,870,000. This medical research program, conducted in the new clinical center and through grants to institutions throughout the United States, is at the forefront of the effort to find answers to the great medical enigmas of our time. The increase provides for an intensified effort in mental health, grants for research on water pollution, research grants for nurse utilization studies, and provision for the planned expansion of the clinical center activities." Oveta Culp Hobby, HEW Secretary, February 8, 1955 (House Hearings on Labor-HEW Appropriations, FY1956, p. 5)
- "The [House Appropriations] bill includes $89,138,000, the amount of the request and $7,870,000 above the amount appropriated for 1955... Almost half of the increase recommended is to enable the Institutes to carry forward their activities in 1956 at the same level that will be attained during 1955 with the increased funds appropriated last year, and to carry out the planned expansion to more nearly utilize the full capacity of the Clinical Center... The remainder of the increase is made up of several items. Under 'Operating expenses' there is an increase of $625,000 for grants for studies in the field of nurse utilization and preparation of nursing personnel. There is an increase of $250,000 in Mental health activities and $500,000 in Neurology and blindness activities for the research program, on retarded children. An increase of $250,000 over the amount requested is also provided for Neurology and blindness activities to activate an additional 26-bed unit in the Clinical Center." (H. Rpt. 84-228, March 18, 1955, pp. 13-14)
- "The [Senate Appropriations] committee recommends an increase of $4,072,000 [for the NCI] over the House allowance and directs that $3.5 million of this be applied to expand the base of the cooperative studies on chemotherapy and $500,000 for further demonstrations in the practical application of knowledge already available on cancer of the cervix in women. The committee was much impressed by the information brought to it on the problems presented by cancer of the cervix, the second most common cancer of women... The committee recommends an increase of $4,099,000 [for the

NIMH] over the house allowance. The committee continues to be impressed by the magnitude of the growing problems of the mentally ill which appear to be common in both the you and the old... The increase recommended by the committee should permit extensions of each of the major segments of the mental health program. The direct research should permit a more effective program on the study of drugs having pronounced effects on the central nervous system, on problems related to personality development, and on problems related to the interplay between organic diseases and personality disorders... The committee recommends a total of $23,800,000 in support of activities under this [NHI] appropriation, an increase of $6,622,000 above the budget request and the House allowance. Testimony this year showed that sound progress had been made in the more important areas of cardiac disability—that is, arteriosclerosis, hypertension, and rheumatic fever. Development in these fields would appear to be sufficiently far along that an advantage would be gained if sizable increases were granted in each area. Particularly impressive were the striking advances in the prevention of rheumatic fever and rheumatic heart disease... The committee is also interested in the progressive development of new medical agents which have an effect in the field of high blood pressure and in the progress of our understanding of the development and causes of hardening of the arteries" (S. Rpt. 84-410, May 2, 1955, pp. 19-21)

- "The Departments of Labor and Health, Education, and Welfare and Related Agencies Appropriation Act for fiscal 1956 carried a record grant for medical research at the [NIH]. Nearly a month elapsed while House and Senate conferees haggled over funds for medical research and hospital construction. They agreed finally on $97,573,000 for NIH and $111 million for hospital construction... including $5,125,000 for basic medical research; $24,828,000 for the [NCI]; $17,751,000 for mental health activities; $18,778,000 for the [NHI]; $2,136,000 for dental health activities; $10,740,000 for arthritis and metabolic disease activities; $7,580,000 for microbiology activities; and $9,861,000 for research on neurology and blindness... House conferees "were opposed to blanket increases" in funds for medical research "unless accompanied by new or augmented programs, since beyond a certain point, giving more money in itself does not necessarily buy more progress... More attention must be given to the development of a larger pool of trained scientists and to the creation of additional research facilities where they can work." ("Labor and H.E.W," *CQ Almanac 1955*, 11th ed., 232-35. Washington, DC: Congressional Quarterly, 1956)

NIH R&D Appropriations for FY1957

Bill: Departments of Labor, and Health, Education, and Welfare Appropriation Act, 1957
Public Law: 84-635 **Enacted:** June 29, 1956 **Effective:** July 1, 1956

Nominal change		Real change		Classification
Millions ($)	YOY%	Millions ($2012)	YOY%	
$79.3	80.5%	$367.7	75.7%	Exogenous

Congress again appropriated significant increases in both nominal and real NIH research funding for FY1957, motivated by long-run public health concerns, recent successes of NIH medical research programs, and concerns about scientific manpower for future research efforts. The Eisenhower administration requested $126.5 million in FY1957 appropriations for the NIH, an increase of $27.5 million (29%) over enacted FY1956 funding levels. President

Eisenhower remained keen on investing more heavily in medical research, research facilities, and training of research scientists to address a "shortage" of manpower needed for future health research efforts. The significant increase in NIH funding proposed in the FY1957 budget request was, however, deemed wholly inadequate by the appropriators, particularly those in the Senate. The House Appropriations Committee's allowance for the NIH added $10 million above and beyond the budget request, roughly $4 million of which was for promoting the training of scientific manpower and the other $6 million for research grants, with particular emphasis on research in the areas of cancer, mental health, microbiology, cardiovascular and metabolic diseases, and dentistry. In their subsequent bill, the Senate Appropriations Committee approved $48.9 million more than their House counterparts, for a net increase roughly 45% above the budget request; the Senate appropriators reiterated that they were favorably impressed with the NIH's recent research breakthroughs and argued that far more funding could efficiently be spent than the administration was requesting; Senate priorities included cancer chemotherapy research program and providing longer, more expensive medical research grants for up to five years instead of three years. In a stark reversal from recent years, the conference committee failed to resolve disputes between the two bills, and instead, the full House approved Senate amendments that boosted NIH funding to $184 million. The Senate's effort had been aided by intense advocacy by scientific and medical groups as well as the prevailing desire not to be perceived as casting a "vote in favor of cancer and heart disease." The increases in NIH appropriations appear to have been motivated by long-run public health concerns and unrelated to any concerns about unemployment or any other short-run macroeconomic prerogatives. As such, we classify this policy event as exogenous. Most pertinent narrative evidence:

- "Budget expenditures for labor and welfare in the FY1957 are an estimated 228 million dollars greater than in the current fiscal year, and 442 million dollars higher than actual expenditures in 1955. The increase in 1957 stems largely from my proposals to strengthen and expand education, health, and research services substantially. These budget recommendations will contribute greatly to the wellbeing of all our people, both through those activities which relate directly to individuals and families and those which operate indirectly through improved community services and private enterprise... Under existing laws, I am recommending increased appropriations directed mainly to the expansion of medical research, greater support for basic scientific research and training, enlargement of protective and preventive services in the fields of health and welfare, improvement of our labor and manpower services, and construction of hospitals and other necessary health and research facilities." (Budget Message of the President, FY1957, January 16, 1956, p. M42)
- "Despite the dramatic results of recent years, our national medical research effort has not expanded enough to realize Its full potential. Financial support has not kept pace with current medical progress, nor with the needs of our growing and aging population, nor with the Nation's accelerating technology. The needs of our medical scientists and research institutions arise from the same economic bases as do industry's needs for production in an expanding economy. Medical research needs money, men, materials, and facilities. The [PHS] budget for 1957 is designed to help meet some of those needs. The legislative program is designed to meet a part of the need for facilities. The $27.5 million increase recommended by President Eisenhower for the expansion of the major medical and related research programs of the [PHS] would accomplish three main purposes. It would permit substantial increases in support of medical research

conducted in medical schools, universities, and other nonprofit research institutions. It would provide help for the training of many additional research scientists in medical fields, concurrently with the proposed expansion of research. And it would permit the [PHS] to move ahead toward fuller utilization of our clinical center and related facilities at Bethesda, Md." Statement of Dr. Leonard A. Scheele, Surgeon General, March 14, 1956 (Senate Hearings on Labor-HEW Appropriations, FY1957, p. 281)

- "The [House Appropriations] Committee held long and detailed hearings with the top men of the [NIH]... The committee was, in general, favorably impressed with the program and budget that was submitted. However, the information given to the Committee during these hearings indicates that the funds requested fall short of the amount that can efficiently be used to attain the maximum benefits that can reasonably be expected by their medical research program, and the Committee is therefore recommending increases, over the request, which total $10,000,000. The Committee calls particular attention to the urgency of taking steps at this time to ensure that an adequate supply of medical research scientists will be available in the years ahead... the Committee would expect that approximately 40 percent of the increase be devoted to activities promoting the training of manpower. The remaining amount should be used primarily for research grants" (H. Rpt. 84-1845, March 2, 1956, p. 14)
- "The [Senate Appropriations] committee heard incontrovertible testimony by witnesses of the highest caliber as to the need for increased funds in each of the major fields of medical research in cancer, heart disease, mental disorders, neurological diseases and blindness, virus and related research, and other vital areas. These witnesses presented persuasive testimony on each of these areas to the effect that if funds were forthcoming the manpower and the research facilities required to make effective use of the funds would be available. The committee wishes to express its appreciation for the willingness of busy scientists and men of affairs to explain in detail to the committee the current medical research scene. The committee has been impressed with the manner in which the stimulus of available funds has invigorated the entire field of medical research since World War II ended. The national capacity for growth in productive medical research was grossly underestimated, and some of the underestimates have been made by experts. One such underestimate was made by the administration witnesses before this committee in the spring of 1955... it is clearly evident not only that the $98 million [for FY1956] is being very productively spent but also that additional funds could well have been profitably invested in medical research during the current fiscal year. A few short weeks after expressing opposition to the committee increases, Institute officials proposed, and the Department accepted, a budget totaling $126.5 million, or $14 million in excess of the total adopted by the Senate. This committee is of the opinion that the misassessment of the situation by the administration last year has been repeated this year and that the proposed budget of $126 million is therefore inadequate. The committee for this reason believes that the action of the House in proposing a budget of $135 million is clearly in the right direction. It particularly endorses emphasis upon manpower training in the House report." (S. Rpt. 84-2093, May 24, 1956, pp. 16-17)
- "The fiscal 1957 appropriations bill for the Departments of Labor, Health, Education and Welfare, and related agencies included a record-breaking $184 million allotment to the [NIH]—$171 million for medical research, the remainder for operating expenses and construction of surgical facilities. The House voted $135.5 million for NIH, which was

$9 million more than the President requested; the Senate voted for an appropriation of $184.4 million. The final NIH appropriation was nearly $58 million more than the President requested... The House on June 27 adopted the conference report by voice vote and agreed to a number of Senate amendments reported in dispute. Eight of these added $49 million to the [NIH], for a total of $184 million... Clarence Cannon (D-MO) [said] "We are dealing with the most adroit and most effective lobby I have ever seen... 25,000 lobbying telegrams" asking for support of the Senate amendments for increased NIH funds. "In a superheated, hysterically pressured atmosphere like this, nobody is going to vote against home and mother and free beer—nobody is going to vote in favor of cancer and heart disease." ("Labor and H.E.W. Funds," *CQ Almanac 1956*, 12th ed., 03-635-03-637. Washington, DC: Congressional Quarterly, 1957)

NIH R&D Appropriations for FY1958

Bill: Departments of Labor, and Health, Education, and Welfare Appropriation Act, 1958
Public Law: 85-67 **Enacted:** June 29, 1957 **Effective:** July 1, 1957

Nominal change		Real change		Classification
Millions ($)	YOY%	Millions ($2012)	YOY%	
$32.6	18.3%	$130.6	15.3%	Exogenous

Congress again appropriated significant increases in both nominal and real NIH research funding for FY1958, motivated by long-run public health objectives, recent successes of NIH medical research programs, and concerns about scientific manpower. The Eisenhower administration requested $220 million in FY1958 appropriations for the NIH, proposing a sizable increase of $38 million (21%) over the prior year's enacted funding. President Eisenhower remained keen on investing more heavily in medical research, research facilities, and training of research scientists to address a shortage of manpower. But in keeping with recent dynamics, appropriators wanted even more of a significant increase in NIH research funding than the administration had requested in the FY1958 budget. In their committee report, the Senate Appropriations Committee stated that one of their two overarching policy objectives for medical research was that "research on massive problems generated by the major diseases should not be limited by lack of money," and their FY1958 budget allowances for the NIH reflected this generous attitude; in particular, the Senate committee wanted to "support of all scientifically worthwhile" cancer research and provided $11.6 million more for the NCI than in the House allowance. The conference committee settled on $241.2 million for the NIH, $22 million above the House allowance, and just $11 million shy of the higher Senate-approved funding level, resulting in another significant net increase over FY1957 appropriations. The increases in NIH appropriations appear to have been motivated by long-run public health concerns and unrelated to any concerns about unemployment or other short-run macroeconomic prerogatives. As such, we classify this policy event as exogenous. Most pertinent narrative evidence:

- "The Eisenhower Administration will ask in its 1958 budget for more than $200,000,000 for medical research by the [NIH]. This will be a record. The increased sum is in keeping with the intent of Congress and with the philosophy of Secretary Marion B. Folsom of [HEW] of the gradual broadening of the program to solve welfare problems and prevent sickness." ("Record Research in Health Mapped: Administration Will Request $200,000,000 in Budget for Next Fiscal Year," by Sess Furman, *New York Times*, January 1, 1957)

- "Substantial budget increases are recommended for existing activities that will improve the health of the American people. Congress is also urged to enact legislation under which the Federal Government can help the medical and dental schools to build more and better teaching, as well as research, facilities to prevent the already acute shortage of trained medical manpower from becoming critical... The budget recommendations for the [NIH] provide for more research, while keeping in proper balance support of individual projects, training of additional technicians, and new laboratories and other facilities. This balance is necessary to safeguard the quality of research because of the high utilization of the present technical resources. An increase of 38 million dollars in expenditures is estimated, primarily for the new grants to assist in the construction of medical research facilities and to provide the non-Federal institutions receiving grants with more equitable payments for the indirect costs of these programs" (Budget Message of the President, FY1958, January 16, 1957, pp. M18, M60)
- "The total appropriations to the [NIH], leaving out of consideration funds appropriated for construction, for the FY1956 was $98,458,000. On the advice of some of the most eminent authorities in the field of medical research, Congress appropriated $183,007,000 for the [NIH] for FY1957. The estimated amount which will be unobligated at the end of this FY is approximately $10,000,000... The total amount requested for FY1958 is $190,183,000... The [House Appropriations] Committee has approved the proposed request for each Institute. The Committee has not approved the proposed increase in overhead allowances and has included a provision in the bill to limit the overhead allowances to 15%." (H. Rpt. 85-217, March 21, 1957, p. 17)
- "The bill includes $46,902,000 [for the NCI], the amount of the request, and a reduction of $1,530,000 from the amount appropriated for 1957. In comparing the budget request with the 1957 appropriation one must take into consideration that a minimum of $4,288,000 of the 1957 appropriation is estimated to be unobligated at the end of this year and thus revert to the Treasury. Cancer continues to be one of our most serious public health problems. This year approximately 700,000 Americans will be under medical treatment for cancer, including about 450,000 newly diagnosed cases. During the year we may expect 255,000 deaths from cancer... The cost of cancer to our people is tremendous. The annual hospital bill alone is estimated at $300,000,000, not to mention losses on which it is difficult to place a dollar estimate... The future holds definite promise in the areas of cancer chemotherapy, extension of the cell examination case-finding technique to gastric, lung, prostatic, and urinary cancer; studies on environmental causes of cancer; and accelerated research on virus causation and treatment of cancer... The Committee was disappointed that more progress has not been shown this year in the chemotherapy program..." (Ibid, pp. 18-19)
- "To increase and sustain momentum in medical research, two general objectives appear to the [Senate Appropriations] committee to be clear and imperative. The first is that training in medical science should be further strengthened. The second is that research on massive problems generated by the major diseases should not be limited by lack of money... The committee has deleted the provision of the House bill limiting the allowance for indirect costs on research grants to 15 percent. The committee believes that indirect costs are as much a part of the total cost of research as are direct costs." (S. Rpt. 85-416, May 13, 1957, p. 18)
- "The [Senate] committee recommends $58,543,000 for activities under this [NCI] appropriation, an increase of $11,641,000 over the House allowance. The committee wishes

to make available the funds for support of all scientifically worthwhile research in this field. Progress in cancer research, measured in the perspective of the past 5 to 10 years, is satisfactory. Radiation and hormone therapy, as well as surgical techniques, have been consistently and substantially improved... From testimony in the hearings, the committee has noted many similarities in the philosophies, approaches, and actual substance of research utilized by scientists seeking curative drugs for cancer and virus diseases. Both groups wish to discover factors that will slow down the growth of unwanted and harmful cells or living particles. The committee suggests that the [NCI] assists the two groups in a joint approach to their problems. Since much money and effort are devoted to obtaining numerous chemicals, antibiotic beers, and related substances being tested for anti-cancer effects, it is logical and economical to explore the potential value of these same materials against the viruses of influenza, poliomyelitis, and a host of other virus diseases for which currently there is no curative drug." (Ibid, pp. 22-23)

- "The conferees allotted the [NIH] $21 million more than the House had voted and $11 million less than the Senate had approved. The NIH total included $14 million for general research... Sen. Lister Hill (D Ala.), in an Aug. 19 floor speech, said the Budget Bureau, in an "arbitrary and capricious administrative action," had cut $17.7 million from [NIH] medical research funds for the first quarter of fiscal 1958. Hill said NIH had submitted apportionment requests totaling $138,522,850 for the first quarter. The Budget Bureau approved only $120,805,000, Hill said, and in so doing "perverted a law... to override the considered will of Congress by making available... less than was available (appropriated) and needed." Of the $241 million granted NIH under the bill, $211 million was for medical research." ("Labor and H.E.W. Funds," *CQ Almanac 1957*, 13th ed., 03-707-03-711. Washington, DC: Congressional Quarterly, 1958)

NIH R&D Appropriations for FY1959

Bill: Departments of Labor, and Health, Education, and Welfare Appropriation Act, 1959
Public Law: 85-580 **Enacted:** August 1, 1958 **Effective:** August 1, 1958

Nominal change		Real change		Classification
Millions ($)	YOY%	Millions ($2012)	YOY%	
$81.4	38.7%	$351.4	35.7%	Exogenous

Congress again appropriated significant increases in both nominal and real NIH research funding for FY1959, motivated by long-run public health objectives, recent successes of NIH medical research programs, and concerns about scientific manpower. In addition to requesting sizable increases in R&D funding for the space race and ICBM race in the aftermath of the Sputnik shock, President Eisenhower's FY1959 budget request proposed substantial increases in NIH and NSF funding for scientific training; see "NASA R&D Appropriations for FY1959" and "NSF R&D Appropriations for FY1959" for more details. The Eisenhower administration requested $241.2 million in FY1959 appropriations for the NIH, of which $97 million was for research projects, nearly unchanged from FY1958 funding levels, but a proposed increase in allowable overhead expenses would have resulted in a $7 million decrease for research grants. The House Appropriations Committee rebuked the administration for this cut in NIH research funds, stating that they "could not in good conscience accept, as being even near to adequate, the budget submitted," and criticized efforts to cut NIH

research programs "worth many times the dollars saved." The House appropriators were particularly pleased with recent NIH research efforts in areas including cerebral palsy, epilepsy, multiple sclerosis, and Parkinson's disease as well as longer-running efforts in cardiovascular disease, cancer, and mental health. The Senate Appropriations Committee remained even more adamant that "lack of money will not be permitted to impede the advancement of medical research" and criticized the administration's budget request as yet again falling short of adequately funding all worthwhile health research; the committee proposed funding increases for all NIH research areas, including a particularly large $24 million increase for cancer research funded by the NCI. The conference committee settled on $294.4 million for the NIH, $69.5 million less than the Senate bill had approved but $41.3 million above the House allowance and $53.2 million above the budget request. The increases in NIH appropriations appear to have been motivated by long-run public health concerns and unrelated to any concerns about unemployment or other short-run macroeconomic prerogatives. As such, we classify this policy event as exogenous. Most pertinent narrative evidence:

- "In the face of Soviet challenges, the security and continued well-being of the United States depend, as never before, on the extension of scientific knowledge. Our technological progress requires a higher level of support for basic scientific research from both private and public sources. It also demands a growing supply of highly trained manpower—scientists, engineers, teachers, and technicians. To this end, I am recommending an expanded program for the [NSF] and a new program for the Department of Health, Education, and Welfare... Assistance to basic research is provided also in physical sciences by the Bureau of Standards and in life sciences by the [NIH]." (Budget Message of the President, FY1959, January 13, 1958, pp. M32-33)
- "For the last several years Congress has consistently supported the [NIH] at a level that provided for the orderly expansion of the programs of research in major diseases of mankind. The [House Appropriations] Committee could not in good conscience accept, as being even near to adequate, the budget submitted by the Administration. That budget not only represented lack of progress, it represented a backward step... The Committee could find no basis for starting to go backward in this program except the desire to save dollars. The saving of dollars is a laudable objective if it is not at the expense of programs worth many times the dollars saved..." (H. Rpt. 85-1565, March 25, 1958, p. 17)
- "The [House] Committee is pleased to note the continuing vigor of medical research in this country, and is gratified to have played a part in bringing about sound growth over the years. Ten years ago the total research effort of the nation in such fields as arthritis, rheumatism, all neurological disorders — for example, cerebral palsy, epilepsy, multiple sclerosis, Parkinson's disease — was insignificant. Now research in these areas is flourishing. There have been research breakthroughs in arthritis, in epilepsy and in some other metabolic and neurological diseases. With sustained effort, there will be comparable advances in other diseases. Significant strides in heart disease, cancer, and mental illness during the past year will be noted below, as will significant research findings in the field of dental disorders and allergy and infectious diseases... The research effort in cancer is producing results that would have seemed visionary as recently as a decade ago. The productivity of an aggressive research attack, guided by the best scientific advice available, is amply demonstrated by the evolution of the cancer program" (Ibid, pp. 19-19)
- "The [Senate Appropriations] committee has observed that, over the years, testimony

has gradually shifted somewhat from emphasis upon the magnitude of the problems of disease to emphasis upon the accomplishments of medical research and upon vigorous research now in progress in areas that were earlier shunned as barren. In view of progress in medical research, leading to gains in humanitarian and economic terms that far outweigh the cost in money, the committee must again reiterate that it will continue to ensure that lack of money will not be permitted to impede the advancement of medical research in this country. Moreover, the committee will continue to recommend funds ample for the training of scientists and for the construction of research facilities so that the Nation can have a well-balanced and progressively stronger medical research effort... The administration persists in requesting appropriations that are not adequate to finance all of the worthwhile research waiting to be done by competent scientists; this, in FY1958, there was a total of almost $11 million in approved grants for which there were no funds to provide support" (S. Rpt. 85-1719, June 16, 1958, p. 21)

- "The [House] Committee pointed out that in 1958 a total of $97.7 million was appropriated for research projects alone, whereas the 1959 budget called for $97.3 million for research, including $6.7 million for overhead expenses. This represented a $7 million cut, which the Committee disallowed by adding the $6.7 million to the project total... The [Senate Appropriations] Committee recommended sizeable fund increases for all NIH research programs, with the largest addition ($23.7 million) going to the [NCI]. The Committee requested that NIH "balance the heavy investment in the drug approach to cancer by a vigorous effort to stimulate research directed at a study of the virus origin" in cancer. It also directed NIH to develop "more extensive and effective international interchange of people and ideas" in the medical and biological sciences." ("Labor-H.E.W. Funds," *CQ Almanac 1958*, 14th ed., 04-341-04-342. Washington, DC: Congressional Quarterly, 1959)
- "The fiscal 1959 appropriation bill for the Departments of Labor and Health, Education and Welfare provided $167 million more than President Eisenhower requested, with the largest increase over requests going to the [NIH]. Both the House and Senate criticized the Administration for the inadequacy of its requests, especially for NIH continuing research... Conferees agreed to a $294,383,000 appropriation for the [NIH], which was a $41.3 million increase over House-voted funds and a $69,519,000 decrease from Senate-approved funds. The conference report said the increase was approved "with the distinct understanding" that "there should be no reduction in the high standards for determining the acceptability of research projects" financed from the appropriations and that there should be no fund diversion for any purpose not in the budget or not specifically provided for by Congress." (Ibid)

NIH R&D Appropriations for FY1960

Bill: Departments of Labor, and Health, Education, and Welfare Appropriation Act, 1960
Public Law: 86-158 **Enacted:** August 14, 1959 **Effective:** August 14, 1959

Nominal change		Real change		Classification
Millions ($)	YOY%	Millions ($2012)	YOY%	
$107.6	36.9%	$469.2	35.1%	Exogenous

Congress again appropriated significant increases in both nominal and real NIH research funding for FY1960, motivated by long-run public health objectives and recent successes

of NIH medical research programs; the increased funding was entirely driven by Congress, over the objections of the administration. President Eisenhower's FY1960 budget request proposed $294 million for the NIH, nearly unchanged from FY1959 funding levels, reflecting the administration's concern that research and construction for health facilities had been growing too quickly; the budget noted that these expenditures had more than doubled in the past five years. The House Appropriations Committee tore into the administration's budget request for the NIH as window dressing for retrenchment of research funding and proposed substantial increases in appropriations for medical research. The Senate Appropriations Committee again went even further than their House counterparts, lambasting the administration for their failure to "recognize both the effectiveness of these programs and the degree to which they represent the public interest" and proposing a hefty $186 million (63%) increase in NIH funding over the budget request. In urging support for NIH funding, Senator Lister Hill (D-AL) cited a recent report as identifying that NIH-funded research had saved 1.8 million American lives in recent years, and the Senate appropriators thought the American public was soundly in support of medical research funding and willing to pay for it. Settling between the higher Senate and lower House allowances, the conference bill provided $400 million for the NIH—$81 million less than the Senate bill had approved but more than $100 million above the budget request. President Eisenhower issued a signing statement expressing his concerns about the recent growth in NIH research funding—including a 36% increase in the FY1960 appropriations bill over FY1959 levels—notably that lower quality research would be funded and federal dollars would displace private research funding; nevertheless, he signed the bill because Congress also "has responsibility for the exercise of judgment" over budgetary tradeoffs. HEW Secretary Arthur S. Flemming testified that the restrained NIH budget request was necessary to help "combat inflation," but the appropriators shared no such concern and the significant increase in NIH appropriations for FY1960 does not appear to have been motivated by anti-inflationary fiscal restraint. Moreover, the increased funding appears unrelated to any other short-run macroeconomic prerogatives. As such, we classify this policy event as exogenous. Most pertinent narrative evidence:

- "Expenditures by [HEW] for health programs, including those for research and construction of health facilities in fiscal 1960 are estimated at $675 million—more than double the amount five years earlier. Large and rapid increases in outlays for medical research and training by the [NIH] have occurred simultaneously with expansion in related research by other agencies. In 1960, expenditures for such purposes are estimated to increase to $254 million, which is more than three times the amount five years ago. The impact of this expanded effort on medical schools and research institutions, as well as its implications for broader policy in education and health programs, requires careful appraisal. The Secretary of Health, Education, and Welfare is completing a review of our long-term objectives in the field of medical research and training. The results of this study in terms of program and costs, including indirect costs, will be made available to the Congress" (Budget Message of the President, FY1960, January 19, 1959, p. M68)
- "In the past decade, and more particularly during the past four years, there has been a steady and rewarding expansion in the availability of funds for medical research in the United States. At the same time, the Nation has started to invest sizable funds in the training of medical and related scientists and in the construction of health research facilities. These developments have taken place because people want better health, recognize that research is essential for better health, and believe that medical research

should therefore be vigorously and effectively prosecuted... It is fair to say that the [Senate Appropriations] Committee is mystified by the failure of the administration in recent years to recognize both the effectiveness of these programs and the degree to which they represent the public interest. Year after year the administration has come forward with inadequate public health proposals, and year after year Congress has found it necessary to increase the programs to more reasonable levels. Each time, the action of the Congress has received broad public support. Such support is only one of the bases for appraising congressional action. Other measures are demonstrated productivity, the health status and life span of the people, and the strength of medical institutions... By all these criteria and more, the intensified medical research effort has clearly been worthwhile. Yet again this year the administration chose to ignore the facts and came forward with a budget which failed to seize the opportunities and meet the challenges presented..." (S. Rpt. 86-425, June 23, 1959, pp. 19-20)

- "Last Wednesday the Senate, by a vote of 83 to 10, increased the Administration's budget request for [HEW] for the next fiscal year... The major increase was in the appropriation of $484,604,000 for medical research. This was $186 million more than President Eisenhower requested. Significantly, this was the first appropriation bill passed by the Senate this session that has been higher than the President requested. Of the many reasons for this action by the Senate, there are two that are primary. One is the firm conviction of the overwhelming majority of the Senate that saving human lives is more important than saving dollars. The second is their recognition that their constituents, the American people, believe in medical research and are willing to pay tax dollars to expand it... In urging his colleagues to support this increase, Senator Lister Hill of Alabama quoted a number of impressive figures from the newly released 1959 Fact Book of the National Health Education Committee... [including] "Medical advances within the last fifteen years, directly resulting from the Federally supported medical research programs of the [NIH], have saved 1,800,000 lives in the United States" ("Health Research Needs: Study of Congressional Action on Funds Finds Delay on 'Health for Peace' Bill," by Howard A. Rusk, *New York Times*, June 28, 1959)
- "The [House Appropriations] Committee increased the HEW budget by $181,391,700, chiefly by adding $50 million to the [NIH] budget. Labor Department requests were cut by $23,156,100... The Committee report, submitted by Chairman John E. Fogarty (D R.I.) of the Appropriations Committee Labor-HEW Subcommittee, said NIH's explanations of its budget "were the worst and most confusing that have been submitted to the Committee since the establishment of the [NIH]... The research and training in the [NIH] would have to take a very distinct backward step were the Executive budget to be enacted." The report said justifications for the Eisenhower Administration budget recommendations contained "literally hundreds of incorrect figures... By the time the Committee had concluded its hearings, it was abundantly clear that the people whose responsibility it was to prepare these justifications had been placed in an impossible position. They had obviously been assigned the task of making it appear that the budget represented progress in the field of medical research when the true facts are that in a desperate attempt to present, on paper, a balanced budget, the Bureau of the Budget, or someone in authority, had even gone so far as to set back the medical research program." ("Labor-H.E.W. Funds," *CQ Almanac 1959*, 15th ed., 04-328-04-331. Washington, DC: Congressional Quarterly, 1960)
- "HEW Secretary Arthur S. Flemming April 29 defended his department's budget on

grounds the Government must "combat inflation." He said the decision to hold down medical research expenditures was made by his department, President Eisenhower, and the Budget Bureau. [Senate Appropriations] Subcommittee Chairman Lister Hill (D Ala.) praised the House Committee's [higher] recommendations on health research... President Eisenhower's $75 million request for the [NCI] May 27 was called "inadequate" by Dr. I.S. Ravdin of the University of Pennsylvania School of Medicine and Dr. Sidney Farber of Harvard Medical School. They recommended $110,203,000 in appropriations, and Farber pointed out that medical research had changed the cure rate of cancer in the last three years from one in four to one in three" (Ibid)

- "The [FY1960 Labor-HEW appropriation bill] provided $259 million more than President Eisenhower had requested. Almost all of the increases went to health and education programs... budget requests for medical research were criticized as being completely inadequate to meet present-day needs and the [NIH] received large increases over the President's requests... Senate-House conferees on July 29 reported a compromise version of HR 6769 (H. Rpt. 86-734) appropriating $3,950,938,981. Conferees compromised between the lower House and higher Senate allotments for NIH and hospitals, with NIH receiving a total of $400 million..." (Ibid)
- "I have today approved H.R. 6769, [the FY1960 Labor-HEW appropriations bill]. I have taken this action despite concern with regard to the appropriations for the Department of Health, Education, and Welfare. First, with respect to medical research, every American is of course deeply interested in the improvement of health. This interest is reflected in the Administration's progressive record of support for health activities. But there is a limit to the rate at which medical research can grow and yet grow soundly. Appropriations to the [NIH] have increased fourfold in the last six years. H.R. 6769 would add a further increase from $294 million to $400 million—or 36% in a single year. This increase gives me cause for concern on three grounds. I am concerned test it should: (1) Lower the quality of the projects supported by increasing the flow of grant applications more rapidly than the procedures for their careful appraisal can be effectively adapted; (2) Cause too great a diversion into research of the manpower and other resources needed for equally vital teaching and medical practice; (3) Substitute Federal funds for non-Federal support of medical research and training and discourage further expansion of such support..." Dwight D. Eisenhower, Statement by the President Upon Signing the Labor and the Health, Education, and Welfare Appropriations Bill, August 14, 1959 (*The American Presidency Project*, by Gerhard Peters and John T. Woolley, https://www.presidency.ucsb.edu/node/235219)

NIH R&D Appropriations for FY1961

Bill: Departments of Labor, and Health, Education, and Welfare Appropriation Act, 1961
Public Law: 86-703 **Enacted:** September 2, 1960 **Effective:** September 2, 1960

Nominal change		Real change		Classification
Millions ($)	YOY%	Millions ($2012)	YOY%	
$151.6	38.0%	$667.7	37.0%	Exogenous

Congress again appropriated significant increases in both nominal and real NIH research funding for FY1961, motivated by long-run public health objectives and recent successes of NIH medical research programs—again entirely driven by Congress, over the objections

of the administration. President Eisenhower's FY1961 budget requested $400 million for the NIH, again proposing to keep funding frozen in nominal terms, and the president's budget message reiterated his concerns about a "high level" of NIH funding dissuading private investment in medical research. The budget request went over like a lead balloon with the appropriators. The House Appropriations Committee accused the administration of picking "an arbitrary figure rather than assessing the needs," one that would curtail the NIH's research activities, and instead proposed a $55 million increase in NIH funding over the FY1961 budget. As in recent years, the Senate Appropriations Committee was even more critical of the administration's request and proposed a far larger increase in NIH funding than the House had. The Senate committee lambasted the administration for "a reluctance to recognize needs and to capitalize on opportunities" with the NIH's budget and refusing "any appreciable increase over funds appropriated in the preceding year" yet again; the committee provided $664 million for the NIH, a hefty increase of $264 million (66%) over the administration's request. The conference committee split the difference between the House and Senate allowances, providing $560 million in appropriations for the NIH—a sizable $160 million increase over FY1960 levels. The increases in NIH appropriations appear to have been motivated by long-run public health concerns and unrelated to any concerns about unemployment or other short-run macroeconomic prerogatives. As such, we classify this policy event as exogenous. Most pertinent narrative evidence:

- "The Department of Health, Education, and Welfare will insist on maintaining high standards in determining the acceptability of medical research projects for Federal support. As I indicated last August in approving the 1960 appropriations for the Department, it is essential that Federal grants for these projects be so administered that medical manpower is not unduly diverted from other pressing needs and that Federal funds are not substituted for funds from private sources. The 1960 appropriation of $400 million for the [NIH] will not be entirely committed this year even with advanced funding of certain training programs. I am recommending that 1961 appropriations to the [NIH] continue at the high level of 1960." (Budget Message of the President, FY1961, January 16, 1960, p. M61)
- "When the Budget was sent to Congress in January there were some who tried to show that a $400,000,000 budget for the [NIH] was a forward-looking budget that would allow greater progress in 1961. Before the hearings were concluded it was apparent that the budget did not provide for advances not even for a levelling off of the NIH programs. It represented a retrenchment, a step backward... Just the fact that the budget was for exactly the same amount as the appropriation for 1960 makes it obvious that the administration simply picked an arbitrary figure rather than assessing the needs and gearing the budget to them... After careful evaluation of the needs and availability of facilities and personnel the [House Appropriations] Committee is recommending an increase of $55,000,000..." (H. Rpt. 86-1428, March 25, 1960, p. 17)
- "The [Senate Appropriations] committee feels that the Congress and the executive branch have a grave responsibility to act with the utmost wisdom and farsightedness in dealing with the programs and appropriations levels for an agency whose activities have such meaningful import for the health, well-being, and productivity of our people everywhere for generations to come. The Congress has demonstrated its capacity to perceive and meet this responsibility by progressively strengthening programs of the [NIH] according to the opportunities for effective use of increased funds and broadened authorities. It sees them not as expenditures, but as investments of a part of the

taxpayer's contributions to their Government in the conquest of disease. There are few functions of the Federal government that are so widely and strongly supported in concept by the American people. For these reasons, it is surprising to the committee that in recent years —when the advances in medical research have been so gratifying, the needs so challenging, and the opportunities so evident—the appropriation requests on behalf of the [NIH] have reflected a reluctance to recognize needs and to capitalize on opportunities. Indeed, the appropriations requests have given every appearance of being handled as if by some arbitrary formula. As a result, Congress has been required to assume leadership in this field. It has done so willingly, guided by a broad expression of view of what people need, want, and expect of their Government in this matter. Yet the inescapable fact is that between 1956 and 1960—a period of time in which the total appropriations to the [NIH] have increased from $161.7 million to $430.3 million—in no year has the budget request included any appreciable increase over funds appropriated in the preceding year" (S. Rpt. 86-1576, June 14, 1960, p. 16)

- "For NIH the [House] Committee added: $13.6 million for the [NCI], $12.3 million for mental health activities, $8.6 million for the [NHI], $5.4 million for general research, $5.3 million for studies of arthritis and metabolic diseases, $4.7 million for neurology and blindness, $3.7 million for allergy and infectious diseases and $1.4 million for dental health... The [Senate] Committee, in recommending the $664 million proposed by the [Committee of Consultants on Medical Research], added $209 million to House-voted NIH funds, with the largest increases going to the [NHI] ($53.4 million) and general research and services ($51.7 million)" ("Labor-H.E.W. Funds." In CQ Almanac 1960, 16th ed., 04-383-04-386. Washington, DC: Congressional Quarterly, 1960)
- "The largest increases in the Labor-HEW appropriations, compared with Administration requests, were for the National Institutes of Health (increased $160 million over Mr. Eisenhower's request, from $400 million to $560 million)..." (Ibid)

NIH R&D Appropriations for FY1962

Bill: Departments of Labor, and Health, Education, and Welfare Appropriation Act, 1962
Public Law: 87-290 **Enacted:** September 22, 1961 **Effective:** September 22, 1961

Nominal change		Real change		Classification
Millions ($)	YOY%	Millions ($2012)	YOY%	
$189.2	34.3%	$834.0	33.7%	Exogenous

Congress again appropriated significant increases in both nominal and real NIH research funding for FY1962, motivated by long-run public health objectives, recent successes of NIH medical research programs, and new policy priorities of the Kennedy administration. The outgoing Eisenhower administration had requested $540 million for the NIH in their final budget request, a slight $20 million decrease from FY1961 funding levels, but the incoming Kennedy administration was much more supportive of health research funding. President Kennedy was particularly concerned about children's health and, shortly after being inaugurated, delivered a special address to Congress in which he proposed creating a National Institute of Child Health and Human Development within the NIH. The new administration also ordered a thorough review of the NIH's budget; the ensuing report recommended that $641 million would be an appropriate NIH funding level for FY1962, which the PHS and HEW Secretary both endorsed verbatim, but the Bureau of the Budget

pared back this request by $58 million without explanation. The House appropriators were livid with the Budget Bureau's "purely an arbitrary reduction" and restored NIH funding to $641 million in their allowance. The Senate Appropriations Committee proclaimed that there was "enthusiastic public support" for increased NIH medical research funding and that "past investment in research is paying off handsomely," and the committee allowance accordingly provided $835.7 million for the NIH—a $296 million (55%) increase in funding over the initial Eisenhower administration request and a $253 million (43%) increase over the revised Kennedy administration budget request. The conference committee exactly split the difference between the House and Senate allowances, providing $738.3 million in appropriations for the NIH, resulting in a sizable $178 million increase over FY1961 levels. But a month after enacting the FY1962 Labor-HEW appropriations bill, President Kennedy was worried about an increase in the budget deficit and implored his cabinet secretaries to defer spending and restrain from obligating all available funds; this request resulted in a smaller net increase in NIH obligations for the year, despite the president praising the recent increase in medical research funding as important for the "future growth and strength of our Nation" in the same remarks. President Kennedy stated that the enlarged deficit did not pose a risk to the U.S. price level or balance of payments, he was merely pursuing "sound fiscal and budget policies." The increases in NIH research funding appear to have been motivated by long-run public health concerns and unrelated to any concerns about inflation or other short-run macroeconomic prerogatives. As such, we classify this policy event as exogenous. Most pertinent narrative evidence:

- "In 1962, expenditures by the [NIH] for medical research and training will represent about half the total spent for promotion of public health. The programs of the National Institutes will have multiplied more than threefold from 1957 to 1962. The budget for 1962 recommends appropriations of $540 million for the National Institutes, compared to the $560 million enacted by Congress for 1961. While this is $20 million less than the 1961 appropriation, it actually represents a substantial program increase for medical research and training. The reduction results from the elimination in 1962 of nonrecurring projects and from the transfer of programs to other parts of the [PHS] which were included in the total for the [NIH] for 1961. These decreases more than offset increases for new research activities." (Budget Message of the President, FY1962, January 16, 1961, p. M76)
- "The health of our nation is a key to its future—to its economic vitality, to the morale and efficiency of its citizens, to our success in achieving our own goals and demonstrating to others the benefits of a free society... The nation's children—now 40 percent of our population—have urgent needs which must be met. Many still die in infancy. Many are not immunized against diseases that can be prevented, have inadequate diets or unnecessarily endure physical and emotional problems... I am recommending that there be established in the [NIH] a new National Institute of Child Health and Human Development, which will include a Center for Research in Child Health as well as other broad-ranging health research activities not now covered by the specialized work of the existing institutes" John F. Kennedy, Special Message to the Congress on Health and Hospital Care, February 9, 1961 (*The American Presidency Project*, by Gerhard Peters and John T. Woolley, https://www.presidency.ucsb.edu/node/235025)
- "President Kennedy asked Congress Tuesday to establish a National Institute of Child Health and Human Development and a National Institute of General Medical Sciences. This would increase to nine the number of institutes operated by the [PHS] within the

[NIH]. However, the seven existing institutes focus on specific disease problems, such as how to attack cancer or heart diseases. The proposed institutes would concentrate on basic medical research. As first detailed in the president's health message in February, the Institute on Child Health and Human Development would conduct a stepped-up research program into congenital malformations, infant mortality, mental retardation, and maternal factors relating to childhood development" ("Child health Institute Added," by Eve Edstrom, *The Washington Post*, July 20, 1961)

- "During the last year there has probably been more review, analysis, and reanalysis of the annual budget for the [NIH] than during any other similar period since the first Institute was established. The culmination of this effort to arrive at a proper level of financing was the final review in connection with the budget amendment submitted by the current Administration. This review by the [NIH] resulted in a recommendation of $641,000,000... submitted by the [PHS] to the Department. After budgetary review by the Office of the Secretary, this recommendation was submitted without change as the Department's recommendation to the Bureau of the Budget. The Committee has tried to determine from the Secretary, from the Surgeon General, and from the Director of the [NIH], why the Bureau of the Budget reduced this request by $58,000,000. Since no other specific reasons have been given to the Committee, it can only conclude that this was purely an arbitrary reduction. The Committee has included in the bill the $641,000,000 budget." (H. Rpt. 87-392, May 15, 1961, pp. 19-20)
- "There is no problem of greater concern to the people—or of greater importance to the welfare of the Nation—than the maintenance of a vigorous offensive against disease and illness. Because the ultimate success of this offensive is almost wholly dependent on the progress of medical research, the Congress has for a number of years taken the initiative in expanding the activities of the [NIH] which are principally responsible for the administration of the Federal Government's conduct and support of research in the medical and related sciences. Substantial increases in the appropriations for these activities have had enthusiastic public support. The American people have repeatedly demonstrated that they not only wish such support for health research to continue but that they expect it to be increased as rapidly as opportunities for productive work make still greater efforts possible... Little doubt could remain in the mind of any member of the committee that past investment in research is paying off handsomely in progress toward better health for all our people. There have been significant strides toward the solution of many important disease problems. There have been dramatic developments in the prevention of certain major diseases and physical impairments; diagnosis is steadily becoming more certain and more sharply defined; and there have been numerous improvements in therapeutic agents and techniques" (S. Rpt. 87-618, July 25, 1961, pp. 22-23)
- "The [PHS] received $1,333,661,000 [in the Senate Appropriations committee bill], a $280,385,000 increase over estimates, mainly for NIH. The report said the NIH appropriation request was not adequate for pressing the attack on major diseases or for financing "a substantial portion of approved research... whose scientific merit has been carefully scrutinized by panels of experienced scientists." The Committee granted $835,670,000 to NIH. The fiscal 1961 appropriation for NIH was $548 million. President Kennedy asked for $583 million for 1962 and the House voted $641 million. HEW Secretary Abraham A. Ribicoff told the Committee that the funds requested by the Administration were all that should be appropriated." ("Labor-H.E.W. Funds," *CQ*

Almanac 1961, 17th ed., 162-64. Washington, DC: Congressional Quarterly, 1961)

- "In response to an Oct. 26 appeal to department and agency heads by President Kennedy to hold down Government spending, HEW Secretary Ribicoff Nov. 1 ordered a cut of $101,945,000 in his Department's spending in fiscal 1962. All of the agencies within the Department were affected, but the largest cut—$76,806,000—came from the [PHS], with NIH reportedly being cut $60,000,000. The President's statement said that "appropriations are only a ceiling, not a mandate to spend." (Ibid)
- "There is no evidence that the currently estimated deficit presents serious risk to the domestic price level or the U.S. balance of payments... While the recent rises in the estimates of expenditures and the deficit, therefore, are compatible with the sound fiscal and budget policies we have been following, they are further grounds for insistence on economy in executing government programs. This is the reason I have asked each of you to follow a most careful and frugal policy with respect to commitments and expenditures under the 30 budget as enacted by Congress... I have asked each of you to exercise the maximum care in scrutinizing all expenditures, tightening requirements, postponing the initiation of deferrable projects, and phasing out any acceleration of spending which was instituted as an antirecession measure. I am especially desirous that new programs or expansions of existing programs be undertaken with caution and deliberation, to make sure that sound criteria are used, careful plans are laid, and minimum funds are spent. I much prefer that obligational authority remain uncommitted where there is any doubt that expenditures would yield substantial returns to the national interest." John F. Kennedy, Statement by the President to Cabinet Officers and Agency Heads on the 1962 and 1963 Budget Outlook, October 26, 1961. (*The American Presidency Project*, by Gerhard Peters and John T. Woolley, https://www.presidency.ucsb.edu/node/235258)
- "While I regret very much the failure of the Congress to enact legislation for general aid to education, expenditures for scientific research (including medical research) and education will rise by 170 million dollars over the proposals of the previous administration, even excluding the large increases in funds for military and space research. The scientific and technological gains that will be achieved as a result of the national research effort (including military and space research) will be of the utmost importance to the future growth and strength of our Nation..." (Ibid)

NIH R&D Appropriations for FY1963

Bill: Departments of Labor, and Health, Education, and Welfare Appropriation Act, 1963
Public Law: 87-582 **Enacted:** August 14, 1962 **Effective:** August 14, 1962

Nominal change		Real change		Classification
Millions ($)	YOY%	Millions ($2012)	YOY%	
$140.0	18.9%	$623.4	18.9%	Exogenous

Congress again appropriated significant increases in both nominal and real NIH research funding for FY1963, motivated by long-run public health objectives, recent successes of NIH medical research programs, and new policy priorities of the Kennedy administration. President Kennedy was particularly focused on boosting scientific and medical manpower and improving children's health, and had recently proposed creating both a National Institute of Child Health and Human Development and a National Institute of General Medical Science,

both under the umbrella of the NIH; shortly after releasing his budget request, the president delivered a special address to Congress on national health needs in which he praised recent medical breakthroughs resulting from NIH-funded research and making the case for his new proposed institutes and targeted increases in NIH funding. While receptive to the new institutes, Congressional appropriators were again furious that the administration was not devoting greater resources to medical research and again approved substantially more than the administration sought. The NIH had initially requested $855 million, but President Kennedy's budget office, eyeing the budget deficit, pared that request back to $780 million. The House Appropriations Committee expressed its disappointment and added $60 million in their allowance over the administration's revised request. The Senate Appropriations Committee expressed continued support for newer research areas outside the "major categorical diseases or the traditional clinical science," notably child health, human development, and aging, and provided an additional $60 million for the NIH above and beyond the House allowance. The conference committee settled on $880 million appropriations for the NIH, closer to the higher Senate allowance than that of the House, resulting in a net increase of roughly $140 million over enacted FY1962 funding levels. The increases in NIH research funding appear to have been motivated by long-run public health concerns and unrelated to concerns about unemployment or other short-run macroeconomic prerogatives. As such, we classify this policy event as exogenous. Most pertinent narrative evidence:

- "The Federal Government's role in improving the Nation's health is a large and growing one. For example, the Government in the current year is supporting about three-fifths of the more than $1 billion being spent on medical research in this country. In 1963, the Department of Health, Education, and Welfare will spend an estimated $1.4 billion on health services and research. More than half of this total is to be spent by the [NIH] for medical research and related training and facilities. The 1963 budget for the Institutes recommends a significant increase in research project grants and for the support of clinical research centers and provides for the training of additional technical manpower with increased emphasis on skills needed in mental health work. The estimated increase of more than $100 million in expenditures in 1963 will provide for an expansion of the Institutes' programs consistent with sound planning and competing demands in other health programs and other scientific fields. These activities will be augmented under the proposed legislation to create a National Institute of Child Health and Human Development and a National Institute of General Medical Sciences within the [NIH]" (Budget of the United States, 1963, p. 88)
- "To relieve the critical shortage of doctors and dentists—and this is a matter which should concern us all—and expand research, I urge action to aid medical and dental colleges and scholarships and to establish new National Institutes of Health." John F. Kennedy, State of the Union Address, January 11, 1962, *The American Presidency Project*, https://www.presidency.ucsb.edu/node/236917)
- "Fortunately, medical research, supported to an increasing degree over the past 15 years by the Federal Government, is achieving exciting breakthroughs against both cancer and heart disease as well as on many other fronts. We can now save one out of every three victims of cancer, compared to only one out of four saved less than a decade ago. Our nationwide cancer chemotherapy program is saving many children and adults who would have been considered hopeless cases only a few years ago. And advances in heart surgery have restored to productive lives many thousands, while full prevention of many forms of heart disease seems increasingly within our reach. We

must, therefore, continue to stimulate this flow of inventive ideas by supporting medical research along a very broad front. I have proposed substantially increased funds for the [NIH] for 1963, particularly for research project grants, and the training of specialists in mental health. Expenditures by the Institutes in 1963 are estimated to exceed $740 million, an increase of more than $100 million from the current year and a four-fold increase in the last five years... In keeping with the broadening horizons of medical research, I again recommend the establishment of a new Institute for Child Health and Human Development within the [NIH]. Legislation to create this new Institute was introduced in the last session of Congress... I also recommend that the present Division of General Medical Sciences at the [NIH] be given the status and title of an Institute. This program supports fundamental research in biology and other sciences, and strengthens the research capabilities of universities and other institutions." John F. Kennedy, Special Message to the Congress on National Health Needs, February 27, 1962 (*The American Presidency Project*, https://www.presidency.ucsb.edu/node/236888)

- "The [House Appropriations] Committee is convinced that the Nation must be assured that the future progress of medical research is not hampered by the lack of adequate research resources—the physical facilities and the qualified personnel. The effectiveness of Federal grant support for research still depends on parallel programs that will provide more adequate facilities and suitably trained scientific personnel. The Committee again heard persuasive evidence from both official and private witnesses that facilities and manpower continue to be the critical limitation on the pace of research in the future" (H. Rpt. 87-1488, March 23, 1962, p. 23)
- "At the insistence of the Congress the NIH has, in recent years, become the primary force for establishing and sustaining a vigorous national research effort in the health-related sciences. Progressive increases in appropriations have enabled the several Institutes and the Division of General Medical Sciences not only to provide really substantial support for research and research training in medical and related institutions throughout the country but have also broadened the scope of their activities to encompass health research objectives that do not fall into the narrow mold of the major categorical diseases or the traditional clinical sciences... the [NIH] have addressed themselves to research in the broad field of child health, human development, and aging. They have undertaken long-term epidemiological studies and have launched systematic and cooperative research projects on the significance of the perinatal experiences of both the mother and child on the usefulness of a large number of drugs in the treatment of cancer... The [Senate Appropriations] committee, in considering the estimates for the [NIH], has given careful attention to these broad aspects of the NIH programs. The increases recommended, totaling $60 million over the House allowance, are designed to meet pertinent program needs and to strengthen research and training in neglected areas of great promise. The committee is convinced that such an additional investment will be handsomely repaid by further rapid advances all along the health-research front." (S. Rpt. 87-1672, June 29, 1962, pp. 23-24)
- "The largest single increase made by the [House Appropriations] Committee was in funds for NIH—a $60.4 million increase, to $840.8 million. The report said the Committee was "disappointed" that the Administration had cut funds requested by NIH from $855 million to $780.4 million. It said the budget "failed in particular to make any provision for expanding the crucially important (medical) research training programs and was quite inadequate to provide the level of research grant support that will

maintain the momentum of the increasingly effective medical research effort... In increasing funds for NIH, the [Senate Appropriations] Committee said "the vast majority of Americans rightly regard the expenditure of public funds for medical research as less an expense of Government than a high-interest investment of tax dollars from which they and their families will reap the benefit." ("Labor-H.E.W. Funds," *CQ Almanac 1962*, 18th ed., 04-171-04-174. Washington, DC: Congressional Quarterly, 1963)

- "As in past years, Congress made the largest increases over Administration requests in [Labor-HEW] funds for the [NIH]—a $100,400,000 increase, for an NIH total of $880,800,000" (Ibid)

NIH R&D Appropriations for FY1965

Bill: Departments of Labor, and Health, Education, and Welfare Appropriation Act, 1965
Public Law: 88-605 **Enacted:** September 19, 1964 **Effective:** September 19, 1964

Nominal change		Real change		Classification
Millions ($)	YOY%	Millions ($2012)	YOY%	
$91.8	10.6%	$389.6	10.1%	Exogenous

Congress again appropriated significant increases in both nominal and real NIH research funding for FY1965, motivated by long-run public health objectives, recent successes of NIH medical research programs, and new policy priorities of the Johnson administration. Health care was a top priority of President Johnson, who delivered a special address to Congress on health care policy shortly after releasing the FY1965 budget; the administration was proposing major expansions of federal health care programs—what would soon become Medicare and Medicaid—but also pushed an accompanying expansion of medical research. The administration's amended budget request proposed $956.5 million for the NIH, a 4% increase over FY1964 appropriations. The House Appropriations trimmed the administration's requested budget for the NIH by $4.3 million, largely reflecting a newly proposed limitation on indirect research costs, while simultaneously expressing skepticism that the budget was doing enough to expand the training of scientific manpower. The Senate Appropriations Committee, on the other hand, was very pleased with recent progress in various NIH research programs and thought scientists were on the cusp of major breakthroughs in biomedical and genomics research that merited additional funding; the committee approved the full top-line budget, again nixing a House-passed limitation on indirect costs, and provided an additional $10 million for NCI-funded cancer research. The conference committee settled on appropriations of $966.0 million for the NIH, just shy of the higher Senate allowance, resulting in a net increase of $48 million (5.2%) over FY1964 appropriations. The increases in NIH research funding appear to have been motivated by long-run public health concerns and unrelated to any concerns about unemployment or other short-run macroeconomic prerogatives. As such, we classify this policy event as exogenous. Most pertinent narrative evidence:

- "The budget proposals for health activities in 1965 will continue to strengthen the [NIH] and the Food and Drug Administration and will improve environmental health protection. The budget provides for rapid progress under the legislation passed in the last session of the Congress to combat mental illness and retardation, increase the number of doctors and dentists, and reduce air pollution." (Budget Message of the President, FY1965, January 21, 1964, p. 25)

- "Expenditures for the [NIH] include increases for the new Institutes of Child Health and Human Development and the Institute of General Medical Sciences... Federal expenditures for medical and health-related research activities are estimated at $1.3 billion in 1965. Nearly two-thirds of this amount is expended by the [NIH]... The seven disease-centered institutes were augmented in 1963 by two new institutes more oriented toward basic research and the total human life cycle. The increases in 1965 support growth for these two institutes and provide for the training of additional research personnel, particularly in mental health. Over $30 million of NIH funds will go to industrial firms for testing and evaluation of new chemicals and drugs for the treatment of cancer, cardiovascular diseases, and mental illness." (Budget of the United States, FY1965, pp. 415, 417)
- "The American people are not satisfied with better-than-average health. As a Nation, they want, they need, and they can afford the best of health... Over the past decade, our Nation has developed an unparalleled program of medical research. This investment has already paid rich dividends, and more dividends are within reach. The budget that I have proposed for fiscal 1965 assures the rate of growth needed to meet current opportunities and to provide a sound base for future progress." Lyndon B. Johnson, Special Message to Congress on the Nation's Health, February 10, 1964 (*The American Presidency Project*, by Gerhard Peters and John T. Woolley, https://www.presidency.ucsb.edu/node/239952)
- "Thanks largely to stimulation and support from our national health research programs, this Nation is now defended by a biomedical research community flourishing as never before, and with recognized world leadership. With slow but steady growth in the resources for health research—in the number of trained scientists and the number and sophistication of research facilities—many future gains against disease may be confidently looked for. Derived from this growing biomedical community, a steady accretion of small bits of new knowledge enormously enlarged total comprehension of health processes, year by year, and prepares the way for the occasional swift and unexpected gains we call 'breakthroughs.' Certain breakthroughs of the past several years have been identified to the committee as placing biomedical research on the threshold of unprecedented advances. These fall mainly in the area of molecular biology, and relate to a genetic code and biochemical control mechanism for cells." (S. Rpt. 88-1460, August 17, 1964, pp. 28-29)
- "As amended, the request represents a 4-percent increase over the 1964 appropriation of $918,454,000; The [Senate Appropriations] committee recommends the amount of the request for these ten operating appropriations; but within that total, has made adjustments to reflect urgent needs identified by the committee in the course of the hearings. In addition, the committee recommends $10 million for a special program of cancer research. This will permit the expansion of research on the vital origin of leukemia and exploit important new findings which give promise of a major new breakthrough in leukemia research" (Ibid, p. 29)
- "The [House Appropriations] Committee provided $952,242,000 for the [NIH]—$4,250,000 less than the request. The cut reflected the Committee's retention of the 20 percent limit on payments for indirect research costs. In a general discussion of NIH funds, the Committee said the NIH budget was "the most conservative budget submitted to Congress in recent years" and questioned whether the request for research training was consistent with the goal of doubling "medical research manpower over the

decade of 1960 to 1970." It commended NIH on the management of federal grants but repeated its 1963 request that the [PHS] take pains not to interfere with "scientific freedom."... The Committee took the following actions on new NIH programs: provided $35 million, the full request, for the construction of community mental health centers, and provided $8 million for the construction of centers for mental retardation research. Under hospital construction, it provided the full $23,346,000 requested for all authorized programs, including $10 million to initiate construction of facilities for the mentally retarded." ("Labor–H.E.W. Funds," *CQ Almanac 1964*, 20th ed., 180-86. Washington, DC: Congressional Quarterly, 1965)

- "The [Senate Appropriations] Committee provided $966,492,000 for the [NIH]—a net increase of $10 million over the Administration request and $14,250,000 over the House figure. It added a special appropriation of $10 million for the [NCI]... Conferees provided $965,992,000 for the [NIH]... Conferees agreed to the Senate's addition of a $10 million special appropriation to the Cancer Institute for studies of viruses, leukemia, and related diseases." (Ibid)

NIH R&D Appropriations for FY1966

Bill: Departments of Labor, and Health, Education, and Welfare Appropriation Act, 1966
Public Law: 89-156 **Enacted:** August 31, 1965 **Effective:** August 31, 1965

Nominal change		Real change		Classification
Millions ($)	YOY%	Millions ($2012)	YOY%	
$141.4	14.7%	$622.0	14.7%	Exogenous

Congress again appropriated significant increases in both nominal and real NIH research funding for FY1966, largely motivated by long-run public health objectives, recent successes of NIH medical research programs, and health policy priorities of the Johnson administration. Health care remained a top priority of President Johnson, who again delivered a special address to Congress on national health care policy shortly after releasing the FY1966 budget; the president touted that health research expenditures would rise 10% in FY1966 under the budget request. The Johnson administration had commissioned an independent committee to analyze the NIH's budget, which concluded that NIH funds were generally "being spent wisely and well in the public interest." The House Appropriations Committee approved $1.05 billion for the NIH, an $11.7 million increase over the budget request, primarily spread out across cancer, cardiac, and kidney research, taking particular affront to budget cuts to cancer research. In a similar vein, the Senate Appropriations Committee bemoaned a "modest" increase in NIH funding, disappointed with funding levels for research in cancer, kidney disease, and blindness; the committee recommended an additional $30.3 million for the NIH over the House committee allowance. The conference bill provided $1.073 billion for the NIH, landing closer to the higher Senate allowance than the lower House allowance for the agency, for a net increase of $32.9 million over the budget request. But in his signing statement, President Johnson expressed nothing but gratitude over the outcome of the bill, lauding the increased funding for the NIH's valiant effort to study "causes and the cures for epilepsy, arthritis, muscular dystrophy, cystic fibrosis, mental illness, and hundreds of other diseases." The increases in NIH research funding appear to have been motivated by long-run public health concerns and unrelated to any concerns about unemployment or other short-run macroeconomic prerogatives. As such, we classify this policy event as exogenous. Most pertinent narrative evidence:

- "Expenditures of the [NIH] are estimated to increase by $114 million in 1966, of which $101 million will be for the conduct of research and $13 million will be for research facilities, new centers for mental retardation research, and community mental health centers. Federal support of health-related research by all agencies—of which three-fifths is by NIH—will continue to represent about two-thirds of the national total in 1966." (Budget of the United States, FY1966, p. 115)
- "Today, at this point in our history, we are privileged to contemplate new horizons of national advance and achievement in many sectors. But it is imperative that we give first attention to our opportunities—and our obligations—for advancing the nation's health. For the health of our people is, inescapably, the foundation for the fulfillment of all our aspirations... Two decades ago this nation decided that its Government should be a strong supporter of health research to advance the well-being of its people. This year that support amounts to more than two-thirds of the total national expenditure of $1.5 billion for health research. Continued growth of this research is necessary, and the 1966 Budget includes: 10% growth in expenditures for health research and for the related training..." Lyndon B. Johnson, Special Message to the Congress: "Advancing the Nation's Health," January 7, 1965 (*The American Presidency Project*, by Gerhard Peters and John T. Woolley, https://www.presidency.ucsb.edu/node/240622)
- "The importance of medical research is a subject on which virtually every American can agree. The activities supported by the appropriations for the [NIH] have a direct personal meaning for every individual and hold out a hope to which no person can be indifferent. The record is crowded with an ever-growing list of instances in which this hope has been renewed through the discovery of a new drug, the development of a new vaccine, the perfection of a new surgical or diagnostic technique, other application of a new treatment, or the implementation of a new preventative measure... The budget estimates submitted on behalf of the [NIH] also seem modest. The [Senate Appropriations] committee was again disappointed that so little provision was made for areas that are ripe for major development, such as the refinement and perfection of an artificial kidney; for the solution of major new health problems, such as the suspected cancer-causing effects of viral vaccines; for invigorating research on such widespread disabilities as blindness; for pressing forward toward the solution of outstanding problems in such promising new techniques as organ transplantation; and for strengthening the important training programs on which the vigor of future medical research depends. The committee has looked very carefully into the program deficiencies of the budget and has recommended increases for the [NIH] totaling $30,300,000. These increases fall very short of meeting the needs which the committee has identified..." (S. Rpt. 89-537, August 3, 1965, pp. 30-31)
- "As it traditionally had in the past, Congress provided more than was requested for NIH; for the first time, NIH funds exceeded $1 billion. In recommending the funds for NIH, the Appropriations Committees of both chambers cited the favorable conclusions of a special Presidential committee which had made an independent study of NIH activities... A special Presidential committee concluded in 1965 that NIH's activities were "essentially sound" and that its budget was, "on the whole, being spent wisely and well in the public interest." It reported that NIH-supported research, which accounted for 40 percent of all biomedical research in the United States, was of "high quality"... The 13-member committee, appointed by President Johnson in 1964, was composed of scientists, industrialists and educators... The report said that NIH's "most

important organizational need" was in the area of policy and planning... " ("Labor-H.E.W. Funds," *CQ Almanac 1965*, 21st ed., 161-66. Washington, DC: Congressional Quarterly, 1966)

- "The [House Appropriations] Committee increased funds for the [NIH] by $11.7 million, to $1,051,756,000. Lacking "the guidance of an adequate budget submission" for NIH, the report said, the Committee "added funds not requested...for several special new programs where the great need is obvious and where the promise of success is great. Included were increases of $2.5 million for the Heart Institute "to launch an artificial heart development program"; $2 million for the Institute of Arthritis and Metabolic Diseases for perfecting the artificial kidney and making possible its more widespread use; $1,650,000 for the Cancer Institute for an intensified task force program on breast cancer; $2.3 million for the Heart Institute for expansion of a study of drugs and coronary heart disease for which the Budget Bureau had not requested funds—"one of many examples of completely irresponsible action on the part of the Bureau of the Budget in connection with the budgets for" the HEW and Labor Departments; $2 million for the Cancer Institute for an undergraduate training program in the treatment of cancer which was "budgeted to be discontinued... 'for reasons of economy'" but the Committee had "not seen one shred of evidence that the American people want to economize by cutting back on productive programs that advance the fight against cancer;" and $1,250,000 "over the obviously inadequate budget of $1,467,000" for the Division of Computer Research and Technology. All other NIH programs were funded at the requested levels." (Ibid)
- "The [Senate Appropriations] Committee increased funds for the [NIH] to $1,082,056,000—$42 million more than the request and $30.3 million more than the House sum. It said it had not included any increases in programs that would fall in categories expected to be covered in a supplemental request after the enactment of a bill (S 596, HR 3140) authorizing regional medical centers to combat heart disease, cancer, and stroke... In addition to approving all the increases made by the House in NIH requests, the Committee provided further increases for every Institute" (Ibid)
- "The final bill provided $1,072,956,000 for the [NIH] (request: $1,040,056,000; House: $1,051,756,000; Senate: $1,082,056,000). It contained all the unbudgeted funds added by the House but reduced some of the further Senate increases as follows: provided $300,000 of the $2.5 million for the Institute of General Medical Sciences; appropriated $400,000 of the $800,000 for the Division of Biologics Standards; provided $3.5 million of the over-all $7 million for the Institute of Mental Health; deleted the $2 million for the Heart Institute and provided $3.5 million instead of $4.5 million for the Institute of Neurological Diseases and Blindness. In addition, the bill reallocated the Senate's $3 million increase for the Institute of Allergy and Infectious Diseases to provide $1 million for work on rubella vaccines (instead of $500,000) and $250,000 (instead of $750,000) for research on transplantation and immunology." (Ibid)
- "The signing of H.R. 7765 was a moment of particular pleasure for me, and, I believe, an event of profound significance for this country... The $8 billion committed through this measure will make possible activities from cancer research to vocational education to the fight against juvenile delinquency. It extends the programs of the [NIH] which are seeking the causes and the cures for epilepsy, arthritis, muscular dystrophy, cystic fibrosis, mental illness, and hundreds of other diseases... The Congress which passed this measure is building more than a record of statistics: it is building a monument

to hope—and showing that hope can become reality, that national problems can be alleviated through creative Government programs." Lyndon B. Johnson, Statement by the President on the Signing of the Labor, HEW, and Related Agencies Appropriations Bill, September 1, 1965 (*The American Presidency Project*, by Gerhard Peters and John T. Woolley, https://www.presidency.ucsb.edu/node/240729)

NIH R&D Appropriations for FY1967

Bill: Department of Labor, and Health, Education, and Welfare Appropriation Act, 1967

Public Law: 89-787 **Enacted:** November 7, 1966 **Effective:** November 7, 1966

Nominal change		Real change		Classification
Millions ($)	YOY%	Millions ($2012)	YOY%	
$178.8	16.3%	$758.2	15.6%	Exogenous

Congress again appropriated significant increases in both nominal and real NIH research funding for FY1967, largely motivated by long-run public health objectives and recent successes of NIH medical research programs. The House Appropriations Committee was critical of the administration's request for failing to maintain the "momentum of already existing programs" and instead approved $1.38 billion for the NIH, $74.2 more than was proposed in the budget, including an additional $30 million for NIH-funded research grants. The Senate Appropriations Committee was even more critical of the administration's request, which it deemed "deficient in a number of respects," and provided an additional $66 million for the NIH above and beyond their House counterparts' allowance, much of which was earmarked for construction of new health research facilities and research grants. The conference committee generally accepted the higher Senate allowances for the institutes, resulting in a significant net increase in NIH R&D funding for FY1967. The increases in NIH research funding appear to have been motivated by long-run public health concerns and unrelated to any short-run macroeconomic prerogatives, such as concerns about inflation or unemployment. As such, we classify this policy event as exogenous. Most pertinent narrative evidence:

- "The national investment—both public and private—in health research was less than $500 million in 1957. Under the stimulus of the Federal Government, this amount will have grown to more than $2 billion by 1967. Federal support of health research is estimated to rise from 52% to 65% of the total national effort during this decade. In 1967, more than half of the Federal support will come from the [NIH]—the principal Federal health research agency. Expenditures by NIH will total nearly $1.2 billion in 1967, $150 million more than in 1966. The budget totals also cover the possibility of providing initial funding if important new breakthroughs make feasible major advances such as the development of an artificial heart or a new vaccine." (Budget of the United States, FY1967, p. 120)
- "The [House Appropriations] Committee feels, as it did last year, that the budget should make adequate provision for carrying forward the vitally important programs for which the Congress and the American people have repeatedly expressed their support, which have earned their confidence... The estimates submitted on behalf of NIH for 1967 once again do not, in the opinion of a majority of the Committee, meet this basic requirement. Not only does the budget make no allowance for initiating or accelerating research in specific areas where there is both a clear national need and a reasonable

promise of success, but a close examination reveals that in the critical items for the grant-support of research, it does not even make adequate provision for sustaining the momentum of already existing programs... The Committee is particularly concerned about the failure of the budget to make proper allowance for the needs of the existing research programs. Recent studies have shown that to maintain the effectiveness and attain the objectives of programs such as those of the [NIH and NSF], the level of support must be increased by about 15 percent per year. This was the conclusion reached in a study undertaken in December 1963 at the request of the Committee on Science and Astronautics by a distinguished panel of the National Academy of Sciences under the chairmanship of Dr. George B. Kistiakowsky... The budget provides a total of $458,575,000 for the regular research grant programs of NIH which allows for an increase of only $18,870,000, or 4.3 percent, over the amount available in 1966. This increase falls short of even meeting unavoidable wage and price increases and therefore actually constitutes a reduction in the level of effectiveness of the research support that will be available next year. In fact, for two of the Institutes—Cancer and Mental Health—the budget proposed an outright reduction in regular research grant funds" (H. Rpt. 89-1464, April 28, 1966, p. 26)

- "The budget estimates submitted on behalf of NIH are deficient in a number of respects when measured against the needs of the programs and vital importance of work which these appropriations support. The [Senate Appropriations] Committee found that the estimates do not take into consideration a number of major factors that affect the necessary level of Federal support for medical research and training. The first of these is the natural growth of a vigorous and highly productive program. If full advantage is to be taken of the country's capacity for biomedical research, adequate funds must be available to meet costs arising from the increasing sophistication and complexity of the techniques used for research; to make research support available to young investigators emerging from the extensive research training programs; and to sustain the new research facilities being created... The budget makes virtually no allowance for prospective costs arising from these natural growth factors. The committee endorses the action of the House making at least a partial allowance for these costs but is not in a position to make a more detailed assessment of the requirements of each of the Institutes for this purpose." (S. Rpt. 89-1631, September 22, 1966, p. 26)
- "The [House Appropriations] Committee recommended $1,376,983,000 for the [NIH], $74,219,000 more than the President requested. The Committee complained that funds requested for the NIH did not meet the basic requirement of "carrying forward vitally important programs." It said the requested $458,575,000 for NIH regular research programs provided only a 4.3-percent increase over fiscal 1966, compared to the 15-percent increase considered necessary to meet rising costs. The Committee recommended a $30 million increase over the request for NIH research grants. It said $17.7 million provided an 8-percent increase over fiscal 1966 for regular research grants, and $12.3 million was for six research institutes "whose immediate needs for existing programs will not be met by a basic 8-percent increase. One of the "worst features" of the Administration's health requests was a $35-million reduction (to $15 million from $50 million in fiscal 1966) in funds for grants for health research facilities construction authorized in 1965, the Committee said. The Committee said Congress had expected to appropriate $100 million in fiscal 1967 of the $280 million authorized for the construction grants during fiscal years 1967–69. It called the $15-million request "completely unrealistic." The

Committee recommended $50 million... Other increases recommended by the Committee included $1,950,000 to create a "National Blood Program," $2.3 million for a heart drug study, $800,000 for an artificial kidney program, and $1 million for research on blindness." ("Labor–H.E.W. Funds," *CQ Almanac 1966*, 22nd ed., 178-84. Washington, DC: Congressional Quarterly, 1967)

- "The [Senate Appropriations] Committee added $66 million to the House appropriation for NIH for a total of $1,442,983,000, a 10.8-percent increase over Budget estimates. The largest increase over House funds provided for NIH was the addition of $25 million to the $56 million approved by the House for construction grants for health research facilities. Of the $81-million total, $75 million was for health research facilities, and $6 million was for mental retardation research centers. The Committee increased the House amount for the [NHI] by $15 million to $169,770,000 and directed that the additional amount be used in the artificial heart program. Other increases included about $10 million for research grants in various institutes and $8.5 million for training grants. The Committee stipulated that $1 million of the funds it added for the Institute of Child Health and Human Development should be used "in the area of population dynamics, with particular emphasis upon research in the comparative effectiveness and impact of various contraceptive devices." (Ibid)
- "Conferees provided $2,475,622,000 for the PHS... Conferees followed the Senate figures for all divisions of the [NIH] except for the [NHI] for which the appropriation was reduced by $5 million from the Senate appropriation to $164,770,000. Grants for construction of health research facilities were reduced from the Senate appropriation of $81 million to the House figure of $56 million (request: $21 million)." (Ibid)

NIH R&D Appropriations for FY1970

Bill: Departments of Labor, and Health, Education, and Welfare, and Related Agencies Appropriation Act, 1970

Public Law: 91-204 **Enacted:** March 5, 1970 **Effective:** March 5, 1970

Nominal change		Real change		Classification
Millions ($)	YOY%	Millions ($2012)	YOY%	
-$62.2	-4.7%	-$512.0	-9.2%	Endogenous

Changing course, Congress appropriated a significant decrease in both nominal and real NIH research funding for FY1970, largely motivated by concerns about inflation. The outgoing Johnson administration's final budget request was again intended to help "relieve" inflationary pressures by restraining federal spending; see "NASA R&D Appropriations for FY1970" for more details. The House Appropriations Committee overwhelmingly approved the administration's budget request for the institutes, many of which reflected a nominal decrease relative to FY1969 funding levels. The Senate Appropriations Committee bemoaned that many of the increases in requested funding were for scientific education programs, while requests for health research funding "represent a step back." The Senate committee approved substantially more funding for the NIH than their House counterparts had, but the Nixon administration threatened to veto the Labor-HEW appropriations bill because of its anticipated inflationary effect. After Congress failed to overturn Nixon's veto, the conferees agreed to a Senate amendment, supported by Nixon and intended to prevent a second veto, cutting total appropriations in the revised bill—save for the Social Security Administration

and a handful of smaller agencies, but not exempting the NIH—by an additional 2%. The revised legislation resulted in a net decrease in NIH R&D funding, which appears to have been largely motivated by short-run concerns about inflationary pressures from the budget. As such, we classify this policy event as endogenous. Most pertinent narrative evidence:

- "Support of medical research will continue at a high level in 1970. Outlays of $1.1 billion in 1970 will support an estimated 12,800 new and continuing research projects. Special emphasis will be given to research on eye diseases, family planning, air pollution, and other environmental factors affecting man's health. Continuing emphasis will be placed on those research projects which promise near-term results for practical application." (Budget of the United States, FY1969, p. 142)
- "The [House Appropriations] bill includes $180,725,000 [for the NCI], the amount requested, and a decrease of $4,424,500 from the amount appropriated for 1969... The bill includes $160,513,000, the amount requested [for the NHI], and a decrease of $6,414,500 from the amount appropriated for 1969... The bill includes $29,289,000, the amount requested [for the NIDR], and a decrease of $694,500 from the amount appropriated for 1969... The bill includes $137,668,000 [for the NIAMD], the amount requested, and a decrease of $6,220,000 from the amount appropriated for 1969." (H. Rpt. 91-391, July 24, 1969, pp. 16-20)
- "The total budget request for the enlarged NIH shows an increase of $54 million over the comparable operational level for FY1969 of $1,394,549,500. This is an increase of less than 4 percent for these important activities which, if it were evenly distributed, would be hardly enough to offset the unavoidable increases in costs. However, it is not evenly distributed, and it would therefore not be true to say that this is a stand-still budget. It is a one-step-forward-one-step-back budget. The increases requested are almost all for the manpower and education programs... The health-research components of the NIH budget represent a step back. The estimates allow $29 million less than the comparable 1969 appropriation level for the research institutes and division. Funds for new research projects are cut by $10.8 million which, taking into account unavoidable increases in costs for which no allowance is made, will mean that grant-supported new projects will have to be reduced by about 15 percent. This reduction comes on top of an already highly restrictive funding situation. During the past year, NIH was only able to award grant funds to 68 percent of the projects judged worthy of support. The further reduction of funds would make it possible to fund only 51% of approved research projects with a consequent further loss of momentum in research on the causation, cure and prevention of disease." (S. Rpt. 91-710, February 26, 1970, pp. 29-30)
- "The biggest increases made by the [Senate Appropriations] Committee over appropriation levels set by the House were $175,733,000 for the [NIH]... Nearly every division of NIH received increased funds; the largest increases were nearly $32 million for health manpower, and $33.9 million for the construction of health educational, research, and library facilities. The report criticized the Administration for cutting back in medical research and health manpower requests." ("Senate Delays Final Vote on Labor-Hew Appropriations," *CQ Almanac 1969*, 25th ed., 545-54. Washington, DC: Congressional Quarterly, 1970)
- "In an unprecedented move, President Nixon told Senate leaders on Dec. 18 that he would veto the Labor-HEW-OEO appropriations bill (HR 13111) if it arrived at the White House in the form in which it passed the Senate. The President said that, despite his sympathy with the objectives of the programs for which Congress had increased

appropriations above the Budget request, he could not, "at this critical point in the battle against inflation, approve so heavy an increase in federal spending"... Following the filing of the conference report, the President again vowed to veto HR 13111 in its present form" (Ibid)

- "The original [FY1970 Labor-HEW appropriations bill] was eventually rejected when the House on Jan. 28, 1970, sustained Mr. Nixon's Jan. 26 veto of the measure. The bill had first been passed by the House on July 31, 1969, and by the Senate on Dec. 17, 1969... Prior to the passage of the bill, the Senate adopted the Committee amendment, supported by the President, allowing Mr. Nixon to spend only 98 percent of the funds appropriated. The amendment was added to lessen the threat of a Presidential veto because of the "inflationary" increases in the bill above the President's requests... [Senator] Cotton (R-NH) gave Senators a list of cuts within the 2-percent limitation which, he said, were drawn up by Secretary of HEW Robert H. Finch. Included in the reductions were:... $6.3 million for mental health; $15.5 million for health manpower; $8.2 million for education for the handicapped; $6.5 million for instructional equipment; $26 million for the [NIH]..." ("Second Labor-HEW Funds Bill," *CQ Almanac 1970*, 26th ed., 02-139-02-144. Washington, DC: Congressional Quarterly, 1971)
- "A group of prominent scientists came here today to try to persuade the Government and the people of the United States that budget cuts are causing a crisis in medical research that could prove disastrous for future medical care. The plea appeared to be an effort to get Congress to revolt against the stringency of the administration's health research budget, coupled with an effort to persuade the Administration to relax its own anti-inflation stance in this area." ("Health Crisis Seen in Research Cuts," *New York Times*, November 12, 1969)

NIH R&D Appropriations for FY1972

Primary Bill: Departments of Labor, and Health, Education, and Welfare, and Related Agencies Appropriation Act, 1972

Public Law: 92-80 **Enacted:** August 10, 1971 **Effective:** August 10, 1971

Secondary: Second Supplemental Appropriations Act, 1972

Public Law: 92-306 **Enacted:** May 27, 1972 **Effective:** May 27, 1972

Nominal change		Real change		Classification
Millions ($)	YOY%	Millions ($2012)	YOY%	
$334.8	24.3%	$1,002.2	19.3%	Exogenous

Again reversing course, Congress appropriated significant increases in both nominal and real NIH research funding for FY1972, largely motivated by President Nixon's "war on cancer" and related prioritization of cancer research in the budget request. The inflationary situation had improved, and the emphasis of the FY1972 budget request was no longer restraining spending growth to contain inflationary pressures; see "NASA R&D Appropriations for FY1972" for more details. Shortly after releasing the budget, President Nixon delivered a special address to Congress on national health policy in which he pushed for an additional $100 million for cancer research, to which Congress happily obliged. The House Appropriations Committee added $87.9 million to the administration's budget request and the Senate Appropriations Committee, decrying the budget request as a "lack-lustre, pedestrian document," added an additional $159.4 million; the Senate Committee was particularly

frustrated that "preoccupation" with the Vietnam war and inflation had sidetracked focus from expanding health research funding in recent years. The conference committee settled on $1.68 billion for the NSF, $156 million more than the requested. After the regular appropriations cycle had concluded, President Nixon signed the National Cancer Act of 1971 (Pub. L. 92-218) into law in December 1971; the bill turbocharged the NCI, created a new National Cancer Advisory Board, and authorized the NCI director to establish up to 15 new centers for clinical research, training, and development of new cancer diagnostics and treatments. The bill also authorized additional appropriations of $20 million for FY1972, $30 million for FY1973, and $40 million for FY1974 for the "diagnosis, prevention, and treatment of cancer." The Second Supplemental Appropriations Act, 1972 (Pub. L. 92-306) subsequently appropriated an additional $40 million for the NCI, available through FY1973. The increases in NIH appropriations appear to have been motivated by long-run public health concerns and unrelated to short-run macroeconomic prerogatives, such as concerns about inflation or unemployment. As such, we classify this policy event as exogenous. This policy event is dated to 1971Q3, when the FY1972 Labor-HEW Appropriations Act took effect, resulting in a significant increase in NIH research funding well before the Second Supplemental Appropriations Act for FY1972 was enacted, providing a much smaller additional boost to NIH funding. Most pertinent narrative evidence:

- "I will offer a far-reaching set of proposals for improving America's health care and making it available more fairly to more people... I will also ask for an appropriation of an extra $100 million to launch an intensive campaign to find a cure for cancer, and I will ask later for whatever additional funds can effectively be used. The time has come in America when the same kind of concentrated effort that split the atom and took man to the moon should be turned toward conquering this dread disease. Let us make a total national commitment to achieve this goal." Richard Nixon, State of the Union Address, January 22, 1971 (*The American Presidency Project*, by Gerhard Peters and John T. Woolley, https://www.presidency.ucsb.edu/node/240562)
- "Federal outlays for biomedical research will rise to $1,355 million in 1972 and constitute over 60% of all funds spent on health research in the United States. Cancer is the second most prevalent cause of death. Scientists believe we are now able to accelerate research on cancer with a high probability of success. The 1972 budget initiates a special $100 million increase in research funds targeted at cancer research. The 1972 budget also provides for intensive research on sickle cell anemia. Additional research funds are provided for heart disease, tooth decay, and an expanded effort to increase knowledge of human reproduction and to improve the ability of parents to plan their families. Other major investigations will be directed toward lung diseases, the effect of environmental pollutants on health, understanding mental illness and drug addiction, and preventing the disabilities and diseases of infancy and early childhood." (Budget of the United States, FY1972, p. 150)
- "In the last seven years we spent more than 30 billion dollars on space research and technology and about one-twenty-fifth of that amount to find a cure for cancer. The time has now come to put more of our resources into cancer research and—learning an important lesson from our space program—to organize those resources as effectively as possible... we should recognize that of all our research endeavors, cancer research may now be in the best position to benefit from a great infusion of resources. For there are moments in biomedical research when problems begin to break open and results begin to pour in, opening many new lines of inquiry and many new opportunities

for breakthroughs. We believe that cancer research has reached such a point. This administration is therefore requesting an additional $100 million for cancer research in its new budget." Richard Nixon, Special Message to the Congress Proposing a National Health Strategy, February 18, 1971 (*The American Presidency Project*, by Gerhard Peters and John T. Woolley, https://www.presidency.ucsb.edu/node/240690)

- "The following constitutes items of special concern to the [Senate Appropriations] Committee because of a lack of funding or underfunding in the budget request. In many cases, the House recognized the inadequacy and its bill added the necessary amounts. In those cases where the level of funding recommended in the House bill is, in the opinion of the Committee, inadequate, further increases have been recommended in the Senate bill... The House Bill approved the increases in the budget request and added $87,881,000 to bring up to the 1971 program level all [NIH] research and training grant and contract programs that were cut below that level in the budget. The Committee concurs in the House Action and has included an additional $159,424,000 for selected research initiatives." (S. Rpt. 92-316, July 29, 1971, pp. 8-9)
- "The budget estimates for the [NIH] are in odd contrast to the dynamic nature and superb capability of the medical research establishment that has been painstakingly built up in the United States and which is now unmatched by any other country. They are also in odd contrast to the seriousness and urgency of the health problems that remain to be solved and the legitimate and growing aspirations of the American people for better health care which, in the long run, can only come about through the development of more accurate and earlier diagnosis, more effective treatment and, whenever possible, reliable preventive measures. The budget is a lack-luster, pedestrian document that does not rise to the readily identifiable opportunities for pressing the fight against disease and disability and that fails to make adequate provision for the optimum use of the research tools already at hand. Several months ago Congress welcomed the President's request for an additional $100 million to launch a cancer conquest program in FY1972. The request was promptly granted in the Second Supplemental Appropriations Act which was approved on May 24. The Committee was encouraged by this apparent, evidence that the Administration was, at long last, ready to move ahead with research on the major diseases and was particularly impressed by the President's emphatic statement that he would "ask later for whatever additional funds can be effectively used." Official witnesses have presented this action as marking the resumption of more vigorous support for medical research which has been allowed to lag during the past few years because of preoccupation with the Vietnam War and the problems of inflation. The regular budget estimates, however, show no evidence of any desire to recover lost research momentum. For the research components of NIH there is an overall increase of only 2.2 percent which falls far short of the inescapable increase in the cost of research... Research on diseases of the heart and lung—the leading cause of death in this country—was allowed an anemic increase of 2 percent. For research on stroke and the tragically crippling neurological diseases, there is actually a decrease of 3 percent. For the Institute that supports research on kidney failure, arthritis, digestive diseases, diabetes, and other metabolic diseases, there is a minuscule increase of 0.7 percent..." (Ibid, pp. 31-32)
- "The largest increases [in the House Labor-HEW bill] over Administration requests were $127.8-million for medical facilities construction, $88.7-million for the [NIH] and $81.8-million for mental health programs... For the [NIH], the [Senate] committee

recommended $1,821,940,000—$294.8 million more than the budget request, $374.9 million more than the House appropriation, and $138.8 million more than the fiscal 1971 appropriation... conferees set [NIH] appropriations at $1,683,229,000. This was $156.1-million more than the $1,527,105,000 budget request; $236.2-million more than $1,447,055,000 House figure, and $138.7-million less than the $1,821,940,000 Senate amount. The [NIH] research programs were increased $142.1-million above the budget request of $1,291,841,000... The research increases included a $3,193,000 increase over the budget request for the [NCI]" ("Labor, HEW Appropriations: $20.8-Billion for fiscal 1972," *CQ Almanac 1971*, 27th ed., 01-232-01-237. Washington, DC: Congressional Quarterly, 1972)

NIH R&D Appropriations for FY1973

Primary Bill: Continuing Appropriations, 1973

Public Law: 92-334 **Enacted:** July 1, 1972 **Effective:** July 1, 1972

Nominal change		Real change		Classification
Millions ($)	YOY%	Millions ($2012)	YOY%	
$167.2	9.8%	$339.6	5.5%	Exogenous

Congress again appropriated significant increases in both nominal and real NIH research funding for FY1973, largely motivated by President Nixon's "war on cancer" and congressional support for medical research funding. Shortly before releasing the FY1973 budget request, President Nixon signed the National Cancer Act of 1971 (Pub. L. 92-218) into law in December 1971, which had authorized $30 million in additional appropriations for the NCI in FY1973, and the Second Supplemental Appropriations Act, 1972 (Pub. L. 92-306) had appropriated an additional $40 million for the NCI, available through FY1973. The administration had also been championing increased sickle cell anemia research and pushed to turbocharge the NHLI along with the NCI—an effort culminating in the enactment of the National Heart, Blood Vessel, Lung, and Blood Act of 1972 (P.L. 92-423) in September 1972, renaming the NHI the NHLI and expanding its mission. In his January 1972 State of the Union Address, President Nixon touted the recent enactment of the National Cancer Act of 1971 and recent increases in cancer and sickle cell anemia research funding; the FY1973 budget request also reflected the same priorities, as well as research efforts related to heart and lung disease and drug and alcohol addiction. The appropriators welcomed the administration's sustained emphasis on cancer research but thought other areas of medical research were lacking in the budget request. In their report on FY1973 Labor-HEW appropriations, the House Appropriations Committee noted that roughly 75% of the $104 million proposed increase in NIH funding was for cancer and cardiac health research while funding for other research programs would not maintain "present levels of activity." The House committee provided an additional $38.1 million for research at NIH institutes other than the NCI and NHLI in their allowance. The Senate Appropriations Committee was particularly frustrated that research fellowship and training programs had been allowed to fall in real terms and added another $47.8 million above the House allowance to restore NIH fellowships and training grants to FY1969 levels. The Senate committee also added an additional $50 million for the NHLI above and beyond the House allowance, which would have represented a $117 million (50%) increase over FY1972 funding "to make a good start on an accelerated program to arrest the ravages of heart and lung disease." President Nixon welcomed the requested funding for cancer research, but vetoed the FY1973 Labor-HEW

appropriations bill, declaring it "a perfect example of that kind of reckless Federal spending that just cannot be done without more taxes or more inflation, both of which I am determined to avoid." Congress passed a second version of the bill with the same level of funding but allowing the President to impound up to $1.2 billion of those funds, which Nixon again vetoed for exceeding his budget request. The series of five continuing resolutions that made Labor-HEW appropriations throughout FY1973 provided the lower of the House or Senate allowance for each program, nonetheless resulting in $2.54 billion for the NIH, $348 million (16%) above the administration's request, including sizable increases for the administration's NCI and NHLI priorities. The (first) Continuing Appropriations, 1973 (Pub. L. 92-334) bill set this funding level, and four subsequent continuing resolutions merely extended said funding levels for the NIH throughout the remainder of FY1973, so this policy event is dated to 1972Q3. While the vetoes of the Labor-HEW appropriations bills were motivated by concerns about inflationary pressure from government spending and Congress exceeding the budget request, the increases in NIH appropriations appear to have been motivated by President Nixon's war on cancer and unrelated to concerns about inflation or other short-run macroeconomic prerogatives. As such, we classify this policy event as exogenous. Most pertinent narrative evidence:

- "The National Health Strategy I outlined last February is designed to achieve one of the Nation's most important goals for the 1970's, improving the quality and availability of medical care, while fighting the trend toward runaway costs. Important elements of that strategy have already been enacted. The Comprehensive Health Manpower Training Act and the Nurse Training Act, which I signed on November 18, represent the most far-reaching effort in our history to increase the supply of doctors, nurses, dentists and other health professionals and to attract them to areas that are experiencing manpower shortages. The National Cancer Act, which I signed on December 23, marked the climax of a year-long effort to step up our campaign against cancer. During the past year, our cancer research budget has been increased by $100 million, and the full weight of my office has been given to our all-out war on this disease. We have also expanded the fight against sickle cell anemia by an additional $5 million... Our program for the next year will also include further funding increases for health research—including substantial new sums for cancer and sickle cell anemia—as well as further increases for medical schools and for meeting special problems such as drug addiction and alcoholism." Richard Nixon, State of the Union Address, January 20, 1972 (*The American Presidency Project*, by Gerhard Peters and John T. Woolley, https://www.presidency.ucsb.edu/node/254763)
- "Almost a year ago, I submitted a health message to Congress establishing a National Health Strategy for the 1970's. This strategy was directed toward three objectives: prevention of health problems, assured access to medical care, and greater efficiency within the health care system... in 1973, I propose further actions that are essential to my national health strategy, including... a substantial increase in funds for the attacks on cancer and sickle cell anemia" (Budget Message of the President, FY1973, January 24, 1972, p. 22)
- "The National Health Strategy calls for the development of more and improved resources for health care. The 1973 budget supports this development through increased outlays for biomedical research, health manpower, construction of ambulatory medical care facilities, and efforts to make the system of health care more effective and efficient. Outlays for biomedical research will total $1.6 billion in 1973 compared to

$1.1 billion in 1969. Major research efforts are targeted to achieve breakthroughs in critical areas— particularly cancer, where outlays will reach $335 million. In 1973 the Administration will also increase research on sickle cell anemia and family planning. Other major areas of research will be heart and lung disease, drug and alcohol addiction, and environmental and occupational factors that affect health." (Budget of the United States, FY1973, p. 145)

- "There has been a general feeling during the past year— stimulated, in large part, by the passage of the new cancer conquest legislation — that medical research, after seven lean budget years was once more on the move. Indeed, at last year's hearings, official witnesses spoke of the beginning of a new and more vigorous phase in Federal support for medical research. The hope that lost momentum will be regained has recently been further buoyed by the Administration's support for pending legislation for a major expansion and acceleration of research on heart disease... [but] the 1973 budget request for the [NIH] is disappointing. For the NIH research components, as a group, the revised budget request of $1,580 million represents an increase of $104 million, or 7 percent, over the comparable 1972 level. However, nearly $76 million of this increase is for the Cancer Institute ($53.4 million) and the Heart Institute ($22.6 million) leaving for the other Institutes only $28 million of which nearly $4 million is for the mandatory pay raise. The net increase for the vast range of diseases, other than cancer and heart disease, is thus less than 3 percent which is certainly less than is required merely to keep these programs at their present levels of activity. The increase for the Cancer Institute, though by far the largest in the budget estimates for NIH, falls well short of conforming to the President's announced policy of providing "whatever additional funds can be effectively used." (H. Rpt. 92-1118, June 8, 1972, pp. 18-19)
- "In view of the obvious and unarguable need for at least a maintenance of effort in the other areas of the National Institutes, dealing with diseases that afflict millions of people, the [House Appropriations] Committee was amazed to see that the funds requested for new research projects, in the Institutes other than Cancer and Heart, were 10 percent below their 1972 level. Lack of support for new projects and new investigators will quickly stultify research and a 10 percent cut, at a time when costs are still rising, cannot fail to have a serious effect. The Committee has therefore added funds to the appropriations of each of these Institutes to restore the number of competing research grants that can be supported in 1973 to the 1972 level... The increases for the Institutes (other than Cancer and Heart) and the research Divisions total $38,065,000" (Ibid, pp. 19-20)
- "The [Senate Appropriations] Committee is convinced that the time has come—and, indeed, is past due—to restore the research fellowship and training programs to the level at which they were before the subtle policy of attrition was put into effect. It has, accordingly, added $46,782,000 to the bill which, together with the House increases for these programs, will restore them to their FY1969 level and provide a reasonable base for their future growth... The Committee is satisfied with the House allowance of $492.2 million for the Cancer Institute—an increase of $60 million over the budget request—will provide adequate funding for this program. The amount in the bill represents a 46 percent increase over the FY1972 appropriation; it is more than two and a half times the amount available for cancer research in FY1970 when the commission that reviewed the opportunities for an accelerated effort was appointed. An equivalent effort must, however, be made to conquer the major heart and lung diseases which actually

cause more deaths and disabilities than cancer. To the House allowance of $300 million for the [NHLI], the Committee has added a further $50 million. This will provide an increase of $117.4 million, or 50 percent, over the FY1972 appropriation and will enable the Institute to make a good start on an accelerated program to arrest the ravages of heart and lung diseases." (S. Rpt. 92-894, June 19, 1972, p. 40)

- "Today, I must return without my approval HR 15417, the [FY1973 Labor-HEW] appropriations bill. Exceeding my budget recommendations by $1.8 billion, this bill is a perfect example of that kind of reckless Federal spending that just cannot be done without more taxes or more inflation, both of which I am determined to avoid... What Congress has done is take my ample and carefully considered 1973 budget proposals and balloon them to fiscally dangerous dimensions. This Administration is second to none in its concern for America's health, education, and manpower program needs. From the very beginning, we have consistently proposed and supported desirable programs in both the health research and health services areas, and we will continue to do so. For example, we proposed—and in November of 1971, I signed into law—the most comprehensive health manpower legislation in the Nation's history. This Administration launched the first separate Federal effort to combat sickle cell anemia. We have nearly doubled the Federal commitment to finding a cure for cancer... The failure of Congress to use balance and restraint in the framing of HR 15417 has turned it into a big-spending measure that impairs the Nation's economic health... In returning this measure without my approval, I again urge Congress to join with me to avoid higher taxes, higher prices, and a resulting cut in purchasing power for the American people by enacting a general spending ceiling of $250 billion." Richard M. Nixon, Veto of the Departments of Labor, and Health, Education, and Welfare Appropriation Act, 1973, August 16, 1972 (*The American Presidency Project*, by Gerhard Peters and John T. Woolley, https://www.presidency.ucsb.edu/node/254719)
- "Nine days after Congress adjourned, President Nixon on Oct. 27 pocket vetoed a bill (HR 16654) appropriating $30,538,919,500 for the Departments of Labor and Health, Education and Welfare (HEW) for fiscal 1973. Nixon's veto was his second of a Labor-HEW money bill during the 1972 session. Both versions were vetoed for the same major reason: that they greatly exceeded Nixon's budget requests. After the House sustained the veto of the first Labor-HEW bill (HR 15417) on Aug. 16, Congress cleared a second bill appropriating the same amount of money—$30,538,919,500—but permitting the President to impound up to $1,238,919,500. But if Nixon had impounded the maximum, the bill would still have been $532 million more than he requested. Nixon's second veto of the Labor-HEW funds came amid a highly publicized series of actions in which the President vetoed eight other bills as inflationary. In vetoing the measures, Nixon said: "If I were to sign these measures into law, I would, in effect, be making promises that could not be kept since the funds required to finance the promised services are not available and would not be available without the higher taxes I have promised to resist"... Because of the Nixon veto, Labor-HEW programs for fiscal 1973 were to be funded under a continuing appropriations resolution (H J Res 1331) at the lower of either the Senate- or House-approved appropriation in the HR 15417." ("Nixon Vetoes $30.5-Billion Labor-HEW Appropriations," *CQ Almanac 1972,* 28th ed., 01-865-01-878. Washington, DC: Congressional Quarterly, 1973)

NIH R&D Appropriations for FY1974

Bill: Departments of Labor, and Health, Education, and Welfare Appropriation Act, 1974
Public Law: 93-192 **Enacted:** December 18, 1973 **Effective:** December 18, 1973

Nominal change		Real change		Classification
Millions ($)	YOY%	Millions ($2012)	YOY%	
$96.0	5.1%	-$174.8	-2.7%	Endogenous

Congress appropriated a modest increase in nominal NIH research funding for FY1974, which resulted in a significant decrease in real appropriations in the highly inflationary environment; the changes in NIH research funding were motivated both by President Nixon's "war on cancer" and concerns about the inflationary influence of the federal budget. Before the appropriation cycle got underway, the recently enacted National Cancer Act of 1971 (Pub. L. 92-218) had authorized up to $40 million in additional appropriations for the NCI in FY1974. While the Nixon administration was still pushing for more cancer and heart disease research, the overall stance of the FY1974 budget had pivoted to "guard against inflation," and the administration was trying to keep federal spending capped at $250 billion; see "NASA R&D Appropriations for FY1974" for more details. While still supportive of increasing funding for cancer and heart disease research, the House Appropriations Committee was livid that medical research in these areas were "being expanded at the expense of research on other diseases"—all institutes save the NCH and NHLI saw a significant funding cut in the FY1974 budget request; to re-balance medical research efforts, the House committee increased NIH funding by $209.5 million in their allowance. The Senate Appropriations Committee was similarly "appalled" by the Nixon administration's FY1974 budget request for the NIH—as well as the administration's action of impounding $537 million of NIH funding for FY1973—and threw even more funds at medical research than their House counterparts, including for cancer and cardiovascular research. In the backdrop, President Nixon issued a veto threat, stating that he would veto any appropriations bills substantially exceeding his budget requests and thereby "forcing more inflation upon the American people." The conference committee settled on $2.58 million—$611.6 million above the administration's budget request but only $40 million above the enacted appropriations for FY1973 (before the administration's impoundment of funds, which were motivated by concerns about inflation). In the high inflationary environment at hand, this more modest nominal increase nonetheless resulted in a significant decrease in real appropriations. The decrease in the nominal budget request and decrease in real enacted appropriations appear to have been largely motivated by concerns about the federal budget exacerbating inflation, and as such, we classify this policy event as endogenous. Most pertinent narrative evidence:

- "My strategy for health in the 1970's stresses a new Federal role and basic program reforms to assure that economical, medically appropriate health services are available when needed. As major elements in this strategy, the 1974 budget provides for:... increased funding for cancer and heart disease research" (Budget Message of the President, FY1974, January 29, 1973, p. 18)
- "Outlays [for biomedical research] are estimated at $1.7 billion in 1974, compared with the 1973 estimate of $1.6 billion. Major research efforts are directed toward obtaining new knowledge to combat heart disease and cancer—the two leading causes of death in the United States. Budget authority for cancer research will total $500 million in 1974, while funds for research on heart, lung, and blood diseases will reach $265 million. Other targeted research areas include sickle cell anemia, aging, family planning, vene-

real disease, drug addiction, and environmental factors that affect health." (Budget of the United States, FY1974, p. 135)

- "Last year the [House Appropriations] Committee expressed its disappointment that the 1973 budget request for the [NIH]—coming in the wake of the Administration's support for the National Cancer Act of 1971 and the National Heart, Blood Vessel Lung and Blood Act of 1972, which was then pending—did not reflect the general expectation that Federal support for medical research and manpower training was entering a more vigorous phase in which lost momentum might be quickly regained. In the light of subsequent events, it is not surprising that the 1974 estimates for the NIH are even less satisfactory being well below last year's budget request and more than 22 percent below last year's appropriation... The nominal increase of $48.4 million for the research Institutes, as a whole, involves an increase of $91.8 million for the [NCI] and [NHLI], and a decrease of $43.4 million in funds for other Institutes. It is clear that research on cancer and heart disease is being expanded at the expense of research on other diseases. Such a reduction, coming on top of the cut already imposed on these Institutes by the fiscal 1973 "operating plan," would mean that their funds would be reduced by $111.1 million, or more than 12 percent, since the new cancer initiative was launched in FY1972" (H. Rpt. 93-305, June 21, 1973, pp. 22-23)
- "The [Senate Appropriations] Committee can understand and appreciate the difficulties arising from the need to meet mandatory requirements of noncontrollable programs and still control Federal spending. Unfortunately, when forced to operate within a fixed total budget ceiling and still meet mandatory costs, the result is limited budget resources for controllable, or discretionary programs. Given these limitations, many Federal programs have been forced to eliminate or sharply curtail activities that would otherwise be in full operation. The Committee does not underestimate the difficulties faced in attempting to formulate the Federal budget in the face of run-away inflation and scarce resources. However, it feels that in this, the first year of peace, a realignment of priorities can and should be undertaken. This realignment should not be construed to require a choice between one channel of resources or another, but rather a more appropriate balance of Federal expenditures... [prioritizing] relentless warfare against illness and disease." (S. Rpt. 93-414, October 2, 1973, p. 2)
- "This year, as in the past several years, the [Senate] committee is appalled by the budget request for the [NIH]. In all but two instances, the budget represents a reduction below last year's drastically reduced operating level for the NIH. In the case of the Heart and Cancer programs, the budget constituted a net decrease of $25 million below the level appropriated by Congress last year... For the last several years, Congress has attempted to meet this commitment, only to have its efforts nullified through Presidential vetoes and impoundments of funds. Such was the case in 1973. [OMB] not only impounded $537 million of program funds appropriated by Congress but went on to reduce the President's original budget request by an additional $181 million. It should be said that whatever momentum there existed in Federal research efforts prior to fiscal 1973 will be difficult to regain. The time lost in important research will never be made up. The blame for this loss of health research and manpower momentum is directly related to the "total health policy" of the Administration and not to the policies of Congress... To offset minimal increases for cancer and heart disease, the budget request for other Institutes has been reduced by $45 million below the 1973 rating level and $18 million below the level appropriated by Congress last

year. In other words, the budget represents a 19 percent drop for these other Institutes. In more specific terms, the budget request would drastically curtail research on such devastating and widespread health problems as diabetes, kidney disease, stroke, mental retardation, and blindness. The Committee remains steadfast in its commitment to heart and cancer research but refuses to take part in wholesale trade-offs where human life is concerned. To engage in such a practice is indefensible as a policy" (Ibid, pp. 34-35)

- "The [House Appropriations] committee recommended a total of $4,761,728,000 for the Health Services and Mental Health Administration and the [NIH]. The recommended amount was $333,716,000 more than the budget request... The committee also recommended increases over the budget request for all of the [NIH]. The administration had requested increases over the fiscal 1973 requests only for the [NCI and NHLI] while requesting less money for the remaining health institutes... [For the NIH, the House committee recommended] $1,741,271,000—$209,495,000 more than the President's request... The committee increased funding for all the institutes; the largest increase—$37,205,000 over the request—was for the National Institute of General Medical Sciences. The committee also expressed disapproval of administration plans to phase out biomedical research training grants and fellowships awarded by each health institute. "It seems very unwise," the committee said, "to pursue a course that would have the result, even in a few years, of leaving the entire medical research establishment in the hands of a group of aging scientists past their prime." The committee added $172,372,000 to the health institutes appropriations to allow them to fund the same number of research projects, fellowships and training grants as were funded in fiscal 1972..." ("Nixon Signs $32.9-Billion Labor-HEW Bill," *CQ Almanac 1973*, 29th ed., 156-66. Washington, DC: Congressional Quarterly, 1974)
- "The [Senate Appropriations] committee recommended a total of $5,025,127,000 for the Health Services and Mental Health Administration and the [NIH]... Major increases over the House-approved version were for the [NIH]. The committee recommended increases for all of the disease institutes except Environmental Health Sciences. The committee recommended $580 million for the [NCI]—$80 million more than the budget request and $57,617,000 more than the House approved. A total of $320 million was recommended for the [NHLI]—$55 million more than requested and $38,585,000 more than the House amount. The committee also recommended a total of $169,421,000 for alcoholism programs—$36,322,000 more than requested and $45 million more than the House amount... the committee said it was "shocked by what appears to be a general downgrading of all efforts to overcome this national problem" (Ibid)
- "Nixon had indicated that he would veto appropriations bills that were substantially above his budget request. Upon signing three authorization bills on June 18, Nixon said that the authorization levels in the bills were higher than he believed desirable but would "not damage our overall fiscal position if the Congress now follows my budget recommendations in the appropriations process... As we go forward, let there be no mistake about one fundamental point: If bills come to my desk that are irresponsible and would break open the federal budget, forcing more inflation upon the American people, I will veto them." (Ibid)
- "House-Senate conferees filed their conference report on HR 8877 (H Rept 93–626) Nov. 8, appropriating a total of $32,926,796,000. The final amount was $1,376,843,000 more than the budget request. Conferees resolved differences between the House and

Senate versions as follows: [NIH] Appropriation: $2,576,478,000—$611,616,000 more than the President requested. The House had approved $2,499,895,000; the Senate, $2,665,730,000." (Ibid)

NIH R&D Appropriations for FY1975

Bill: Departments of Labor, and Health, Education, and Welfare Appropriation Act, 1975
Public Law: 93-517 **Enacted:** December 7, 1974 **Effective:** December 7, 1974

Nominal change		Real change		Classification
Millions ($)	YOY%	Millions ($2012)	YOY%	
$383.3	19.4%	$581.9	9.1%	Exogenous

Congress appropriated significant increases in both nominal and real NIH research funding for FY1975, largely motivated both by President Nixon's "war on cancer" and congressional concerns about a balanced medical research program. Medical research in cancer, heart, lung, and blood diseases continued to be the top priorities of the Nixon administration, and was reflected in the FY1975 budget request. As Congress was working on the FY1975 Labor-HEW appropriations bill, the National Cancer Act Amendments of 1974 (Pub. L. 93-352), enacted on July 23, 1974, extended the National Cancer Program and authorized additional NCI appropriations of $53 million for FY1975, $68.5 million for FY1976, and $88.5 million for FY1976. However, the appropriators remained frustrated that cancer and cardiac research was being prioritized at the expense of work by other NIH institutes. The Senate Appropriations Committee again expressed its "disappointment" with the administration's budget request for NIH-funded medical research, particularly that cancer research was displacing other medical research funding; even regarding cancer research, the Senate committee was frustrated that the administration's request fell shy both of the FY1975 authorization limit and recent recommendations of the National Cancer Advisory Council. The conference committee settled on $2.09 billion for the NIH, slightly closer to the Senate allowance of $2.19 billion than the House-approved $1.79 billion allowance, including $91.7 million in additional NCI funding relative to the FY1975 budget request. The net increase in NIH appropriations appears to have been motivated by long-run public health concerns and unrelated to concerns about inflation or other short-run macroeconomic prerogatives. As such, we classify this policy event as exogenous. Most pertinent narrative evidence:

- "Under this budget, the momentum of cancer, heart, and other research initiatives would be sustained, and total funding for biomedical research would exceed $2 billion in 1975, almost double the 1969 level." (Budget Message of the President, FY1975, February 4, 1974, p. 17)
- "Outlays [for biomedical research] are estimated at nearly $2.2 billion in 1975. Major efforts to obtain new knowledge about heart disease and cancer will continue. Budget authority for cancer research will total $600 million in 1975, with outlays of $559 million anticipated. Outlays for research on heart, lung, and blood diseases will reach $334 million. Emphasis will also be placed on other important research areas including digestive diseases, cystic fibrosis, neurological disease, sickle cell anemia, schizophrenia, aging, family planning, venereal disease, drug addiction, alcoholism, and environmental factors that affect health." (Budget of the United States, FY1975, pp. 118-119)
- "The budget request of $1,834,784,000 for NIH as a whole represents an increase, over the comparable appropriation for FY1974, of $54 million, or 3 percent. Although this

figure falls far short of meeting simple inflation costs, it gives a deceptively benign picture of the true nature of this budget. The funds requested for the [NCI] include an increase of $72.6 million, or 13.8 percent. The funds requested for the [NHLI] include an increase of $22.5 million, or 7.9 percent. But the real deficiency of the budget lies in the fact that the increases for these two Institutes total $95.1 million out of a total increase for all the research components of NIH of only $52.4 million. In other words, research on all other diseases and disabilities is cut by $42.7 million... The budget requests for the other eight Institutes and the Fogarty Center are at virtually the same dollar level as the comparable 1974 appropriations. This comparison is, however, misleading. As the result of a court order, $239.1 million of the FY1973 appropriated funds for NIH, which had been impounded by the administration, were released for obligation in 1974. Consequently, the obligational level in FY1974 is considerably higher than the appropriations" (H. Rpt. 93-1140, June 24, 1974, pp. 20-21)

- "For the past two years the [Senate Appropriations] Committee has expressed its disappointment that the budget requests for the [NIH] does not reflect the general expectation—and need—that Federal support for medical research should be entering a more vigorous phase. During the two and a half years since the National Cancer Act was signed, the pace of the administration's support for research has appeared at times to be two steps forward—one and a half steps back. The fears expressed by various eminent scientists that any increase for research on cancer would be at the expense of research on other diseases have turned out to be all too well founded. In fact, the cancer program itself has not fared nearly as well as its enthusiastic proponents were led to expect—especially when the President called for a "total national commitment" to the search for a cure for cancer and announced that he would ask the Congress "for whatever additional funds can be effectively used." In the light of subsequent events, it is not only becoming clear that the so-called war on cancer is little more than a skirmish but that it is being used, by the [OMB], as a screen for a general retreat in many other sectors of biomedical research. The only substantial increase in the budget estimates for NIH is for the [NCI] for which $600 million is requested. This amount, however, is $203.5 million short of the $803.5 million authorized for the cancer program in 1975 and $150 million short of the recommendations of the National Cancer Advisory Council. Moreover, because of the release of previously impounded funds, the NCI had nearly $589 million available in FY1974. When compared to a $600 million President's budget request for FY1975, the year-to-year increase represents a 1.7 percent increase over the 1974 operating level which is clearly not an adequate amount to off-set the increase in the cost of living which hits clinical and biomedical research especially hard." (S. Rpt. 93-1146, September 11, 1974, pp. 34-35)
- "Criticizing the administration for raising its requests for research on cancer and heart disease at the expense of the rest of the disease institutes, the [House Appropriations] committee increased budget requests for NIH by $205.1-million to a total of $1,787,328,000... The committee increased funding for the [NCI] by $60-million, to $479,506,000, and raised funding for the other institutes to make their funding levels comparable to or slightly higher than fiscal 1974 levels." ("Congress Votes $33-Billion in Labor-HEW Funds," *CQ Almanac 1974*, 30th ed., 97-109. Washington, DC: Congressional Quarterly, 1975)
- "As it had in the past, the [Senate Appropriations] committee criticized the administration for requesting a slight increase in funding for the [NCI] while cutting back fund-

ing requests for other NIH programs... The committee recommended $2,158,350,000 for NIH—$323,566,000 more than requested and $371,022,000 more than the House amount. The total included funds for research contracts which the House had not considered because there was no authorization... The committee raised the amount requested for the cancer institute to $720 million, $240,494,000 over the House allowance. Funding for the other institutes was also increased so they would be at least level with the fiscal 1974 operating budgets. The committee opposed the administration's proposal to phase out health research training grants, including enough funding to bring such grants up to the fiscal 1974 level. Like the House, the committee restored funding for general research support grants, a program the administration wished to terminate... The Senate adopted only two amendments increasing total appropriations in the bill... The second added $35-million, for a total of $755-million, to the [NCI]" (Ibid)

- "Conferees agreed to appropriate... $2,090,418,000 for the [NIH]. Appropriations for several health programs, including health manpower, were not considered because of a lack of authorizing legislation. The major increase over the budget request was for the [NCI]. The administration requested $600 million; conferees agreed to a $691,666,000 appropriation. Conferees also agreed to Senate-approved amendments for [NHI] research contracts. The appropriation had not been considered by the House." (Ibid)
- "I have signed H.R. 15580, the [FY1975 Labor-HEW appropriations bill]. The Congress intended that the appropriations provided in H.R. 15580 should not exceed the fiscal year 1975 budget... The conferees' report on the bill, however, explicitly states that the "Conferees are acutely aware of the need to control inflation and of the need to restrain spending as one means to achieve this objective." The report further states: "The Conferees have no intention of approving new budget (obligational) authority which will ultimately result in spending in excess of the total budget estimate for the bill." In conclusion, the conferees expressed the willingness of Congress to consider fully deferrals and rescissions submitted by the President to achieve these objectives. I commend the Congress on this responsible approach to reducing inflationary pressures." Gerald R. Ford, Statement on Signing the Departments of Labor, and Health, Education, and Welfare Appropriation Act, 1975, December 9, 1974 (*The American Presidency Project*, by Gerhard Peters and John T. Woolley, https://www.presidency.ucsb.edu/node/256111)

NIH R&D Appropriations for FY1976

Bill: Departments of Labor, and Health, Education, and Welfare Appropriation Act, 1976

Public Law: 94-206 **Enacted:** January 28, 1976 **Effective:** January 28, 1976

Nominal change		Real change		Classification
Millions ($)	YOY%	Millions ($2012)	YOY%	
$81.7	3.5%	-$212.9	-3.1%	Exogenous

Congress appropriated a modest increase in nominal NIH research funding for FY1976, which resulted in a significant decrease in real appropriations in the highly inflationary environment of the day; the changes in NIH research funding were largely motivated by disagreement between the Ford administration and congressional appropriators about the prioritization of health research. The National Cancer Act Amendments of 1974 (Pub. L. 93-352) had recently authorized appropriations of $68.5 million for the NCI in FY1976, and

President Ford maintained his predecessor's emphasis on cancer research but had proposed significant rescissions—cancellations of appropriated funds—to the NIH's enacted FY1975 budget, which Congress did not approve, setting the stage for a tumultuous budget fight. The administration's FY1976 budget request for the NIH was presented as a small net decrease, factoring in the proposed NIH rescissions into the budget baseline, but the appropriators were livid about a huge proposed cut relative to the enacted FY1975 levels of funding for the agency. The House Appropriations Committee claimed that the budget request would force the NIH "to renege on commitments or implied promises of support totaling more than $106 million," amounting to a "serious blow" against progress in health research. The Senate Appropriations Committee characterized the FY1976 request for the NIH as yet another "inadequate and unreasonable Presidential budget request," one compounded by out-of-date assumptions and lazy budgeting. Appropriators in both chambers significantly increased NIH funding in their committee bills, particularly for the NCI and NHLI, with the Senate committee again providing even larger increases over the administration's request, as in recent years. Relative to the budget request, the conference committee settled on increases of $156.7 million for the NCI, $77.2 million for the NHLI, and $108.7 million for the ADAMHA, among other agencies. President Ford vetoed the FY1976 Labor-HEW bill for "unjustified, unnecessary, and unwise" increases in federal spending, but Congress overrode the veto. The net nominal increase in NIH R&D appropriations relative to FY1975 funding levels—which were well above the budget baseline for the administration's request—were sufficiently modest to result in a significant decline in real medical research funding. However, the nominal increase and net real decrease in NIH appropriations appear to have been unrelated to concerns about inflation or other short-run macroeconomic prerogatives. As such, we classify this policy event as exogenous. Most pertinent narrative evidence:

- "Outlays for NIH biomedical research will be nearly $1.7 billion in 1976—an increase of 15% since 1974. This funding level will maintain efforts in all significant research areas. Major emphasis will continue to be placed on cancer research, where outlays of $582 million are estimated for 1976." (Budget of the United States, FY1976, p. 133)
- "The [House] bill includes $2,150,755,000, an increase of $469,401,000 over the budget request and an increase of $211,473,000 over the 1975 appropriations. The budget estimates for the [NIH] were designed to provide a very small net increase in 1976 over the reduced amount that would have been available in 1975 under the President's proposed rescissions in the appropriations for FY1975. However, as Congress did not concur in these rescissions, the full amount of the appropriations is, in fact, available for obligation... For NIH as a whole, the budget request would make it necessary to renege on commitments or implied promises of support totaling more than $106 million. Such an unprecedented withdrawal of support by NIH would be a serious blow not only to the research projects directly affected but to the institutions in which they are conducted and, most importantly, to the pace of progress in health-care capability." (H. Rpt. 94-311, June 19, 1975, p. 20)
- "The [Senate Appropriations] bill includes $2,266,181,000, an increase of $584,827,000 over the budget request, $115,426,000 over the House allowance, and $328,822,000 over the FY1975 level. In the past years the Congress has strongly and successfully resisted the inadequate and unreasonable Presidential budget requests for the [NIH]. These insufficient requests would have fallen far short of matching the much talked about commitments to attacks on cancer, heart disease, venereal disease, blindness, and environmental hazards had Congress accepted them. The fiscal 1976 budget re-

quest is no different than previous requests. This year, however, the NIH estimates are unrealistic in a much more literal sense; they are based on a premise that had become inoperative by the time the requests were being considered in Congress. It is clear from the budget justifications and the testimony at the hearings that it was the Administration's intent to maintain NIH activities at the FY1975 level but that this level was assumed to be contained in the President's plan for recessions of 1975 appropriations. No cognizance was taken of the fact that the rescission plan would be rejected by both Houses of Congress and that the NIH programs would actually be operating at the level provided by the FY1975 appropriations. As a result, the budget requests appropriations for FY1976 totaling $1.8 billion to maintain programs for which $2.1 billion was appropriated in 1975. The 14 percent reduction does not reflect a policy decision by the administration to reduce Federal support for medical research by one-seventh; it is simply due to the fact that the budget is outdated and has been superseded by events." (S. Rpt. 94-366, September 10, 1975, p. 33)

- "The [Senate Appropriations] committee added $100-million to the House allowance, for a total of $803,564,000, for the [NCI]. That amount was $216.7 million over the budget request and $134.4 million over the 1975 amount. The committee also added $50 million to the House allowance, for a total of $379,059,000, for the [NHLI], making that appropriation $107.2 million greater than requested and $75.8 million greater than the comparable 1975 amount. The committee added much smaller amounts to the House appropriations for several other of the health institutes. It offset some of the increases by reducing the amount appropriated by the House for buildings and facilities by $52 million, to $41 million. That amount was still $38-million greater than the fiscal 1975 appropriations" ("Veto of Labor-Hew Funds Bill Overridden," *CQ Almanac 1975*, 31st ed., 887-900. Washington, DC: Congressional Quarterly, 1976)
- "Conferees agreed to appropriate a fiscal 1976 total of $31,592,976,318 for the HEW Department—$795,140,318 more than requested, $62,473,318 over the House amount and $148,579,000 less than the Senate amount. Most of the increase over the budget requests came in the area of health programs where conferees agreed to appropriate $3,904,971,000—$765,261,000 more than the administration had budgeted. Key appropriations were $557,693,000 for the Health Services Administration—$130,911,000 more than requested; $743,564,000 for the [NCI]—$156,727,000 more than requested, $40-million more than the House amount and $60-million less than the Senate amount; $349,059,000 for the [NHLI]—$77,219,000 more than requested, $20-million more than the House amount and $30-million less than the Senate amount; and $633,018,000 for the [ADAMHA]—$108,675,000 more than requested, $24,800,000 more than the House amount and $22,444,000 less than the Senate amount." (Ibid)
- "To the House of Representatives: I return without my approval H.R. 8069, the Departments of Labor and Health, Education, and Welfare Appropriation Act, 1976... H.R. 8069 would provide nearly $1 billion more in spending authority than I had requested. Not only would the $45 billion total in this bill add significantly to the already burdensome Federal deficits expected this year and next, but the individual increases themselves are unjustified, unnecessary, and unwise. This bill is, therefore, inconsistent with fiscal discipline and with effective restraint on the growth of government... By itself, this bill would add $382 million to this year's deficit and would make next year's deficit $372 million more than if my recommendations had been adopted. In addition, the increases provided for this year would raise expectations for next year's budget and

make the job of restraining spending that much more difficult. Thus, this bill would contribute to excessive deficits and needless inflationary pressures" Gerald R. Ford, Veto of the Departments of Labor and Health, Education, and Welfare Appropriation Act, 1976, December 19, 1975 (*The American Presidency Project*, by Gerhard Peters and John T. Woolley, https://www.presidency.ucsb.edu/node/257297)

- "Congress Jan. 28, 1976, handed President Ford his first defeat of the new year over federal spending when it overrode his veto of a bill (HR 8069—PL 94-206) making fiscal 1976 appropriations of $36,073,748,318 for the Departments of Labor and Health, Education and Welfare... By a surprisingly large 28-vote margin, the House voted to override Jan. 27, 310-113. The Senate overrode the veto on Jan. 28 on a 70-24 vote, seven votes more than the two-thirds of those present and voting needed for an override. Ford had vetoed the bill Dec. 19, calling it a "classic example of unchecked spending"... But override supporters in both the House and the Senate said President Ford's budget requests were inadequate and did not reflect congressional priorities. The issue "is really rather a simple one," said Rep. Daniel J. Flood (D Pa.), floor manager of the bill in the House. "The question is, do you believe that Congress was right in providing a modest increase in appropriations for programs like cancer research, maternal and child health, mental health, alcoholism... Or do you think that federal support for these programs should be reduced below the current [spending] levels?" (Ibid)

NIH R&D Appropriations for FY1978

Bill: Continuing Appropriations, 1978

Public Law: 95-165 **Enacted:** November 9, 1977 **Effective:** November 9, 1977

Nominal change		Real change		Classification
Millions ($)	YOY%	Millions ($2012)	YOY%	
$407.3	15.9%	$662.8	9.9%	Exogenous

Congress appropriated significant increases in both nominal and real NIH research funding for FY1978, largely motivated by long-run public health objectives and concerns about the supply of biomedical researchers. The outgoing Ford administration had requested a relatively modest $32.4 million (1.2%) increase in NIH funding, which congressional appropriators once again deemed to be grossly inadequate. The House Appropriations Committee proposed $2.74 billion for the NIH, representing an increase of $166.0 million (6.4%) over the budget request, while their Senate counterparts added $299.2 million (11.6%) above and beyond the administration's request. The House committee was particularly concerned that short shrift was being given to supporting funding and training for early biomedical research careers, while the Senate Committee remained skeptical that cancer and cardiovascular disease research should command such a high share of NIH research funding, and that within those two, more funding should be allocated toward heart disease, which was responsible for more deaths annually. The FY1978 Labor-HEW appropriations bill became unusually bogged down, mired by partisan disputes about federal funds paying for abortions. The conference agreement (H. Rpt. 95-538) accompanying the FY1978 Labor-HEW appropriations bill had settled upon funding levels, roughly splitting the difference between House and Senate allowances for the various NIH institutes, but conferees failed to resolve differences over abortion policy riders. A first CR enacted in October (Pub. L. 95-130) temporarily

extended NIH funding at the lower of the conference report or enacted funding for FY1977, effectively keeping NIH funding frozen in nominal terms for one month. The second Continuing Appropriations, 1978 (Pub. L. 95-165) bill instead approved the conference report as adopted by the House on August 2, providing higher funding levels for the NIH than those approved for FY1977, but only through November 30, 1977. A final CR (Pub. L. 95-205) resolved the abortion policy rider issue and provided funding for the remainder of the fiscal year, but did not alter NIH funding levels from the FY1978 Labor-HEW appropriations bill conference report. The net increase in NIH appropriations appears unrelated to concerns about inflation or other short-run macroeconomic prerogatives. As such, we classify this policy event as exogenous. Most pertinent narrative evidence:

- "Outlays for research are estimated to decline from $2.2 billion in 1977 to $2.0 billion in 1978 and 1979... The budget request maintains current levels of effort in major research areas such as cancer and heart disease. The elimination of general-purpose, noncompetitive formula grants to research institutions is proposed in 1978 in order to provide additional funding for competitive research grants. The 1978 budget includes support for health services research in areas such as quality of care, cost containment and health insurance. Budget authority for regular NIH competitive research grants made to universities, clinics, and medical centers is estimated to rise by $55 million to $1.1 billion in 1978. This provides for an increase of 7% in basic research, emphasizing areas such as immunology and genetics. NIH research grants usually represent a 3-year Federal commitment. For example, in 1978, $769 million of the $1.1 billion in budget authority requested for regular NIH grants will go to fulfill prior year commitments." (Budget of the United States, FY1978, p. 162)
- "The [House] Committee recommendation for the [NIH] totals $2,742,402,000. This is an increase of $166,031,000 over the budget request and $198,388,000 over the 1977 appropriation. The recommended appropriations allow for an additional $91,158,000 in new and competing research grants, restores the research training activities to the 1977 level, continues the Biomedical Research Grant Program... It is obvious that the vigor of the American health research enterprise can only be maintained if a sufficient number of our brightest and most imaginative young people are attracted to and properly trained for biomedical research careers. The Committee has long been concerned that the research training programs of NIH be maintained at a level adequate to meet future needs. For this purpose, the bill contains an increase of $16.2 million over the budget estimates which will keep these programs at their FY1977 dollar level and provide a modest increase for the training of research personnel for which there is an urgent and crucial need in research on the impact of environmental factors on health." (H. Rpt. 95-381, June 2, 1977, pp. 23-24)
- "The [Senate Appropriations] bill includes a total of $2,875,588,000 for the 16 NIH appropriations, an increase of $299,212,000 over the budget request, $133,181,000 over the House allowance, and $881,569,000 over the comparable fiscal year 1977 appropriations. The Congress can be proud of the results of its long years of taking the initiative in broadening the scope and accelerating the pace of medical research in this country. While the primary objective of creating an unrivaled research establishment has been attained, the scope and momentum of its work must be maintained... The Committee has not significantly disturbed the balance of the budget request, but it is somewhat concerned that twice as much is spent on cancer research as on research on heart, lung, and blood diseases which account for more deaths and protracted disabilities than can-

cer. And there is some question about whether devoting half of the NIH research funds to these two major areas best serves the varied health needs of the American people or takes optimum advantage of scientific opportunities for significantly advancing the medical profession's understanding of and ability to diagnose, treat and prevent the many diseases and disabilities" (S. Rpt. 95-283, May 18, 1977, pp. 38-39)

- "A bitter five-month struggle over the use of federal funds for abortion ended Dec. 7 when the House and Senate finally agreed on a compromise position. The agreement enabled final passage of $60 billion of fiscal 1978 appropriations for the Departments of Labor, Health, Education, and Welfare (HEW) and related agencies. It came just in time to avert cuts in the mid-December paychecks of some 240,000 employees in the affected agencies" ("Abortion Agreement Ends Funding Deadlock," *CQ Almanac 1977*, 33rd ed., 295-313. Washington, DC: Congressional Quarterly, 1978)
- "The [House Appropriations] committee included a total of $2.7-billion for the [NIH], increasing the administration's request by $166-million. In addition to financing $91 million in new research grants, the higher funding levels were intended to restore research training activities to 1977 levels and continue a program of biomedical research grants that the administration wanted to abolish. In increasing those requests, the committee said it particularly sought to attract more young people to biomedical careers and focus more of their training on the study of environmental factors related to health. The committee markedly increased the budget requests for several specific institutes as well. Recommendations included $831.9 million for the [NCI], $432.6 million for the [NHLBI], $237.5 million for the National Institute of Arthritis, Metabolism and Digestive Diseases and $175 million for the National Institute of Neurological and Communicative Disorders and Stroke." (Ibid)
- "As in other years, the Senate committee sharply raised House appropriations for NIH, including a total of $2.9 billion for the 16 institutes. The recommendation exceeded the House figure by $133 million and the administration's budget request by nearly $300 million... The conferees recommended total fiscal 1978 appropriations of $60,168,561,000. Because of a combination of cuts and lowered estimates for public assistance expenditures, the final amount fell below both the House and Senate figures—by $1.17 billion and $476 million, respectively... But the administration did not want these "savings" allocated to other programs, as the Senate version recommended. The conferees obliged by scaling down proposed increases for youth summer jobs, various education programs, and most of the [NIH] research institutes" (Ibid)

NIH R&D Appropriations for FY1979

Bill: Departments of Labor and Health, Education, and Welfare Appropriations Act, 1979
Public Law: 95-480 **Enacted:** October 18, 1978 **Effective:** October 18, 1978

Nominal change		Real change		Classification
Millions ($)	YOY%	Millions ($2012)	YOY%	
$397.7	13.4%	$455.2	6.2%	Exogenous

Congress appropriated significant increases in both nominal and real NIH research funding for FY1979, largely motivated by long-run public health objectives and new policy objectives of the Carter administration. Bucking trends from the Ford administration, President Carter's FY1979 budget request proposed substantial increases in funding for basic health

research, prioritizing children's health, nutrition, mental health, alcohol, and drug abuse research programs in particular. Mental health was a top concern for President Carter; shortly after being inaugurated, he created a Presidential Commission on Mental Health, and his budget's proposed funding increase for mental health, alcohol, and drug abuse research programs was in line with the commission's subsequent recommendations. But the administration proposed keeping the larger cancer and cardiac health research programs at roughly the same funding level as FY1978, limiting the total requested increase for the NIH; mental health research for the NIMH was funded through the Alcohol, Drug Abuse, and Mental Health Administration (ADAMHA), which remained a separate agency outside the NIH umbrella with its own appropriations accounts. Both the House and Senate appropriations committees added significant sums to the administration's requests for the various NIH research programs, providing significantly more for cancer and cardiac disease research among other areas; the House committee proposed $2.95 billion for the NIH, $305.7 million (11.5%) more than the budget request, while the Senate committee added $365.3 million (13.8%) to the administration's request. The House committee was also particularly keen to fund epidemiology research and scientific training, concluding that this important area of public health had been "somewhat neglected" in recent decades. The House Committee slightly pared back the administration's request for the NIMH's research program, but their Senate counterparts allowed the full request for the NIMH and approved $12 million (1.5%) more in total for the ADAMHA than the budget requested, including additional NIAAA alcoholism research funding. The administration later lobbied Congress to pare back some of the increases in the Labor-HEW appropriations bill, including those for the NIH, but the appropriators refused; the full House instead opted for a smaller across-the-board 2% reduction in funds in a floor amendment, and the Senate also trimmed back funding in a floor amendment. The conferees, however, discretely dropped both sets of budget-cutting amendments, prioritizing the higher funding levels approved by the appropriators, and roughly squaring the difference between House and Senate allowances for NIH and ADAMHA research. The net increase in NIH appropriations appears to have been motivated by long-run public health concerns and unrelated to concerns about inflation or other short-run macroeconomic prerogatives. As such, we classify this policy event as exogenous. Most pertinent narrative evidence:

- "The Federal mission of assuring the development of new knowledge on the causes, prevention, and treatment of disease is supported indirectly through grants and contracts for biomedical and behavioral research, as well as directly through research, carried out by Federal researchers in Federal facilities. With increases in life expectancy, the incidence of chronic and degenerative diseases in the United States has increased. Federal research emphasizes basic research in chronic and degenerative illnesses, such as cancer and cardiovascular disease, and in environmental and mental health problems... The budget request maintains current levels of effort in major research areas, such as cancer, diabetes, and heart disease. The budget request also provides substantial increases in support of research in developmental biology and behavioral and biological reproductive studies, including nutrition... HEW obligations for basic research are estimated to rise from $844 million in 1978 to $964 million in 1979. Proposed obligations for research related to mental health, alcohol, and drug abuse increase from $180 million in 1978 to $222 million in 1979, reflecting recommendations of the President's Commission on Mental Health." (Budget of the United States, FY1979, pp. 185-186)
- "The [House] committee recommendations for the [NIH] total $2,952,191,000. This is

an increase of $305,650,000 over the budget request and $318,356,000 over the comparable 1978 appropriations... The outstanding achievements of American physicians and other biomedical scientists and the position of leadership in medical research and technology that this country has achieved are in large part attributable to the support Congress has provided, during the past two decades, through the NIH appropriations... There is renewed interest in research on the causes and control of epidemics—a subject which has been somewhat neglected since the major contagious diseases were brought under control during the first half of this century. Research in epidemiology—and the training of competent epidemiologists who are now in short supply—is now very fragmented and clearly needs a more coordinated and efficient approach..." (H. Rpt. 95-1248, June 1, 1978, pp. 20-23)

- "The [House] bill includes $730,022,000 a decrease of $10 million from the budget request and an increase of $76,258,000 over the comparable 1978 appropriation... This appropriation supports the activities [of ADAMHA] which are responsible for developing knowledge, manpower, and treatment services to assist the nation in undertaking and addressing the continuing phenomena of mental illness, the abuse of drugs, and the misuse of alcohol. The Committee believes that ADAMHA should develop formal working relationships with the various NIH institutes in order to better coordinate ongoing and future research programs and to avoid duplication of effort" (Ibid, p. 47)
- "The [Senate Appropriations Committee] bill includes a total of $3,011,816,000 for the NIH appropriations, an increase of $365,275,000 over the President's budget request, $59,625,000 over the House allowance, and $377,981,800 over the comparable FY1978 appropriation... The Committee recommends an appropriation of $827,846,000, an increase of $97,901,000 over the comparable FY1978 level, $12,000,000 over the President's budget, and $22,000,000 over the House allowance for the [ADAMHA]" (S. Rpt. 95-1119, August 17, 1978, pp. 37, 63)
- "The many research programs of the [NIH] were granted $3 billion, a $305.7 million increase over the budget amount [in the House committee bill]. Most of the increases for the various institutes were earmarked for research grants, in particular projects that were "investigator-initiated." Totals for the institutes that received the largest increases over budget requests included $889.2 million for the [NCI], $485.6 million for the [NHLBI], $287.9 million for the National Institute of Arthritis, Metabolism and Digestive Disease, $183.2 million for the [NIAID] and $225.1 million for the National Institute of General Medical Sciences. The bill increased the budget request for construction by $37 million, to a total of $68 million, in order to expand the National Institute of Child Health and Human Development. The committee also added $38 million in research grant funds to the agency's funding, but refused to earmark $4 million of the amount specifically for research on smoking and health, as requested by HEW Secretary Joseph A. Califano Jr... After chopping an estimated $1.4 billion from spending in the bill, the House passed HR 12929 on June 13 on a 338–61 vote... Ironically, House adoption of the broad spending cuts followed the unceremonious scuttling of administration proposals to reduce specific programs. The administration had sought to eliminate increases made by the committee for the [NIH], elementary and secondary school assistance, and college student aid, which together added some $650 million to the budget request. Administration representatives had importuned committee member David R. Obey, D-Wis., to propose an amendment bringing funding for the programs back to budget levels. But Obey angrily and publicly denounced

the attempt... The Miller amendment, cutting 2 percent, or about $380 million, from total controllable spending in the bill, was adopted by a 220–181 vote on June 13. The amendment limited reduction of any single program to 5 percent." ("Labor-HEW Funds: Abortion Compromise," *CQ Almanac 1978*, 34th ed., 105-15. Washington, DC: Congressional Quarterly, 1979)

- "By bucking their most divisive issue—abortion—back to the full House and Senate, conferees on HR 12929 were able to report the measure Oct. 6... conferees decided to report the differing House and Senate provisions in disagreement, leaving the matter to be settled directly on floor votes. The final amount approved by the conferees was $56.1 billion. This is compared with $56.6 billion approved by the House and $54.5 billion approved by the Senate. The total budget request for the two departments and related agencies was $57.3 billion... The conferees quietly dropped a much-publicized House provision calling for a 2 percent cut in the spending in the bill, and a $1 billion cut added on the Senate floor. The conferees accepted spending levels mid-way between House and Senate amounts for almost all programs." (Ibid)

NIH R&D Appropriations for FY1981

Bill: Continuing Appropriations, 1981

Public Law: 96-369 **Enacted:** October 1, 1980 **Effective:** October 1, 1980

Nominal change		Real change		Classification
Millions ($)	YOY%	Millions ($2012)	YOY%	
$179.9	4.9%	-$300.1	-3.8%	Endogenous

Congress appropriated a substantial nominal increase for NIH R&D funding in FY1981, but in the highly inflationary environment at hand, it nonetheless resulted in a significant decrease in real appropriations for the year. Despite budgetary efforts to "contain inflation," President Carter's initial FY1981 budget request proposed significant funding increases for the research programs of both the NIH and ADAMHA. But those initial budget plans were soon revised as the economic situation rapidly deteriorated early that year. In mid-March, the administration announced a new anti-inflationary program, the focal point being reducing government spending, and promised to send congress a smaller revised FY1981 budget eliminating the deficit; see "NASA R&D Appropriations for FY1981" for more details. The March budget revision reduced the request for federal science and research funding by 2.8%, and much of the remaining envisioned growth in R&D spending was for DOD as opposed to nondefense agencies; the NIH saw its budget request for research pared back by $85 million (2.5%). But the updated underlying economic forecasts again proved wildly overoptimistic, sending the budget office back to the drawing board; the final FY1981 budget was not released until January 1981, well into the fiscal year and shortly before President Reagan was inaugurated. The House Appropriations Committee was none too pleased about the NIH's budget request being revised down by $91 million and a requested $41 million rescission of NIH funding for FY1980, which Congress did not approve; the Committee instead approved $3.62 billion for the NIH in FY1981, an increase of $187.3 million (5.5%) over enacted FY1980 funding levels and $126 million above the revised request. The House committee was especially pleased with recent achievements in NIH-funded diabetes research and remained concerned about providing more training support for medical research. But the appropriations process partially broke down in FY1981,

and the Senate never reported or passed a version of the FY1981 Labor-HHS-Education appropriations bill; appropriations for agencies funded by the Labor-HHS-Education were made in a series in CRs. The (first) Continuing Appropriations, 1981 (Pub. L. 96-369) set funding levels for the NIH in reference to the House-passed version of the FY1981 Labor-HHS-Education bill, through December 15, 1980; these funding levels were subsequently extended for the rest of the fiscal year in an end-of-session CR (Pub. L. 96-536) on December 16, ending a brief partial lapse in funding. Through the CRs, Congress appropriated a modest nominal increase in NIH funding for the year, motivated in part by long-run public health and medical research objectives. However, the reduction in the administration's nominal budget request for the NIH and the ensuing decline in real appropriations for the agency appear to have been largely driven by concerns about inflation and partly reflected a broader anti-inflationary program that influenced top-line spending in the CRs. As such, we classify this policy event as endogenous. Most pertinent narrative evidence:

- "We must monitor the economic outlook carefully. If the economy begins to deteriorate significantly, I will consider tax reductions and temporary spending programs for job creation targeted toward particular sectors of economic stress. But I believe current economic conditions argue for restraint. I believe that this judgment and this budget recognize that equitable budget restraint is essential in our efforts to control inflation; that the unemployed should not bear the costs of our anti-inflation efforts; and most importantly, that we continue to pursue the goals of full employment, price stability, and balanced growth... By continuing a clear and consistent policy of restraint, the 1981 budget ensures that the Federal budget will not be an inflationary force in the economy." (Budget Message of the President, FY1981, January 28, 1980, pp. M3-4)
- "Despite overall budget constraints, the administration is committed to increasing support for basic scientific inquiry and to helping advance the frontiers of technology in areas of general application. This commitment has been demonstrated by a policy of "real growth" for basic research in each of the budgets of this administration... Basic research is aimed at increasing our understanding of fundamental scientific principles that encompass a wide range of natural phenomena. Research on the laws of matter, of the universe, and on biological processes can provide the foundation for technological progress that is essential to maintaining the Nation's long-term prospects for industrial growth, agricultural productivity, a safe environment, medical advances, energy sufficiency, and national security. The budget provides for nearly 3% real growth over 1980 in obligations for basic research for all scientific disciplines throughout the Government." (Budget of the United States, FY1981, p. 120)
- "The budget proposes to increase budget authority for health research from $3.7 billion in 1980 to $3.8 billion in 1981... Health research at the [NIH] is the largest component of these activities. Budget authority is proposed to rise from $3.2 billion in 1980 to $3.4 billion in 1981. The request provides for support of 5,000 grants for new and continued research projects to increase the base of knowledge in health research and will support a total of approximately 16,700 research project grants in 1981. This strategy reflects the administration's commitment to a stable funding base for NIH's basic research activities. Approximately 50% of the budget authority requested for NIH is for research project grants. In addition to NIH research funding, budget authority for research in mental health, alcohol, and drug abuse is proposed to increase from $235 million in 1980 to $266 million in 1981, an increase of nearly 55% over the 1977 level. The 1981 budget will expand basic and applied research in areas such as neurotransmitters

and brain biochemistry, mental health treatment assessment, and biomedical factors in drug and alcohol abuse." (Ibid, pp. 253-254)

- "Scientific [R&D], which have been given a high priority by President Carter, appear to have survived well the budget cutting that has undermined many Government programs in recent weeks... Medical research supported by the [NIH] would be cut by $85 million, a 2.5 percent reduction from the original budget proposal" ("Science Projects Spared in Carter Budget Cutting," by Robert Reinhold, *New York Times*, April 6, 1980)
- "[The following questions were not asked at the hearing but were submitted to the Department for response subsequent to the hearing] Question: Madame Secretary, when the President first presented his budget for FY1981, I was somewhat disappointed with the funding levels he proposed for the [NIH]. However, I was aware that the figure represented an increase over the appropriation level Congress agreed to for FY1980. This is the first increase in funding for the Institutes by an Administration in many years. Now it seems that the progressive attitude of the Administration has been reversed in order to balance the budget. I find this hard to understand when one considers the cost to the nation of these diseases annually. Cancer alone is estimated to cost $30 billion a year. Would it not be more cost effective to spend adequate sums of money to combat these diseases than to have them take their toll in other federal programs such as disability benefits, Medicare and Medicaid expenses as well as the loss in revenues which consequently result? Answer: Despite the small spending reductions proposed for the [NIH] of $43 million in 1980 and $91 million in 1981 our commitment to this Nation's excellent biomedical research enterprise remains strong. Funding for new investigator-initiated research grants, the foundation for all basic research, continue unchanged in order to support 5,000 such grants in 1981. Decreases we have suggested in contract support applied research, cancer control, and care support of research centers are not viewed as seriously disrupting the work of research scientists in finding the cause of the preventing diseases. It should be noted that achieving a balanced budget and reducing inflationary costs, in addition to the efforts of research scientists in preventing disease, will have a significant impact on the future costs of Medicaid and Medicare... Unless the high costs of health care are rapidly contained, the ability of the Federal Government in the future to support researchers will be seriously eroded" Hearing Transcript, April 17, 1980 (Hearings Before the Senate Appropriations Committee on Labor-HHS-Education Appropriations, FY1981, pp. 41-42)
- "The [House] Committee's recommendations for the [NIH] total $3,616,447,000. This is an increase of $126,000,000 over the budget requests and $187,304,000 over comparable appropriations for 1980. The Committee's increase will restore the appropriations for most of the Institutes to at least the level requested in the original FY1981 budget estimates submitted to Congress last January. The revised budget, submitted in April, reduced the January estimates for 1981 by $91,000,000 and would have rescinded 1980 appropriations for NIH totaling $41,500,000. The Congress has not approved any of the 1980 recessions. The total budget authority for NIH recommended in the bill represents an increase of about 5.5 percent over the appropriations for 1980, and 13.5 percent over the appropriations for 1979... The Committee believes that a more concerted and comprehensive effort must be made to stabilize training support... the Committee needs better data and advice on the proper balance between stabilized research support and stabilized training support and on the relative importance, in this regard, of the various training programs... The Committee is impressed by the progress made in diabetes

research, including major achievements in the use of artificial devices, the development of insulin through DNA research, the transplantation of islet cells, and the improved management of blood sugar levels to abate the development of complications... the Committee expects all Institutes supporting diabetes research to continue their current level of effort and utilize a portion of the increase to expand activity in this area" (H. Rpt. 96-1244, August 21, 1980, pp. 26-28)

- "After a long lobbying campaign by the nation's health research establishment, Congress backed off and agreed not to require the [NIH] to go through the normal authorization process required of almost all other federal agencies. Final congressional approval of biomedical research legislation (S 988—PL 96-538) Dec. 4 marked the successful conclusion of the campaign by medical schools and other research institutions to keep Congress from expanding its role in setting priorities for the $3.5 billion-a-year research programs." ("Health Research," *CQ Almanac 1980*, 36th ed., 463-66. Washington, DC: Congressional Quarterly, 1980)
- "Economic conditions and changing political realities—from the taxpayer revolt to the taking of American hostages in Iran—combined in 1980 to put increasing pressure on health, education, and welfare systems. Inflation pushed the costs of medical care, food, fuel for home and school heating, and other living expenses so high that many government programs—and their recipients—were stretched to the breaking point... Rising unemployment, which went up by almost two percentage points during 1980, added to the burdens on social programs, as people who had lost their jobs turned to the government for help. At the same time, the growing conservatism of the voters worked to hold down funds available for the programs. Congress struggled to balance the federal budget, and state and local governments sought to stay within spending limits set by tax-cutting initiatives. Especially after the election victory of Republican presidential candidate Ronald Reagan, 1980 seemed to mark the end of an era, as the enormous expansion of social programs of the 1960s and 1970s entered a period of reassessment and reduction." ("Health/Education/Welfare 1980: Overview," *CQ Almanac 1980*, 36th ed., 409-10. Washington, DC: Congressional Quarterly, 1981)
- "Congress Dec. 16 approved a second continuing appropriations resolution (H J Res 644) providing money for government agencies whose appropriations had not been enacted—thereby clearing the way for the 96th Congress to adjourn... As cleared, H J Res 644 extended funding for agencies normally funded under the four appropriations bills [including] Labor-HHS-Education (HR 7998)" ("2nd Continuing Resolution," *CQ Almanac 1980*, 36th ed., 218-22. Washington, DC: Congressional Quarterly, 1981)

NIH R&D Appropriations for FY1982

Primary Bill: Continuing Appropriations Act of 1982

Public Law: 97-51 **Enacted:** October 1, 1981 **Effective:** October 1, 1981

Secondary: Continuing Appropriations Extension, 1982

Public Law: 97-85 **Enacted:** November 23, 1981 **Effective:** November 23, 1981

Tertiary: Further Continuing Appropriations, 1982

Public Law: 97-92 **Enacted:** December 15, 1981 **Effective:** December 15, 1981

Nominal change		Real change		Classification
Millions ($)	YOY%	Millions ($2012)	YOY%	
$29.0	0.8%	-$479.5	-6.3%	Endogenous

Congress appropriated a modest nominal increase for NIH research funding in FY1982, but in the highly inflationary environment at hand, it again resulted in a significant decrease in real appropriations for the year. The outgoing Carter administration had requested a significant increase in NIH funding from $3.4 billion to $3.6 billion in FY1982, and additionally requested increasing ADAMHA research funding from $240 million to $276 million. However, the incoming Reagan administration, grappling with stagflation and campaign promises, had markedly different budget priorities and heavily revised the FY1982 budget shortly after President Reagan was inaugurated, reducing the request for the NIH. The 1980 election also led to a significant realignment in congressional science policy leadership, notably the defeat of incumbent Senate Appropriations Committee Chairman Warren Magnuson (D-WA), who had been a longtime advocate of NIH research funding (the NIH's clinical research hospital was appreciatively renamed after him in 1980). The House Appropriations Committee increased NIH funding by $72.5 million over the budget request in their allowance, again prioritizing training support for medical research and an increase in the number of research grants funded. The Senate Appropriations Committee—now more sympathetic to President Reagan's efforts to reduce domestic spending—trimmed the House allowances for the NIH, and also pared back ADAMHA funding for research and scientific training, relative to enacted funds for FY1981 and the new budget request. But the appropriations process for the Labor-HHS-Education bill remained mired, and the Senate did not pass the Senate appropriator's FY1982 bill. Funding for agencies covered by the Labor-HHS-Education bill was instead again moved in a series of CRs, the second of which was vetoed by President Reagan for inadequate spending cuts, motivated by concerns about inflationary pressures from the federal budget; the budgetary showdown resulted in a daylong partial government shutdown and was resolved with further discretionary spending cuts in the final CR funding NIH appropriations for FY1982. The reduction in the administration's nominal budget request for the NIH, the veto of the second CR, and the ensuing decline in real appropriations for the institutes appear to have been influenced by concerns about inflation and partly reflected a broader anti-inflationary austerity program. As such, we classify this policy event as endogenous. Most pertinent narrative evidence:

- "During the last decade we withstood a series of economic shocks unprecedented in peacetime. The most dramatic of these were the explosive increases in OPEC oil prices. But we have also faced world commodity shortages, natural disasters, agricultural shortages, and major challenges to world peace and security. Our ability to deal with these shocks has been impaired by slower productivity growth and persistent, underlying inflationary forces built up over the past 15 years... However, unacceptably high inflation remains our most difficult economic problem. This inflation requires that we hold down the growth of the budget to the maximum extent, while still meeting the demands of national security and human compassion... " (Budget Message of the President, FY1982, January 15, 1981, p. M4)
- "Health research on the causes, prevention, and treatment of disease, and efforts to link research effectively with practical applications, are critical. Increased funding is requested for the [NIH] to award 5,000 new grants and to expand the resources available for basic and clinical research. Increases are also requested for mental health research... Budget authority for health research at the [NIH] is proposed to increase

from $3.4 billion in 1981 to $3.6 billion in 1982. The request provides for support of 5,000 grants for new research projects and a total of approximately 16,085 research project grants in 1982. These levels reflect the continuation of the administration's commitment to stable funding for NIH project grants and an increase in resources for basic and clinical research activities. The budgets for 1981 and 1982 have restored and maintained a relatively equitable distribution of funds among the 11 institutes of the NIH. Additional funds and personnel are made available for the opening of the Ambulatory Care Research Facility at the Warren G. Magnuson Clinical Center on the NIH campus... Budget authority for research in the [ADAMHA] is proposed to increase from $240 million in 1981 to $276 million in 1982, an increase of nearly 15%. Basic and applied research would be expanded in such areas as the neurosciences, epidemiology, prevention, special population needs, and assessment of treatments." (Budget of the United States, FY1982, pp. 233, 242)

- "Scientific and technological issues seldom provoke bitter partisan battles in Congress, but extensive changes in the makeup of key science-related committees in the new Congress portend some significant shifts in American science policy... The 1980 elections swept out many important friends of science, [including] Senator Warren G. Magnuson, also a Washington Democrat who strongly backed medical research as chairman of the powerful Senate appropriations committee... The change of party control in the Senate has brought profound shifts in that house. Much attention is focused on Senator Orrin G. Hatch, the Utah Republican, as new chairman of the Labor and Human Resources Committee, with jurisdiction over the [NSF] and the [NIH]... Mr. Hatch has not spelled out his health priorities. Though a conservative, he is widely respected by Senate liberals. He abolished Senator Kennedy's Subcommittee on Health and Scientific Research, taking its responsibilities under his own wing. Senate staff aides say this was done with the full support of Mr. Kennedy, who felt he could work better with Mr. Hatch than other Republicans on the committee. In the past, the two have seen eye to eye on most issues, particularly on supporting the basic research programs of the N.S.F. and N.I.H." ("New Faces in Congress Mean Sweeping Change in Science Policy," New York Times, February 10, 1981)
- "Shortly after taking office in January, Reagan asked Congress to cut $41.4 billion from President Carter's final budget proposals... Republican leaders who had just taken control of the Senate agreed to consolidate the budget reductions in one "reconciliation" measure early in the 1981 session. By packaging the budget cuts together, and then forcing the House and Senate to vote on a single measure, Republicans hoped to prevent congressional committees and interest groups from chipping away at the president's budget plan. The strategy worked, far better than many dismayed Democrats could have imagined. By Aug. 13, Reagan had signed into law the deepest and farthest-reaching package of budget cuts that Congress had ever approved... Faced with soaring deficit projections spawned by stubbornly high interest rates and inflation, Reagan Sept. 24 announced a second budget-slashing initiative. This time he asked Congress to save $13 billion by paring appropriations measures and making changes in non-discretionary entitlement programs... Congressional response was negative, however, especially among Republicans. GOP members of the Senate Appropriations Committee said they could not cut more than $5 billion from fiscal 1982 appropriations." ("Budget and Appropriations 1981: Overview," *CQ Almanac 1981*, 37th ed., 245-46. Washington, DC: Congressional Quarterly, 1982)

- "The [House] Committee's recommendations for the [NIH] total $3,834,958,000. This is an increase of $72,475,000 over the budget requests and $265,725,000 over the comparable appropriations for 1981. The Committee has, for many years, recognized the importance of the NIH research-training programs to the long-range maintenance of the Nation's biomedical research effort. These training programs ensure the availability of qualified investigators in future years... The budget requests make no provisions for the continued payment of institutional allowances and indirect costs to the institutions at which the training programs are conducted... The Committee believes that the funds thus provided to the institutions for faculty salaries, equipment and supplies are an essential part of the support for the training programs. Accordingly, the Committee has included increases totaling $28,979,000 in the NIH appropriations for the payment of institutional allowances and indirect costs." (H. Rpt. 97-251, September 23, 1981, pp. 24-25)
- "The [House] Committee continues to support the principle that the ability of NIH to fund investigator-initiated research projects competing for support should remain fairly constant from year to year. The President's revised 1982 budget request would support about 4,800 new research projects, compared with 5,000 supported in FY1981. The Committee has therefore added $30,621,000 to the bill to fund an additional 200 research grants. This will raise the total awards to competing applicants—i.e., for new projects or the renewal of ongoing projects that have come to the end of their current period of award—from 4,800, as provided in the budget, to 5,000" (Ibid, pp. 25-26)
- "Prior to the administration's September budget submission the [Senate Appropriations] Committee had not received any budget revisions which reflected the changes authorized in the Omnibus Budget Reconciliation Act, Public Law 97-35... the Committee notes that the September budget revisions arrived after the Labor-HHS-Education Subcommittee marked up the fiscal 1982 bill, and that in a number of instances the revisions did not immediately make clear how the new round of reductions affected specific line items. As a result, the Subcommittee's actions were largely based on the March budget estimates and are reflected in that way in this report." (S. Rpt. 97-268, November 2, 1981, p. 5)
- "The [Senate] Committee recommends an appropriation of $3,818,710,000 for the [NIH]. This is $56,227,000 more than the administration request and $16,248,000 less than the House allowance. The recommendation is $245,313,000 more than the FY1981 comparable appropriation of $3,573,397,000... Although fiscal constraints necessarily impose limitations on the overall level of biomedical research that can be supported, the Committee believes there is a critical need to continue a stable level of support for competing research grant applications that are submitted by scientists in the biomedical research community... This is a time of considerable promise in biomedical research. Significant advances in many areas of medicine have been made in recent years, and biomedical science is on the threshold of further progress that heretofore would have been unthinkable. This potential for saving lives and alleviating suffering carries with it a sizeable potential for reducing healthcare costs and economic losses from illness. It is therefore of concern that the administration proposed to support only 4,807 competing awards in 1982, a decrease of 272 from the 1981 level. Once again the Committee has provided additional funds to support a total of at least 5,000 grants, a level which is viewed as necessary to reaffirm continuing support of this important research mechanism. In all, the Committee provides an additional $26,399,000 for new and competing

research grants. The Committee level will ensure that the aggregate average cost of grants does not lose ground against inflation." (Ibid, pp. 47-48)

- "The [Senate] Committee recommends an appropriation of $781,367,000 for Alcohol, Drug Abuse, and Mental Health activities. This is $6,659,000 less than the March administration request and $58,359,000 less than the House allowance. The recommendation is $155,466,000 less than the FY1981 comparable appropriation... For Mental Health Research, the Committee recommends an appropriation of $136,421,000, which is $8,173,000 less than the President's March request and the House allowance... The Committee regrets the economic necessity of reducing funding for mental health research. The Committee, however, sees the potential for maximizing limited research dollars in this field through closer coordination between the [NIMH] and the various institutes at NIH, in particular the Neurological Institute." (Ibid, pp. 68-71)
- "For the third straight year, Congress did not complete action on the annual [Labor-HHS-Education appropriations bill]. An $87.2 billion fiscal 1982 funding bill (HR 4560) passed the House on Oct. 6, but the Senate did not act on the slightly less expensive version reported by its Appropriations Committee on Nov. 9. Funding for the three departments and various related agencies covered by the bill was included in the three fiscal 1982 continuing resolutions (PL 97-51, PL 97-85, PL 97-92) passed by Congress in 1981. As passed by the House, HR 4560 contained some reductions in spending as requested by President Reagan in his September budget revisions. However, in a defeat for Reagan, the House refused to make further cuts in the bill's popular social programs. The Senate committee's version of the bill was somewhat closer to Reagan's revised budget but did not achieve all the savings sought by the administration... Appropriations of $64.2 billion were approved for HHS—$421 million above the House level... The [Senate] panel cut $29 million from the House-passed appropriation for the Center for Disease Control, $16 million from the [NIH] and $58 million from alcohol, drug abuse, and mental health programs..." ("Labor-HHS-Education Funds," *CQ Almanac 1981*, 37th ed., 331-34. Washington, DC: Congressional Quarterly, 1982)
- "I am returning to the Congress without my signature H.J. Res. 357, the Continuing Resolution providing appropriations for FY1982. This Resolution presented me with a difficult choice: Either to sign a budget-busting appropriations bill that would finance the entire Government at levels well above my recommendations, and thus set back our efforts to halt the excessive Government spending that has fueled inflation and high interest rates, and destroyed investments for new jobs; Or, to hold the line on spending with a veto, but risk interruption of Government activities and services. I have chosen the latter... On September 24, I asked for a reduction of 12 percent in the appropriations for nearly all non-defense discretionary programs and a modest reduction in our planned program to strengthen the national defense. The 12 percent cut would have saved $8.5 billion—a significant contribution to reducing the deficit, but a modest sum in a budget that will total more than $700 billion. By refusing to make even this small saving to protect the American people against overspending, the Congress has paved the way for higher interest rates and inflation, and a continued loss of investment, jobs, and economic growth." Ronald Reagan, Message to the House of Representatives Returning Without Approval the Continuing Resolution for FY1982, November 23, 1981 (*The American Presidency Project*, by Gerhard Peters and John T. Woolley, https://www.presidency.ucsb.edu/node/247307)
- "Reagan cast his first veto when he refused to sign the resolution, closing down the

government for a day. Congress quickly passed an interim measure (H J Res 368) extending funding until Dec. 15, giving it time to piece together yet another continuing resolution that would satisfy both itself and the president. In the end, Reagan agreed to settle for $4 billion in appropriations cuts and to postpone his entitlement and tax proposals until 1982. The final continuing resolution (H J Res 370) extended funding through March 30, 1982, for programs covered under the three appropriations bills that failed to clear before adjournment." ("Budget and Appropriations 1981: Overview," *CQ Almanac 1981*, 37th ed., 245-46. Washington, DC: Congressional Quarterly, 1982)

NIH R&D Appropriations for FY1984

Bill: Departments of Labor, Health and Human Services, and Education, and Related Agencies Appropriation Act, 1984

Public Law: 98-139 **Enacted:** October 31, 1983 **Effective:** October 31, 1983

Nominal change		Real change		Classification
Millions ($)	YOY%	Millions ($2012)	YOY%	
$505.9	11.9%	$554.8	7.5%	Exogenous

Congress appropriated significant increases in both nominal and real NIH research funding for FY1984, largely motivated by long-run public health objectives and new health policy objectives of the Democratic House majority. President Reagan's budget message declared that basic research was "a vital investment in the Nation's future" being prioritized in the FY1984 budget released in January, which requested a $75 million (1.9%) increase for the NIH along with additional funds for ADAMHA's mental health and substance research programs. But the administration, which was prioritizing a large defense buildup and trying to restrain nondefense spending to contain the budget deficit, reversed course in the spring, providing a revised request that would have cut back NIH research funding by more than $100 million, below enacted FY1983 appropriations. However, the Democratic majority in the House had different budgetary priorities than the Reagan administration, as reflected in their FY1984 budget resolution, which provided significantly more funding for domestic priorities. The House Appropriations Committee was incensed by the administration's NIH budget revisions and restored all programs to at least the levels requested in January, proposing total funding of $4.3 billion, up $447.5 million (11.6%) from comparable FY1983 funding levels; in addition to restoring the administration's cuts, research funds were prioritized for HIV/AIDS, Alzheimer's, herpes, and other various infectious diseases. The Senate Appropriations Committee was similarly frustrated about the administration's downward budget revisions for the NIH, particularly the failure to provide funding for restoring NIH research grants to 5,000 and instead assuming funds would be reallocated from other NIH activities; the Senate committee also restored all of these cuts and fully funded 5,000 research grants, providing $4.9 million more than their House counterparts. The Senate committee also proposed increases in the ADAMHA's mental health and substance abuse research programs relative to both the budget request and the House allowances, notably restoring proposed reductions in indirect costs for existing research grants; committee priorities included research on depression and schizophrenia as well as public health research on marijuana and cocaine. The conference committee largely split the difference between the House and Senate allowances for the various NIH Institute and ADAMHA appropriations accounts. The net increases in NIH and ADAMHA appropriations appear to have been driven by Congressional objections to the Reagan administration's efforts to pare back health research funding

and efforts to address new public health concerns, and appear unrelated to any concerns about inflation, unemployment or other short-run macroeconomic prerogatives. As such, we classify this policy event as exogenous. Most pertinent narrative evidence:

- "My administration recognizes the Federal responsibility to maintain U.S. leadership in scientific research. Although support of basic scientific research represents a small share of the Federal budget, it is a vital investment in the Nation's future. Such research lays the foundation for a strong defense in the years to come, and for new technologies and industries that will help maintain our industrial competitiveness, create new jobs, and improve our quality of life. By carefully establishing budget priorities, my administration has been able to reinvigorate Federal support for basic scientific research. With my 1984 budget proposals, such support across the Government will have increased by more than 20% over the 1982 level." (Budget Message of the President, FY1984, January 31, 1983, pp. M13-14)
- "The budget proposes to increase budget authority for health research from $4.2 billion in 1983 to $4.3 billion in 1984. These funds primarily will support basic biomedical research conducted by the [NIH]. Support will be provided for such activities as research project grants, research centers, training of biomedical scientists, and the NIH intramural research program. Funds are also requested for continued support of research on chemical and related behavioral disorders, such as mental illness and alcohol and drug abuse, as well as health services research and health statistical activities." (Budget of the United States, FY1984, p. 5-109)
- "Brushing aside the austere budget submitted by Reagan in January, House Democratic leaders won easy passage March 23 of a budget resolution that was essentially a Democratic manifesto. Passage came harder in the Senate, where moderate Republicans and Democrats bent on deficit reduction narrowly won approval May 19 of a budget blueprint that was unacceptable both to Senate GOP leaders and the president. It took another month for Senate-House conferees to patch together the final compromise plan... The resolution included reconciliation instructions directing congressional committees to approve deficit reduction measures designed to meet the budget's targets... As submitted to Congress on Jan. 31, Reagan's budget called for $848.5 billion in outlays and $659.7 billion in revenues in fiscal 1984. The president proposed a 10 percent increase in "real" (adjusted for inflation) defense spending, within the framework of an overall spending freeze. Although Reagan called for $43 billion in budget savings, he still forecasted a fiscal 1984 deficit of $188.8 billion... " ("Budget Resolution Reorders Reagan Priorities." In CQ Almanac 1983, 39th ed., 435-47. Washington, DC: Congressional Quarterly, 1984)
- "The sixteen appropriations included in the bill for the [NIH], whose separate purposes are described in the following sections of this Report, total $4,297,054,000. This is an increase of $386,330,000 over the budget estimates for NIH and $447,499,000 over the comparable FY1983 appropriations... the [House Appropriations] Committee has restored virtually all of the cuts made in the other programs and provided the funds originally requested for them in the January budget estimates. The March reductions—which included more than $53 million for the support of research centers, nearly $25 million for Biomedical Research Support Grants to educational institutions, $17,000,000 for non-competing research projects, $15 million for R&D contracts, $7 million for 13 new clinical trials, and nearly $10 million in smaller cuts in other programs—would have serious adverse effects on the conduct of biomedical research in

this country that would not be in the long-term interest of the health of the American people. In addition to restoring the program levels in the January budget request, the Committee has included selective increases, detailed in the sections on the appropriations for the individual institutes, totaling $66.5 million. These include $6 million for the research grants of the [NIAID] which is faced with the disturbing appearance of a number of new infectious diseases (such as Legionnaire's Disease, toxic shock syndrome, genital herpes) and the prospect that others will appear as micro-organisms adapt to and take advantage of environmental changes; $6 million for research on [AIDS]; $6 million for research on digestive diseases; $15 million for a major expansion of research on neurological diseases (such as Alzheimer's disease); and $20 million for grants for the sophisticated new instrumentation that is essential for the conduct of medical research" (H. Rpt. 98-357, September 16, 1983, pp. 34-36)

- "The [Senate] Committee recommends an appropriation of $4,301,965,000 for the [NIH]. This is $391,241,000 more than the administration request and $4,911,000 more than the House allowance. The recommendation is $452,410,000 more than the FY1983 comparable appropriation... The administration's April budget submission revised the draft budget version that was sent to Congress in January. In a key change made by the April budget, the administration abandoned its plan to fund only 3,676 new and competing grants and agreed to the 5,000 grant level which has become the hallmark of stability for NIH. However, in making that decision, the revised budget did not request the additional funds to finance the 1,324 grants needed to reach the 5,000 level. Rather, money was proposed to be taken from a variety of NIH activities to achieve the goal. The chief losers in the reshuffle were the direct costs of research, research centers, and biomedical research support grants, among other areas. As part of the revision, it was decided not to provide full-cost new and continuation research project grants, but to trim these awards by approximately 11 percent and 6 percent, respectively. Indirect costs of research were reduced in line with the January budget proposals... The Committee has made major revisions to the administration's NIH budget. In addition to providing more money for at least 5,000 new and competing grants, the Committee has restored all funds for indirect costs of research, for research centers, biomedical research support grants, general clinical research centers, and grants and contracts... In short, the Committee is restoring the average NIH levels of support that prevailed prior to FY1982." (S. Rpt. 98-247, September 26, 1983, pp. 46-47)
- "The [Senate] Committee recommends an appropriation of $174,471,000 for mental health research, an increase of $22,171,000 over the comparable 1983 appropriation. The amount recommended is $2,338,000 more than the House allowance and the budget estimate. The increase in the budget request reflects the policy of the Committee to restore proposed reductions in indirect costs for regular research grants. The Committee is encouraged by the increased commitment of the administration to mental health research. Grants will be awarded and research conducted in such priority areas as brain and behavior; prevention; childhood disorders; schizophrenia; and depression... For drug abuse research, the Committee recommends $57,178,000, an increase of $5,178,000 over the House allowance, $1,018,000 over the budget request, and $9,404,000 in the 1983 level... Research to be supported will focus on selected new initiatives on the biological, behavioral, and psychological factors involved in drug abuse; the collection and analysis of epidemiological data; and the development of more effective prevention and treatment methodologies. Special emphasis will be placed on research on marihuana, cocaine, and other stimulants... In the area of alcoholism research, the

Committee recommends $46,363,000, an increase of $12,879,000 over FY1983 appropriations. The amount recommended is $6,363,000 more than the House allowance and $573,000 more than the budget estimate. The increase over the budget request represents the restoration of the proposed reduction in indirect costs." (Ibid, pp. 87)

NIH R&D Appropriations for FY1985

Bill: Departments of Labor, Health and Human Services, and Education and Related Agencies Appropriation Act, 1985

Public Law: 98-619 **Enacted:** November 8, 1984 **Effective:** November 8, 1984

Nominal change		Real change		Classification
Millions ($)	YOY%	Millions ($2012)	YOY%	
$689.3	14.5%	$902.0	11.3%	Exogenous

Congress appropriated significant increases in both nominal and real NIH research funding for FY1985, largely motivated by long-run public health objectives and the policy preferences of congressional appropriators, who rebuked the White House's budgetary sleight of medical research. The FY1985 budget request acknowledged that funding for scientific research had fallen in real terms since FY1980, but the administration prioritized restoring DOE and NSF funding over that of the NIH, which was to remain slightly below FY1980 real funding levels for the remainder of the decade; the administration proposed only a modest $93.7 million (2.2%) nominal increase in NIH funding for FY1985. The House Appropriations Committee again proposed a substantial increase in medical research funding relative to the budget request, allocating $4.83 billion for the NIH, an increase of more than $500 million over the budget request and nearly $600 million over enacted funding for FY1984; among other priorities, the committee provided funding to considerably expand the number of NIH-funded research grants from 5,000 to 6,200, so that "current momentum of scientific discovery is preserved and future health gains are assured." Their Senate counterparts proposed an even larger increase for the NIH, approving $5.16 billion for the NIH, which was $329.3 million above the House allowance; the Senate Appropriations Committee was livid that the NIH research budget was being neglected while research budgets for DOD, DOE, and the NSF were all seeing double-digit increases in the FY1985 budget request. The Senate committee declared that federal investments in biomedical research had led to "America's unquestioned preeminence in this vital area of science," resulting "in our citizens living longer and healthier lives than ever before," and questioned the wisdom of paring back this research program; they also again proposed increasing ADAMHA's mental health and substance abuse research programs relative to the budget request and prior funding levels, notably prioritizing research into schizophrenia and manic depression and an increase drug abuse research grants. Shortly before the Labor-HHS-Education appropriations bill for FY1985 was enacted, President Reagan vetoed the Health Research Extension Act of 1984, an NIH authorization bill that would have established new arthritis and nursing institutes, which Reagan decried as "unnecessary, expensive new organizational entities." Tellingly, Congress resoundingly overrode President Reagan's veto; Senator Orin Hatch (R-UT) noted that the White House had "underestimated [the NIH's] vast support on Capitol Hill." The Labor-HHS-Education conference bill similarly reflected much higher congressional support for the NIH's medical research programs than was coming from the White House. The net increase in NIH appropriations appears to have been driven by evolving public health concerns and Congressional backlash to the Reagan administration's

efforts to prioritize DOD, DOE, and NSF research funding over health research, and appears unrelated to concerns about unemployment or other short-run macroeconomic prerogatives. As such, we classify this policy event as exogenous. Most pertinent narrative evidence:

- "Fourthly, constant dollar budget levels for scientific research, the [NIH] and cultural support programs will have been reduced by about 5% in real terms between the 1980 peak and the 1984 enacted budget. The proposed 1985 budget essentially stabilizes total funding at this level—with constant dollar outlays projected to average about $7.9 billion over the 1985-89 period. However, within this stable total, a modest reordering of priorities would continue to occur. Outlays in 1984 for scientific research (NSF and the DOE energy science programs) will be 6% above the 1980 constant dollar level—with proposed future increases resulting in a 19% increase by 1989... Real funding levels for NIH would remain slightly below the 1980 level for the remainder of the decade." (Budget of the United States, FY1985, p. 3-47)
- "The administration proposes to increase budget authority for health research from $4.8 billion in 1984 to $4.9 billion in 1985. These funds primarily will support basic biomedical research conducted by the [NIH]. Support will be provided for such activities as research project grants, research centers, training of biomedical scientists, and the NIH intramural research program. Funds are also requested for continued support of research on chemical and related behavioral disorders, such as mental illness and alcohol and drug abuse, as well as health services research and health statistical activities." (Budget of the United States, FY1985, p. 5-111)
- "The sixteen appropriations included in the bill for the [NIH] total $4,834,343,000. This is an increase of $505,325,000 over the budget estimates for NIH and $598,975,000 over the comparable FY1984 appropriations... The NIH is the largest source of support for biomedical research conducted in the universities, medical schools, dental schools, and research institutions of this Nation. For the past 35 years, the support of investigator-initiated research grants has been the principal mechanism for distributing funds provided for NIH-supported research. The [House Appropriations] Committee believes that the support of these projects must be sustained and enhanced so that the current momentum of scientific discovery is preserved and future health gains are assured. The Committee is aware that in recent years while the number of new and competing grants has stabilized at approximately 5,000, the award rates and paylines for these grants have declined, and many high-calibre investigators have not received funding. The Committee, therefore, has increased the funding for NIH by $151,474,000 to support an estimated 6,200 new and competing research project grants." (H. Rpt. 98-911, July 26, 1984, p. 29)
- "The [Senate] Committee recommends an appropriation of $5,163,597,000 for the [NIH]. This is $597,144,000 more than the administration request and $687,556,000 more than the FY1984 comparable appropriation... The Committee continues to be exceptionally concerned with the administration's approach to the NIH budget. The Committee notes that the administration's overall budget request calls for a 14-percent increase in research spending the largest increases going to the Departments of Defense and Energy but with the [NSF] slated for a 13.6-percent increase as well. By contrast, only a 2- percent increase is requested for the NIH. That level of funding would severely reduce the number of approved and funded research projects, require significant cuts in direct costs for all project grants; reduce the amount of research that would be performed by our scientists, ignore the need for continued training opportunities that

serve to attract the keenest young minds in America to biomedical research; severely handicap ongoing clinical trials and leave some 40 new clinical trials unfunded. The administration's budget request totally ignores deteriorating research facilities and the shortfalls and obsolescence in scientific instrumentation and equipment... The Federal Government's substantial investment in biomedical research for nearly four decades has resulted in America's unquestioned preeminence in this vital area of science. The establishment and growth of the Nation's productive biomedical research enterprise since World War II has been one of the most remarkable developments of that dynamic period. The Committee recognizes that our Nation's efforts in biomedical research have resulted in our citizens living longer and healthier lives than ever before. Now is certainly not the time to cut back our support, particularly in light of recent advances in new medical technologies, molecular biology, monoclonal antibodies, recombinant DNA, and many other areas of research now bearing fruit in terms of improved health and better survival rates from major diseases." (S. Rpt. 98-544, June 25, 1984, p. 49)

- "The [Senate] Committee recommends an appropriation of $196,409,000 for mental health research. The amount recommended is an increase of $22,409,000 over FY1984 appropriations and is $18,806,000 more than the budget estimate. The recommendation is consistent with the efforts of the Committee to expand Federal research funding in promising areas. The Committee believes that NIMH should continue to strengthen its research efforts into the causes, treatment, and prevention of serious mental illnesses, particularly schizophrenia and manic depressive illnesses... For drug abuse research, the Committee recommends an appropriation of $65,682,000, an increase of $11,082,000 from 1984 appropriations and $2,169,000 more than the budget request. This program provides grants and contracts to researchers to develop and disseminate knowledge concerning the basic mechanisms of drug action in the central nervous system, the health and behavioral consequences of drug use, its epidemiology, and the treatment and prevention of drug abuse. The recommendation will support ongoing research and increase the number of new and competing grants by 21... a 19-percent increase over the number funded in fiscal year 1984." (Ibid, pp. 112-115)
- "I am withholding my approval of S. 540, the "Health Research Extension Act of 1984," which would extend and amend the biomedical research authorities of the [NIH]. I have been assured by [HHS] that the Continuing Resolution gives adequate authority for current NIH activities in FY1985. This Administration has a record of strong commitment to the support and conduct of biomedical research by the NIH. Each year since taking office, I have requested increases for biomedical research... Rather than improve our research efforts, however, the unfortunate result of S. 540 would be to impede the progress of this important health activity by: Creating unnecessary, expensive new organizational entities; two institutes would be created, an arthritis and a nursing institute. This reorganization of the NIH is premature in light of a study of the NIH organizational structure to be released in a few weeks by the Institute of Medicine/National Academy of Sciences... I want to underscore my commitment to biomedical research and the [NIH]. The NIH has stood as an example of excellence for 40 years. I do not believe that it is either necessary or wise to revise completely the laws under which it has so successfully operated." Ronald Reagan, Memorandum Returning Without Approval the Health Research Extension Act of 1984, October 30, 1984 (*The American Presidency Project*, by Gerhard Peters and John T. Woolley, https://www.presidency.ucsb.edu/node/260526)

- "President Reagan Nov. 8 signed into law a bill (HR 6028—PL 98-619) providing $104.6 billion for [Labor-HHS-Education appropriations]. Technically, Labor-HHS programs were financed from the Oct. 1 start of the fiscal year until Nov. 8 under a series of short-term continuing appropriations measures and the massive continuing appropriations resolution (H J Res 648—PL 98-473) cleared by Congress Oct. 11 and signed by the president Oct. 12... Disputes over abortion funding and prayer in public schools temporarily stalled the measure, but lawmakers were able to resolve differences that in the recent past had blocked enactment of the bill... Major items of the compromise [conference] bill included:... $5.15 billion provided for the [NIH] was about 15 percent more than was appropriated in 1984." ("$104 Billion Bill Clears for Labor, Health and Human Services Departments," *CQ Almanac 1984*, 40th ed., 421-25. Washington, DC: Congressional Quarterly, 1985) The House bill called for $72 billion in new funds for [HHS], $5.4 billion above the fiscal 1984 budget and $1 billion over the president's request for authorized programs... $4.8 billion for the [NIH], $599 million above fiscal 1984 funding and $505 million above the administration's request.
- "Congress Nov. 20 overrode President Reagan's veto of a bill (HR 2409) reauthorizing selected research activities of the [NIH] and creating a new institute for research on arthritis... "Frankly, I was really shocked to find they vetoed the bill," said Sen. Orrin G. Hatch, R-Utah, chairman of the Labor and Human Resources Committee. "I believe the president received bad advice on this and he underestimated its vast support on Capitol Hill," he said." (Congress Overrides Reagan Veto of NIH Bill." In CQ Almanac 1985, 41st ed., 287-88. Washington, DC: Congressional Quarterly, 1986)

NIH R&D Appropriations for FY1987

Bill: Continuing Appropriations, 1987

Public Law: 99-591 **Enacted:** October 30, 1986 **Effective:** October 30, 1986

Nominal change		Real change		Classification
Millions ($)	YOY%	Millions ($2012)	YOY%	
$1,077.0	19.5%	$1,607.0	18.1%	Exogenous

Congress appropriated significant increases in both nominal and real NIH research funding for FY1987, largely motivated by long-run public health objectives and newer health policy concerns, notably the HIV/AIDS crisis. President Reagan's FY1987 budget request prioritized deficit reduction, but AIDS research and other areas of nonmilitary research were singled out as "high priority programs" to be preferenced in a "very tight fiscal environment." The president's budget request, however, proposed a nominal reduction of $180.5 million (-3.4%) across NIH's entire budget. Totally ignoring the administration's input, the House Appropriations Committee proposed $6.15 billion for the NIH, an increase of $893.1 million over enacted FY1986 appropriations and $1.07 billion more than proposed in the FY1987 budget request; increased funding for AIDS research, cancer research, and cardiac were the committee's top priorities as measured by dollars. In a reversal from recent years, the Senate Appropriations Committee proposed slightly less than for biomedical research their house counterparts, trimming $71.9 million from the House allowance but nonetheless proposing more than $1 billion more than the administration's request; the Senate Committee also prioritized increasing HIV/AIDS research, recommending a $66.3 million (49.2%) increase over FY1986 levels. The Senate committee also proposed substantial increases

in mental health and substance abuse research programs of the ADAMHA, particularly for schizophrenia, teenage suicide, and mental health and drug abuse facets of the AIDS epidemic. The net increases in NIH and ADAMHA appropriations appear to have been driven by efforts to address the AIDS crisis and other long-term public health concerns as well as Congressional backlash to the Reagan administration's proposed NIH budget cuts; the policy changes appear unrelated to concerns about unemployment or other short-run macroeconomic prerogatives. As such, we classify this policy event as exogenous. Most pertinent narrative evidence:

- "The task of reducing the deficit must be pursued with an eye toward narrowing the current wide scope of Government activities to the provision of those, but only those, necessary and essential services toward which all taxpayers should be contributing—and providing them as efficiently as possible. This is the underlying philosophy that I have used in shaping this year's budget. Let me explain: High-priority programs should be adequately funded. Despite the very tight fiscal environment, this budget provides funds for maintaining—and in some cases expanding— high-priority programs in crucial areas of national interest. Necessary services and income support for the dependent poor and the elderly receive significant funding in this budget. So do other programs of national interest, including drug enforcement, AIDS research, the space program, nonmilitary research, and national security." (Budget Message of the President, FY1987, February 5, 1986, pp. M4-6)
- "To ensure the Nation's continued leadership in basic health research, it is essential to provide stable support for such research. The 1987 request for NIH would fund 18,000 research project grants, 523 research centers, and 9,100 research trainees. Complementing the NIH effort, funding requested for the Alcohol, Drug Abuse, and Mental Health Administration would support 1,400 research project grants. In addition, the administration will implement a policy of limiting the reimbursement rate for university overhead allocated to federally supported research. This policy restores the appropriate balance between Federal research support and Federal support of university overhead. [AIDS] is the highest public health priority of [HHS]. Complementing State and local programs, the Federal effort encompasses health education and risk prevention as well as research on the causes of and potential treatments for AIDS. Budget authority of $213 million is requested for AIDS research and education in 1987. Beginning in 1987, these funds will be requested by the Office of the Assistant Secretary for Health and coordinated by a newly-established office to ensure that the national effort against AIDS reflects a coherent strategy." (Budget of the United States, FY1987, p. 5-105)
- "We will continue, as a high priority, the fight against [AIDS]. An unprecedented research effort is underway to deal with this major epidemic public health threat. The number of AIDS cases is expected to increase. While there are hopes for drugs and vaccines against AIDS, none is immediately at hand. Consequently, efforts should focus on prevention, to inform and to lower risks of further transmission of the AIDS virus." Ronald Reagan, Message to the Congress on America's Agenda for the Future, February 6, 1986 (*The American Presidency Project*, by Gerhard Peters and John T. Woolley, https://www.presidency.ucsb.edu/node/258274)
- "The total 1987 NIH appropriations of $6,152,775,000 recommended by the Committee represent increases of $1,073,628,000 over the amount requested in the President's budget and $893,120,000 over the amounts currently available for 1986... The President's Budget proposed that all AIDS resources be consolidated in the Office of the Assistant

Secretary for Health. The Committee has not approved this proposal. For NIH, the bill provides $198,943,000 in the appropriation of the Office of the Director, NIH, to continue the AIDS research program that has been underway for several years and to support new and expanded efforts in the conquest of this disease. These funds will be divided among the Institutes. (H. Rpt. 99-711, July 24, 1986, pp. 39-42)

- "The [House Appropriations] bill includes $1,346,751,000, an increase of $188,662,000 over the amount requested and $170,190,000 over the comparable 1986 appropriation. The [NCI] reported that continuing progress in basic research is being translated into practical clinical applications which are leading to increasing survival rates for cancer patients. In addition, the Committee was told that in some cases, incidence rates are improving as well. For example, lung cancer in white males dropped nearly four percent between 1982 and 1983 from 82.7 down to 79.3 new cases per 100,000 population... The bill includes $921,410,000, an increase of $135,713,000 over the amount requested and $110,505,000 over the amount available for 1986. The National Heart, Lung and Blood Institute (NHLBI) is responsible for research to combat and prevent diseases of the heart, blood vessels, lungs and blood. These conditions not only account for more than half the deaths in America but also represent three of the five leading causes of death. Arteriosclerosis—the hardening and narrowing of the arteries can lead to heart attack, angina pectoris, stroke and arterial disease. Although high blood cholesterol has long been suspected as a factor in increasing the risk of coronary heart disease, only recently has a clinical trial conducted by NHLBI proven the existence of a causal relationship. The results of this trial have shown that a one percent reduction in blood cholesterol can provide a two percent reduction in the risk of developing coronary heart disease." (Ibid, pp. 45-47)
- "The [Senate] Committee recommends an appropriation of $6,080,875,000 for the [NIH]. This is $1,001,728,000 more than the administration request, $810,023,000 more than the FY1986 adjusted appropriation of $5,270,852,000, and $71,900,000 less than the House allowance... Over the past several years the Committee has consistently provided increases in NIH funding in order to maintain a level of support for research projects that would keep pace with the rapid growth in new research opportunities as reflected by the increase in the number of investigator-initiated research grant applications approved by the peer review process. This year, again, the Committee has provided for an increase in NIH funding which will support more than 6,100 new and competing research grants... This year the Committee has also increased the funding for NIH programs that support and, in many cases, advance the research efforts and goals of NIH. NIH research centers have received funding increases so that the centers can be supported closer to their recommended funding levels. Research training has received an increase of $10,000,000 to support a total of 10,500 trainees... The Committee has provided $200,943,000 for the NIH research program on [AIDS]. This is $66,271,000 more than the FY1986 adjusted level. The increase reflects the Committee's continued concern over the devastating effects of this disease and the realization that enough funds must be provided to allow our research scientists to pursue all reasonable leads" (S. Rpt. 99-408, August 15, 1986, p. 58-59)
- "The [Senate] Committee recommends $253,149,000 for mental health research, which is $24,149,000 more than the House allowance, $58,259,000 more than the budget request, and $52,705,000 more than the adjusted fiscal year 1986 appropriation. Of this amount, the Committee has provided $11,340,000 for research on AIDS... The Com-

mittee has provided $115,533,000 for drug abuse research, which is $48,128,000 more than the budget request and $50,295,000 more than the adjusted FY1986 appropriation. The House deferred action on this program. Of this amount, the Committee has recommended $27,100,000 for research on AIDS. The Committee continues to be favorably impressed by the quality and breadth of research supported by NIDA. The significant increase for drug abuse research reflects the Committee's deep concern about the effect drugs are having, not only on the health of the American people but on the very fabric of our society... The Committee has provided $68,235,000 for alcoholism and alcohol abuse research. This amount is $13,864,000 more than the adjusted FY1986 appropriation and $11,617,000 more than the administration's budget" (Ibid, p. 120)

- "The [NIH] also received a large boost [in the Labor-HHS-Education title of the omnibus]—from $5.27 billion in fiscal 1986 to $6.18 billion. The president asked for $5.08 billion for NIH. The added money was to be used to fund at least 6,200 new research projects, according to the conference report... For the second straight year, the [House] panel dramatically increased funding for research on AIDS. The bill would provide $336.8 million for research, prevention, and treatment activities, an increase of $112.5 million over 1986 funding. AIDS research funding had more than tripled since fiscal 1985." ("Congress Votes $114.78 Billion for Labor, [HHS] Departments." In CQ Almanac 1986, 42nd ed., 196-200. Washington, DC: Congressional Quarterly, 1987)
- "The conference agreement provides a total of $6,180,660,000 for programs of the [NIH] instead of $6,169,475,000 as proposed by the House and $6,116,875,000 as proposed by the Senate. Included in the total is $247,943,000 for research on [AIDS] as proposed by the Senate." (H. Rpt. 99-960, October 2, 1986, p. 14)

NIH R&D Appropriations for FY1991

Bill: Departments of Labor, Health and Human Services, and Education, and Related Agencies Appropriations Act, 1991

Public Law: 101-517 **Enacted:** November 5, 1990 **Effective:** November 5, 1990

Nominal change		Real change		Classification
Millions ($)	YOY%	Millions ($2012)	YOY%	
$695.1	8.4%	$602.5	5.0%	Exogenous

Congress appropriated significant increases in both nominal and real NIH research funding for FY1991, largely motivated by long-run public health objectives and the Cold War "peace dividend" freeing up resources for nondefense scientific research. President George H.W. Bush's FY1991 budget request prioritized increases in basic research funded by a number of federal agencies, including significant increases for the Human Genome Project being jointly funded by the NIH and DOE; see "Energy R&D Appropriations for FY1991" for more details. The administration also prioritized further increases in HIV/AIDS research, prevention, and treatment programs. While the Bush administration proposed a nontrivial $351.6 million increase in the NIH's budget for FY1991, the House Appropriations Committee proposed an increase of $1.0 billion over enacted FY1990 appropriations, which would have brought total funding up to $8.32 billion for the NIH, almost 14% over enacted funding for the previous year; roughly 15% of this proposed increase was for NCI cancer research, the most for any institute, and breast and cervical cancer research were the committee's top priorities. The Senate Appropriations Committee proposed an even larger NIH budget of

$8.35 billion, adding $29.4 million to the House allowance and totaling $419.1 million above the president's budget request; the Senate committee was particularly concerned with training more scientific researchers and, relatedly, restoring the number of research grants back to 6,000 per year. Discretionary funding in the bill was later subjected to a 2.4% cut to help offset the unexpected cost increases for unemployment insurance programs, but the conference bill still resulted in a significant increase in NIH research funding. The increases in NIH appropriations appear to have been motivated by long-run public health concerns and unrelated to concerns about unemployment or other short-run macroeconomic prerogatives. As such, we classify this policy event as exogenous. Most pertinent narrative evidence:

- "Twelve Federal agencies spend more than $3 billion annually for biotechnology research and development... The budget would expand this investment by $213 million (or 6 percent). Most of the support for basic biomedical research essential to the advancement of biotechnology has come from the [NIH]... The 1991 budget will maintain the nation's commitment to pursue vigorously biomedical research opportunities. NIH-sponsored basic research helps form the foundation of knowledge that makes biotechnology possible. The budget proposes an increase of $280 million for NIH in 1991. Most of this increase will go toward support for basic research... The 1991 budget proposes an increase of 80 percent ($48 million in budget authority) for NIH's human genome initiative. Working with scientists at the [DOE], NIH will support research to identify and map every one of the estimated 100,000 genes in the human body. This project holds the promise of benefiting humankind by identifying the genetic causes of diseases. Once these causes are identified, scientists may then be able to design therapies and prevention strategies for genetic disorders. The budget ensures that this tremendous opportunity will be pursued energetically in 1991. DOE will work cooperatively with NIH through DOE laboratories to accelerate the mapping of the human genome by improving gene sequencing techniques, developing new instrumentation and exploring the unique capabilities of DOE facilities." (Budget of the United States, FY1991, p. 60)
- "Biomedical research increases knowledge about the processes underlying health, disability, and disease, and synthesizes this knowledge into a useful form so that it can be applied to improve health. Such advances can not only improve the quality of health care but ultimately help to reduce its costs. Examples include drug treatment instead of surgery for coronary artery disease and advanced laser treatment for serious eye disease. Advances in biomedical research are occurring at an unprecedented pace. The 1991 budget ensures that the Federal investment continues to foster these advances by proposing an increase of almost 6 percent for basic research in [HHS]. The proposed increase for HHS, including that for the [NIH], will allow us to advance the state of knowledge and improve the treatment of high-incidence diseases. This research lays the foundation for the development of effective prevention and treatment of such diseases. The Federal Government also uses its resources to investigate diseases that afflict relatively smaller numbers of individuals and encourages the private sector to develop treatments for these diseases... The budget continues the Administration's commitment to research on [HIV], the source of the infection that causes [AIDS]. In total, the 1991 budget proposes an 18 percent increase ($531 million) over 1990 for all Federal HIV/AIDS programs, including a 7 percent increase in research, a 16 percent increase in prevention efforts, a 27 percent increase in treatment, and a 39 percent increase in income support for individuals." (Ibid, p. 78)

- "The [House Appropriations] bill includes $8,317,654,000 for the 20 appropriations which together fund the programs of the [NIH]... The Committee bill increases funding for the [NIH] by more than $1 billion over the 1990 level. This increase will address current imbalances and support increased opportunities for improving human health through research. The Committee believes that this increased investment is fully justified by both the humanitarian and commercial potential of the biomedical sciences. In making this commitment of scarce resources, however, the Committee expects NIH to implement more aggressive cost management and cost control measures. In this context, the Committee has made its FY1991 funding recommendations as the first step of a four-year plan which NIH is expected to implement as it manages its 1991 appropriations... The bill includes $1,749,392,000 for currently authorized activities of the [NCI], an increase of $91,126,000 over the amount requested and $150,891,000 over the comparable 1990 appropriation. Within the increased resources made available, the Committee expects the cancer prevention and control program and all aspects of research on breast and cervical cancer to be given the highest priority." (H. Rpt. 101-591, July 12, 1990, pp. 52, 54)
- "The [Senate Appropriations] bill includes $8,347,085,000 for the 20 appropriations which together fund the programs of the [NIH]. These include appropriations for the 13 research institutes as well as the National Center for Research Resources, the National Center for Nursing Research, the National Center for Human Genome Research, the John E. Fogarty International Center, the National Library of Medicine, the Office of the Director, and buildings and facilities. The total in the bill is $419,096,000 above the President's budget request for FY1991 and $770,733,000 above the comparable appropriations for FY1990... The amount added by the Committee restores the number of new grants to approximately 6,000..." (S. Rpt. 101-516, October 2, 1990, p. 80)
- "The success of the Nation's biomedical research enterprise, including America's new and rapidly growing biotechnology industry, is directly dependent upon a critical mass of highly qualified, well-trained scientists entering research careers and then engaging in appropriate research activities. To ensure that a sufficient number of such scientists are available, the NIH supports a wide range of research training programs at universities, medical schools, and other institutions throughout the country. The [Senate] Committee is aware that it takes 8 to 11 years to develop high-quality researchers, and that the level of training supported today determines our research capability in the future. The Committee understands that while there is no present crisis in the aggregate supply of research scientists, changes in the demand for scientists have been projected that could greatly exceed the supply beginning in 1997. These changes in demand will result from several factors including: the aging of faculty hired during the baby boom of the 1960's resulting in a large number of retirements; an expected surge in enrollments at colleges and universities as the number of 18-year-olds begins to expand after 1995; an increased demand for scientists in nonacademic positions which is expected to continue into the next century; and a student population that is less interested in science. In order to help meet the demand for future MDs/PhDs the Committee has provided $30,000,000 for the NIH research training program to support an additional 1,250 trainees for a total level of approximately 13,270" (Ibid, pp. 83-84)
- "Although bill sponsors got a significant boost in funding for the bill as a result of the Oct. 8 budget agreement, members still found themselves squeezed to increase funds as much as they wanted for many programs. Rising fuel prices and a weakening

economy meant that conferees were forced at the last minute to find $1.2 billion to pay for unexpected increases in unemployment insurance and the energy emergency contingency fund. They got the money by imposing an across-the-board cut of 2.4 percent for each of the discretionary funding items in the bill. Even with the cut, however, many key health and education programs got large increases... the [NIH] gained $8.3 billion, an increase over fiscal 1990 of $700 million." ("$188.2 Billion for Labor, Education, and [HHS]," *CQ Almanac 1990*, 46th ed., 847-53. Washington, DC: Congressional Quarterly, 1991)

NIH R&D Appropriations for FY1992

Bill: Departments of Labor, Health and Human Services, and Education, and Related Agencies Appropriations Act, 1992

Public Law: 102-170 **Enacted:** November 26, 1991 **Effective:** November 26, 1991

Nominal change		Real change		Classification
Millions ($)	YOY%	Millions ($2012)	YOY%	
$741.8	8.3%	$837.6	6.7%	Exogenous

Congress appropriated significant increases in both nominal and real NIH research funding for FY1992, largely motivated by long-run public health objectives and the Cold War "peace dividend" freeing up resources for nondefense scientific research. President George H.W. Bush's budget request again prioritized increases in basic research, including an emphasis on the Human Genome Project and HIV/AIDS research, and again proposed significant increases in NIH funding only for Congress to raise the ante. The House Appropriations Committee proposed a net increase of $50 million above the budget request—an allowance of $548.1 million above FY1991 funding levels—but substantially reshuffled priorities; the committee was adamant that the highest priority be given to women's health research programs, notably breast and ovarian cancer and osteoporosis, and proposed cost reforms, deferment of construction grants, and reductions in the Human Genome Project to fund large increases (one-third of the total) for these research priorities. The Senate Appropriations Committee approved the administration's top-line budget request while adding $184.6 million in additional funds for cancer research funded by the NCI in their allowance; they also prioritized women's health research, providing an additional $40 for NCI research on breast, ovarian, and cervical cancers relative to the administration's request, while the Senate bill also pushed heavily for more funding for Alzheimer's research. With the House, Senate, and White House all pushing in similar directions on medical research, the conference bill resulted in a very significant increase in NIH research funding. The increases in NIH research funding appear to have been motivated by long-run public health concerns and unrelated to any concerns about unemployment or other short-run macroeconomic prerogatives. As such, we classify this policy event as exogenous. Most pertinent narrative evidence:

- "The budget recommends an increase of $8.4 billion in the Federal investment in research and development, with special emphasis on basic research, high-performance computing, and energy research and development. It proposes to extend permanently the tax credit for research and experimentation to encourage private sector R&D investment. In addition, the budget reflects the Administration's continued commitment to expanding human frontiers in space and biotechnology." (Budget Message of the President, FY1992, February 4, 1991, p. Part One-3)

- "The budget proposes a $334 million increase for basic biomedical research supported by the [NIH], the primary source of basic biomedical research discoveries in the world. The overall increase of $498 million, or 6 percent, for all of NIH will allow an increase of 9 percent in the funding for research project grants awarded to individual investigators. This will permit over 600 additional grants to be funded... The budget proposes a 26 percent increase for the third year of this 15-year effort to decode the information locked in the chemical building blocks that form human genetic inheritance. This $35 million increase reflects a commitment to develop "maps" of human chromosomes and human DNA sequence data that will allow scientists to develop new diagnostic tests, therapies, or cures for some of the 4,000 known disorders in which genes are the dominant cause. Such diseases include cystic fibrosis, sickle cell disease, and muscular dystrophy. The genome project also will produce increased knowledge about how specific genes function and malfunction and will help increase understanding of diseases characterized by gene-governed chemical reactions, such as heart disease, cancer, and AIDS. This project is being conducted jointly by [DOE and HHS]. The budget requests a total of $169 million for the project, $59 million at Energy and $110 million at [HHS]." (Budget of the United States, FY1992, pp. Part Two-44-45)
- "The [House Appropriations] bill includes $8,824,886,000 for the 20 appropriations which together fund the programs of the [NIH]... The total in the bill is $50,000,000 above the President's budget request for 1992, and $548,147,000 above the comparable appropriations for FY1991. This is a 6.6 percent increase over the 1991 funding level. The net amount added by the Committee over the President's request reflects gross decreases of $145.6 million from the amounts requested offset by gross increases of $195.6 million for high-priority needs identified during Committee hearings... As a result of the testimony presented to the Committee, however, the highest priority was given to women's health issues which received more than one-third of the increases provided in the bill. This includes funding for breast and ovarian cancer, a new long-term clinical trial on women's health, and specific additions for the Office of Women's Health Research to initiate or expand research into areas where women are particularly vulnerable. These include acquired immune deficiency syndrome, reproductive health, linkages between oral contraceptives and breast cancer, osteoporosis, and other areas..." (H. Rpt. 102-121, June 20, 1991, p. 54-55)
- "The [Senate Appropriations] bill includes $8,959,533,000 for the 20 appropriations which together fund the programs of the [NIH]... The amount provided is the same as requested by the administration with the exception of the $184,647,000 added to the [NCI] on a delayed basis to adjust for the effects of inflation since 1980. Additionally, the Committee has reflected Senate priorities by a reallocation of $151,000,000. This $151,000,000 is made available by capturing $55,000,000 of indirect cost savings, concurring with the House on the amounts provided for research training and applying a small percentage reduction to each institute, center, and division... The Committee recommends an appropriation of $2,010,230,000 for the [NCI]. This is $200,000,000 more than the administration request, $296,471,000 more than the 1991 appropriation of $1,713,759,000, and $179,721,000 more than the House allowance." (S. Rpt. 102-104, July 8, 1991, p. 78)
- "It took two tries, but Congress in the closing week of its session finally cleared a [FY1992 Labor-HHS-Education appropriations bill] that was acceptable to President Bush. The action came on Nov. 22, three days after Bush had vetoed the origi-

nal Labor- HHS funding bill (HR 2707) because it contained a provision to suspend administration regulations that barred abortion counseling in federally funded family planning clinics... By far the most heated [conference] debate came over the issue of whether to provide extra funding for two arms of the [NIH], the [NCI and NIA]. Conferees ultimately agreed to a Senate plan pushed by Ernest F. Hollings, D-S.C. to provide $175 million—out of a total of more than $9 billion—specifically for research on cancer and Alzheimer's disease. The funding, $160 million for cancer and $15 million for Alzheimer's, was not to be available, however, until Sept. 30, 1992, the last day of the fiscal year... Although both the House and Senate reports specified increased funding for research into breast and ovarian cancer and other diseases afflicting primarily or exclusively women, female legislators wanted the amounts written into the bill. Those efforts were strongly resisted by [Subcommittee Chairman William H.] Natcher [D-KY], a vehement opponent of earmarking. Members ultimately accepted compromise language crafted by Sen. Adams and Rep. Steny H. Hoyer, D-Md. stating that conferees "urge, in the strongest way, that the [NCI] make breast, prostate, ovarian and cervical cancer their top priorities," and that funding for related research "receive significant increases as outlined in both the House and Senate reports." The inclusion of prostate cancer, a male disease, was for Sen. Stevens, who had had prostate cancer surgery in August and complained earlier in the conference that funding for male-specific diseases was also too low. The female legislators pushing for the extra funding declared victory nevertheless. "It's peanuts compared to what they spend on other diseases that are epidemic," said Rep. Mary Rose Oakar, D-Ohio. "But it's the first time they've really focused in on these issues." ("Abortion Dispute Derails First [HHS] Bill," *CQ Almanac 1991*, 47th ed., 501-15. Washington, DC: Congressional Quarterly, 1992)

NIH R&D Appropriations for FY1997

Bill: Omnibus Consolidated Appropriations Act, 1997; Department of Health and Human Services Appropriations Act, 1997

Public Law: 104-208 **Enacted:** September 30, 1996 **Effective:** October 1, 1996

Nominal change		Real change		Classification
Millions ($)	YOY%	Millions ($2012)	YOY%	
$722.5	6.4%	$759.3	5.3%	Exogenous

Congress appropriated significant increases in both nominal and real NIH research funding for FY1997, largely motivated by long-run public health objectives, renewed bipartisan support for health research, and restoration of the regular budget process following government shutdowns in FY1996; see "Department of Energy R&D Appropriations for FY1996" for more details. The administration's FY1997 budget prioritized federal investments in basic research and proposed increasing NIH funding by roughly 4%, while emphasizing HIV/AIDS research, breast cancer research, and genomics research, among other areas. The House Appropriations Committee added an additional $370.6 million in their allowance for the NIH, relative to the budget request, which would have amounted to a 6.9% increase relative to enacted FY1996 appropriations; the committee report stated that the "funding of biomedical research is an important investment in the future health and economic well-being of our nation," one to be prioritized over deficit reduction efforts, in part reflecting Subcommittee Chairman John Edward Porter's (R-IL) strong support for the agency. The Senate Appropriations Committee similarly affirmed that the NIH's biomedical research program

was "one of its highest priorities," but only provided $38.0 million more than the budget request—$332.6 million less than their House counterparts had approved. The Senate committee remained particularly focused on ensuring the future supply of scientific researchers and providing research grants that would help fund academic training. House Republicans were particularly wary of being blamed for a repeat of the breakdown in the appropriations process and ensuing government shutdowns of late 1995 and early 1996, and a presidential veto threat helped deliver the budget policy priorities of the Clinton administration, but House Republicans' support for the NIH, in particular, led to an even larger increase for the agency. With the House, Senate, and White House all pushing in similar directions on medical research funding, the conference bill adopted the higher House-approved funding levels for the NIH, resulting in a significant increase in appropriations. The increases in NIH research funding appear to have been motivated by long-run public health concerns and unrelated to concerns about unemployment or other short-run macroeconomic prerogatives. As such, we classify this policy event as exogenous. Most pertinent narrative evidence:

- "With science and technology (S&T) so vital to our economic future, our national security, and the well-being of our people, my budget continues our investments in this crucial area. To maintain our investments, I am asking Congress to fulfill my request for basic research in health sciences at the [NIH], for basic research and education at the [NSF], for research at other agencies that depend on S&T for their missions, and for cooperative projects with universities and industry, such as the industry partnerships created under the Advanced Technology Program." (Budget Message of the President, FY1997, March 1996, p. 6)
- "The budget continues the Administration's commitment to biomedical and behavioral research, which promotes the health and well-being of all Americans. The proposed $12.4 billion for NIH is a $467 million, or four percent, increase over 1996. NIH's highest priority continues to be funding investigator-initiated, peer-reviewed research project grants. The budget includes increases for HIV/AIDS-related research, research into breast cancer and other health concerns of women, minority health initiatives, high-performance computing, prevention research, gene therapy, and developmental and reproductive biology. The budget also includes funding for a new NIH Clinical Research Center, which would give NIH a state-of-the-art research facility in which scientists would bring their latest discoveries from the laboratory bench to the patient's bedside." (Budget of the United States, FY1997, pp. 96, 99)
- "The [House Appropriations] bill includes $12,747,203,000 for the 23 appropriations which together fund the programs of the [NIH]... The total in the bill is $370,642,000 above the President's budget request for 1997 and $819,641,000, or 6.9 percent, above the comparable appropriations for FY1996. This funding level provides a 6.5 percent increase in total for the components of NIH excluding the buildings and facilities account. Buildings and facilities receive a 37 percent increase because $90,000,000 is provided for the first year costs of constructing the new clinical research center... The Committee views NIH as one of its very highest priorities and has made difficult resource allocation decisions throughout the bill to preserve what it believes is the minimum necessary funding level for NIH. NIH is the world's leading biomedical research institution; its investments in research save lives and reduce healthcare costs while creating jobs and economic growth in a global economy. In recent years, this research has produced major advances in the treatment of cancer, heart disease, diabetes, and mental illness that have helped thousands of American families. NIH supports over 50,000

scientists at 1,700 universities and research institutes across the U.S. NIH research has spawned the biotechnology revolution, whose products are projected to grow into a $50 billion industry by the turn of the century. The U.S.'s ability to translate scientific discoveries into new product development has resulted in its lead over Europe and Japan in pharmaceutical and biotechnology patents. While the Committee is firm in its commitment to deficit reduction, it believes that funding of biomedical research is an important investment in the future health and economic well-being of our nation." (H. Rpt. 104-659, July 8, 1996, pp. 53-54)

- "The Federal investment in biomedical research at the [NIH] continues to be regarded by the [Senate Appropriations] Committee as one of its highest priorities. The Committee has again worked hard to recommend funding for the NIH which reflects its strong commitment to medical research while also maintaining support for other essential primary and preventive health programs. The FY1997 recommendation for the 24 Institutes, centers, and divisions that comprise the [NIH] totals $12,414,580,000 and, in the view of the Committee, is sufficient to provide the Federal support necessary to maintain a stable biomedical research enterprise in this Nation. The recommendation is $487,018,000 over the 1996 level, $38,019,000 over the President's request, and $332,623,000 less than the House allowance... The Committee is concerned about the future supply of the Nation's health researchers and believes that NIH continue efforts to ensure a stable supply of highly qualified research scientists. The National Academy of Sciences, in its latest report, recommended that NIH increase the number of scientists in behavioral science, nursing research, health services research, and oral health research. The Committee encourages NIH to make a focused effort to train young scientists in these critical areas..." (S. Rpt. 104-368, September 12, 1996, pp. 69-70)
- "Armed with a White House veto threat, Democrats used their end-of-session leverage to win a hefty increase in spending on programs [in the Labor-HHS-Education bill]. Funding for those programs was included in a fiscal 1997 omnibus appropriations bill (HR 3610–PL 104-208) that President Clinton signed into law on Sept. 30. Although much of the growth was in mandatory programs, the measure provided an increase of more than $8.8 billion in discretionary funding—over $5 billion more than either the House or the Senate appropriators had proposed... Restraining their budget-cutting impulses, [House] Republicans proposed to freeze spending on many of the programs they had sought to cut or kill the year before. Democrats still opposed the plan, but the Republicans' move to keep funding largely unchanged for many basic social programs and their general resistance to controversial new policy riders softened the confrontational tone that had marked the previous year's effort... The biggest winner under the draft [House Appropriations] bill was biomedical research at the [NIH], a favorite of subcommittee Chairman John Edward Porter, R-Ill., which was slated to receive a 6.9 percent spending increase." ("Education Gets Big Spending Boost," *CQ Almanac 1996*, 52nd ed., 10-59-10-66. Washington, DC: Congressional Quarterly, 1997)
- "HHS received $29.5 billion [in the conference bill] for discretionary programs, $3.3 billion more than Congress appropriated in fiscal 1996. The largest amount was for NIH: $12.7 billion, the level proposed by the House." (Ibid)
- "With Republicans determined to avoid a politically damaging government shutdown and desperate to get out on the campaign trail, Congress wrapped six still-unfinished fiscal 1997 appropriations bills into a single omnibus package and cleared it Sept. 30.

President Clinton signed the bill into law later the same day. It was only the fourth time since modern federal budgeting began in 1974 that Congress had finished all its regular spending bills by the start of the new fiscal year. The accomplishment was testimony to the remarkable power of political fear. What had been near chaos just a month before—the Republican Congress and Democratic president seemingly far apart on intractable issues, bitter disagreements splitting even House and Senate Republicans—turned to harmony and efficiency in a matter of days. Republicans fearful of losing their seats bolted for the doors, and their leaders obliged them by suing for peace. Republicans gave President Clinton the additional $6.5 billion that he was demanding above what they had planned to appropriate and then handed him more money that he had not requested. That allowed both sides to claim they had protected critical programs in education, the environment, and other areas." ("Catchall FY97 Bill Meets Deadline," *CQ Almanac 1996*, 52nd ed., 10-20-10-21. Washington, DC: Congressional Quarterly, 1997")

NIH R&D Appropriations for FY1998

Bill: Departments of Labor, Health and Human Services, and Education, and Related Agencies Appropriation Act, 1998

Public Law: 105-78 **Enacted:** November 13, 1997 **Effective:** November 13, 1997

Nominal change		Real change		Classification
Millions ($)	YOY%	Millions ($2012)	YOY%	
$905.4	7.5%	$997.0	6.6%	Exogenous

Congress appropriated significant increases in both nominal and real NIH research funding for FY1998, largely motivated by long-run public health objectives and bipartisan support for increasing the NIH's budget. The administration's FY1998 budget again prioritized federal investments in basic research, particularly those for the NIH and NSF, and proposed $13.1 billion for the NIH, an increase of roughly 3% over enacted FY1997 funding levels; HIV/AIDS research, breast cancer research, and genomics research continued to be top administration priorities, among other areas. The House Appropriations Committee added an additional $427.1 million in their allowance for the NIH, relative to the budget request, which would have amounted to a 6% increase for the agency relative to enacted FY1997 appropriations; the committee report declared NIH finding "one of its very highest priorities," noting that NIH-funded research had "produced major advances in the treatment of cancer, heart disease, diabetes, and mental illness that have helped thousands of American families." The House committee also noted that NIH funding was "an important investment in the future health and economic well-being of our nation, one trumping deficit reduction concerns of the day." The Senate Appropriations Committee similarly affirmed that the NIH's biomedical research program remained "one of its highest priorities," and provided $187.6 million more for the institutes than their House counterparts and $614.6 million more than the budget request; the committee noted that the Senate had recently unanimously passed an NIH authorization committing to double the NIH's budget over the next five years, underscoring the tremendous bipartisan support for expanding NIH research programs. The conference committee settled much closer to the Senate's higher funding level for the NIH than the House allowance. The net increase in NIH appropriations appear to have been driven by long-run public health concerns, and appear unrelated to short-run

macroeconomic prerogatives, such as concerns about inflation or unemployment. As such, we classify this policy event as exogenous. Most pertinent narrative evidence:

- "We must speed the remarkable advances in medical science. The human genome project is now decoding the genetic mysteries of life. American scientists have discovered genes linked to breast cancer and ovarian cancer and medication that stops a stroke in progress and begins to reverse its effects and treatments that dramatically lengthen the lives of people with HIV and AIDS. Since I took office, funding for AIDS research at the [NIH] has increased dramatically to $1.5 billion. With new resources, NIH will now become the most powerful discovery engine for an AIDS vaccine, working with other scientists to finally end the threat of AIDS. Remember that every year—every year—we move up the discovery of an AIDS vaccine will save millions of lives around the world. We must reinforce our commitment to medical science." William J. Clinton, State of the Union Address, February 4, 1997 (*The American Presidency Project*, by Gerhard Peters and John T. Woolley, https://www.presidency.ucsb.edu/node/223046)
- "We must maintain our leadership in research, the results of which have so greatly improved our health and well-being. Federal research, in concert with the private sector, creates new knowledge, trains our workers, generates new jobs and industries, solves many of our healthcare challenges, strengthens our ability to address environmental issues, enables us to teach our children better, and ensures that we can maintain a strong, capable national defense. I am proposing to increase our investments in basic research in health sciences at the [NIH], in basic research and education at the [NSF], in research at other agencies that depend on science and technology, and in cooperative ventures with industry..." (Budget Message of the President, FY1998, February 6, 1997, p. 5)
- "The budget continues the Administration's longstanding commitment to biomedical and behavioral research, which advances the health and well-being of all Americans. For the [NIH], it proposes $13.1 billion for biomedical research that would lay the foundation for future innovations that improve health and prevent disease. The budget includes funding for high-priority research areas such as HIV/ AIDS (including efforts to develop an AIDS vaccine), breast cancer, spinal cord injury, high-performance computing, prevention, and genetic medicine. The Office of AIDS Research will continue to coordinate all of NIH's AIDS research. The budget also includes the second year of funding for a new NIH Clinical Research Center, which would give NIH a state-of-the-art research facility in which researchers would bring the latest discoveries directly to patients' bedsides. NIH's top priority continues to be financing investigator-initiated research project grants." (Budget of the United States, FY1998, p. 54)
- "The Federal investment in biomedical research at the [NIH] is regarded by the [Senate] Committee as one of its highest priorities. Few activities of the Government have the potential to improve the quality of life for our Nation's citizenry and reduce the costs of health care than medical research. Earlier this year, the Senate endorsed 98 to 0, a substantial expansion of funding for the [NIH]. The Committee recommendation reflects this commitment to medical research while also maintaining support for other high-priority primary and preventive health programs. The FY1998 recommendation for the 24 Institutes, Centers, and Divisions which comprise the [NIH] totals $13,692,844,000. The recommendation is $952,001,000 over the 1997 level and $614,641,000 over the budget request." (S. Rpt. 105-58, July 24, 1997, p. 67)

- "The bill includes $13,505,294,000 for the 23 appropriations which together fund the programs of the [NIH]... The total in the bill is $427,091,000 above the President's budget request for 1998 and $764,451,000, or 6 percent, above the comparable appropriations for FY1997... The [House] Committee views NIH as one of its very highest priorities and has made difficult resource allocation decisions throughout the bill to preserve what it believes is the minimum necessary funding level for NIH. NIH is the world's leading biomedical research institution; its investments in research save lives and reduce health care costs while creating jobs and economic growth in a global economy. In recent years, this research has produced major advances in the treatment of cancer, heart disease, diabetes, and mental illness that have helped thousands of American families. NIH supports over 50,000 scientists at 1,700 universities and research institutes across the U.S. NIH research has spawned the biotechnology revolution, whose products are projected to grow into a $50 billion industry by the turn of the century. The U.S.'s ability to translate scientific discoveries into new product development has resulted in its lead over Europe and Japan in pharmaceutical and biotechnology patents. While the Committee is firm in its commitment to deficit reduction, it believes that funding biomedical research is an important investment in the future health and economic well-being of our nation. The Committee has allocated the Institute appropriations consistent with the distribution recommended by the Director of NIH... To enhance NIH's flexibility in allocating funding, the Committee has attempted to minimize the amount of direction provided in the report accompanying the bill... there are no directives to fund particular research mechanisms... or specific amounts of funding for particular diseases" (H. Rpt. 105-205, July 25, 1997, pp. 60-61)
- "A divided House Appropriations subcommittee approved a draft of the fiscal 1998 Labor-HHS spending bill by voice vote July 15... The panel allocated more money than Clinton requested for several health programs, including an extra $427 million for the [NIH], bringing the total to $13.5 billion... Like their House counterparts, Senate appropriators allocated more money than Clinton requested for many health programs. The bill included $13.7 billion for the NIH... Conferees agreed to provide $13.6 billion for the NIH, a $907 million increase over fiscal 1997. The total was $142.5 million more than the House bill, but $45 million less than the Senate bill." ("Testing Plan Nearly Sinks Labor Bill," *CQ Almanac 1997*, 53rd ed., 9-50-9-57. Washington, DC: Congressional Quarterly, 1998)
- "Today I have signed into law H.R. 2264, the [FY1998 Labor-HHS-Education appropriations bill]. This Act provides over $80 billion in discretionary budget authority to fund important education, training, and health programs. I am pleased that H.R. 2264 funds a number of my highest domestic priorities at or above my request... The Act provides $33.8 billion for [HHS], providing large increases to a variety of important public health programs. Funding for biomedical research through the [NIH] is increased dramatically. Support for AIDS programs, including programs to assist in the acquisition and provision of break-through AIDS treatments, is stronger than ever." William J. Clinton, Statement on Signing the Departments of Labor, Health and Human Services, and Education, and Related Agencies Appropriations Act, 1998, November 13, 1997 (*The American Presidency Project*, by Gerhard Peters and John T. Woolley, https://www.presidency.ucsb.edu/node/223350)

NIH R&D Appropriations for FY1999

Bill: Omnibus Consolidated and Emergency Supplemental Appropriations Act, 1999; Title II—Department of Health and Human Services Appropriations Act, 1999

Public Law: 105-277 **Enacted:** October 21, 1998 **Effective:** October 21, 1998

Nominal change		Real change		Classification
Millions ($)	YOY%	Millions ($2012)	YOY%	
$1,926.7	14.8%	$2,108.6	13.1%	Exogenous

Congress appropriated significant increases in both nominal and real NIH research funding for FY1999, largely motivated by long-run public health objectives and bipartisan support for increasing the NIH's budget. President Clinton proposed a new Research Fund for America in the FY1999 budget, which again prioritized basic and applied research funded by the NIH and NSF; the budget allocated $14.8 billion for the NIH, an increase of $1.15 billion (8.4%) over enacted funding for FY1998, the largest nominal increase requested for the institutes to date. The administration prioritized further research on diabetes, brain disorders, cancer, drug abuse, genetics, and HIV/AIDS, among other areas, while touting recent biomedical breakthroughs and advances in genomics, which could revolutionize medical research and treatments alike. The House Appropriations Committee again proclaimed the NIH to be "one of its very highest priorities," and in its allowance added an additional $98.7 million above and beyond the budget request for the NIH; the committee lauded that investments in NIH research "save lives and reduce health care costs," while also recently ushering in the "biotechnology revolution" and related economic activity. While the administration intended to increase NIH funding by 50% over the next five years, the Senate had recently—and with resounding bipartisan support—committed to doubling the NIH's budget over the next five years, and the hefty increase requested by the administration was less than the roughly 15% annual increases in funding that would be needed to achieve that objective. The Senate Appropriations Committee proposed $15.6 billion for the agency—up considerably from the $14.9 billion in the House allowance and roughly $2 billion (15%) above FY1998 funding levels. The conference committee settled on the Senate's higher NIH funding level in the omnibus spending bill. House Speaker Newt Gingrich was publicly thanked by medical advocacy groups for helping to secure additional funding for diabetes and autoimmune diseases; the cause was personal, as Gingrich's mother-in-law was diabetic. In a similar vein, Senator Ted Stevens (R-AK), who had beat prostate cancer, championed and tried to earmark increased funding for prostate cancer research. While Congress appropriated nearly twice the increase requested, President Clinton praised the omnibus bill as "a critical down payment on my proposed 21st Century Research Fund for America" and lauded the $2 billion increase for NIH research. The net increase in NIH appropriations appears to have been driven by long-run public health concerns, and appears unrelated to short-run macroeconomic prerogatives, such as concerns about inflation or unemployment. As such, we classify this policy event as exogenous. Most pertinent narrative evidence:

- "In his new budget, President Clinton plans to seek a substantial increase in Federal spending on biomedical research, and members of Congress from both parties say they are virtually certain to approve an even bigger increase. Science and politics point to the same conclusion. When Congress reconvenes this month, lawmakers will be seeking more money for [NIH] because they believe that such investments will be popular with voters in an election year... The budget of the health institutes has doubled in the last decade, to $13.6 billion this year. Nonetheless, lawmakers of both parties say they intend to accelerate the increases, and they talk seriously about trying to double the

budget of the NIH in five years. That would require annual increases averaging 15 percent, far more than the latest increase of 7.1 percent, from 1997 to 1998... The Senate voted 98 to 0 last year to endorse the goal of doubling the agency's budget in five years but did not say where the money should come from. Two influential Republicans, Representative John Edward Porter of Illinois and Senator Arlen Specter of Pennsylvania, said they were determined to find the money. They are chairmen of the Appropriations subcommittees responsible for health care spending. In an interview, Mr. Porter said that he had discussed the question at length with Speaker Newt Gingrich, and that Mr. Gingrich "supports doubling the N.I.H. budget in five years, within the overall context of a balanced budget." At a forum on health issues in Smyrna, Ga., in November, Mr. Gingrich said he wanted to double spending on biological research." ("Medical Research to Get More Money from Government: An Investment in Health," by Robert Pear, *New York Times*, January 3, 1998)

- "Because I am committed to America's continued leadership in science and technology, I am proposing a Research Fund for America, from which many of our important investments will flow. It includes record increases for the [NIH], higher funding for the [NSF], new resources to address global climate change, and a wide variety of investments in basic and applied research. These investments are vital; they help to create new knowledge, train more workers, spur new jobs and industries, address our health care challenges, strengthen our understanding of environmental problems, better educate our children, and maintain a strong national defense." (Budget Message of the President, FY1999, February 2, 1998, p. 6)
- "Progress in biomedical research has ensured that many diseases that Americans faced a generation ago can now be prevented or treated. Smallpox has been eradicated from the world, and polio is gone from the Western Hemisphere. Surgical procedures, such as organ transplants or cardiac pacemakers, can restore normal lives for those who once had few treatment options. The scientific community is now poised to make even more advances that, with sufficient investment, could dramatically alter and improve the way we treat diseases. Several new technologies in medical research show great promise. Specifically, important strides in imaging technologies make it possible to visualize living cells and entire organs, providing new insights into the structure of disease; computer-based systems give scientists new tools to rapidly analyze vast amounts of new data; and the scientific community stands on the cusp of a host of breakthroughs in genetics that will enable scientists to map the entire human genome and revolutionize how we understand, treat, and prevent some of our most devastating diseases. The budget proposes an unprecedented commitment in biomedical research that will lay the foundation for new innovations to improve health and prevent disease." (Budget of the United States, FY1999, pp. 73-74)
- "The budget proposes a Research Fund for America—reflecting the President's commitment to ensuring long-term stability and growth for non-defense research programs... The budget proposes $31 billion for the Fund, representing an eight-percent increase for these programs over the 1998 level... The Fund supports an unprecedented commitment to biomedical research, laying the foundation for new innovations to improve health and prevent disease. It provides an increase of $1.15 billion for the [NIH], the largest ever, to a proposed $14.8 billion funding level that will support greater research on diabetes, brain disorders, cancer, drug demand reduction, genetic medicine, disease prevention strategies, and the development of an AIDS vaccine. NIH's highest priority

continues to be investigator-initiated, peer-reviewed research project grants. To ensure that the United States continues to invest heavily in biomedical research, the budget proposes, for the first time, sustained increases for the NIH over five years. By the year 2003, funding for biomedical research would increase to over $20 billion, or by nearly 50 percent." (Ibid, p. 94)

- "The [House Appropriations] Committee provides $14,862,023,000 for the 23 appropriations which together fund the programs of the [NIH]... The total in the bill is $1,239,637,000 above the FY1998 comparable level and $98,710,000 above the Administration request. This funding level provides a 9.1 percent increase in total for the research components of NIH... The Committee views NIH as one of its very highest priorities and has made difficult resource allocation decisions throughout the bill to provide what it believes is the necessary funding level for NIH. NIH is the world's leading biomedical research institution; its investments in research save lives and reduce healthcare costs while creating jobs and economic growth in a global economy. This research has produced major advances in the treatment of cancer, heart disease, diabetes, and mental illness that have helped thousands of American families. With the funding level provided, NIH will be able to support over 30,000 research project grants at 1,700 universities and research institutes across the U.S. NIH research has spawned the biotechnology revolution, whose products are projected to grow into a $50 billion industry by the turn of the century." (H. Rpt. 105-635, July 20, 1998, pp. 58-59)
- "Disputes on the [FY1999 Labor-HHS-Education] funding bill were so numerous—and the underlying policy disagreements so fundamental—that neither the House nor the Senate was able to pass its version of the legislation (HR 4274, S 2440). At the end of the session, House and Senate appropriators met informally to work out a compromise version of the bill, and then congressional leaders met with White House negotiators to reach a final deal. It became the most expensive title in the omnibus spending package" ("Medical Research, Education Are Big Winners In Bill Funding Labor, [HHS] Departments," *In CQ Almanac 1998*, 54th ed., 2-64-2-74. Washington, DC: Congressional Quarterly, 1999)
- "The [Senate] legislation would include $15.6 billion for NIH, a $2 billion increase over fiscal 1998... Congress splurged on federal medical spending for fiscal 1999, approving unprecedented increases in funding to accelerate research into the cure and prevention of cancer, AIDS, and other serious diseases. The omnibus spending bill (HR 4328) signed by President Clinton on Oct. 21 dedicated $15.6 billion to the [NIH]. That is a 15-percent increase from fiscal 1998 and the beginning of a five-year push to greatly expand the agency's budget. "The $2 billion increase for NIH is simply breathtaking. It's extraordinary—the single largest dollar increase in NIH history," [HHS] Secretary Donna E. Shalala said in an Oct. 21 statement. The White House has called for a 50 percent increase in NIH funding over five years. Some academic and medical groups want to double it... "I have been fighting for years to double NIH funding, and we're on that path," said Sen. Tom Harkin, D-Iowa. Medical groups such as the Association of American Medical Colleges also praised the increase. "These funds will allow us to conquer disease and provide healthier and more productive lives for all Americans," said group President Dr. Jordan J. Cohen." (Ibid)
- "The rise in funds has been accompanied by increased pressure to dedicate some of the NIH budget to research specific diseases. Rep. John Edward Porter, R-Ill., chairman of the House Labor-HHS Appropriations Subcommittee, has fought efforts to earmark

NIH funding, believing as did his predecessor, William Natcher, D-Ky. (1953-94), that those decisions should be left to experts. Due in part to Porter's opposition, lawmakers drafting the conference report dropped a proposal by Senate Appropriations Committee Chairman Ted Stevens, R-Alaska, a prostate cancer survivor, to dedicate $175 million to research on that disease. However, the report urges NIH to make prostate cancer research a top priority. The Juvenile Diabetes Foundation publicly thanked House Speaker Newt Gingrich, R-Ga., for helping to secure $30 million for research into autoimmune diseases, which could include juvenile-onset diabetes, lupus, and other related illnesses. Gingrich, whose mother-in-law is diabetic, has actively worked to secure more research funding as well as expand Medicare coverage of the treatments for the disease." (Ibid)

- "I have signed into law H.R. 4328, the 'Omnibus Consolidated and Emergency Supplemental Appropriations Act, 1999"... There are significant advancements to improve the health of Americans by advancing research and by improving the safety of our food supply. The Food Safety Initiative will expand education, surveillance, import inspections, research, and risk assessment activities. The Congress also made a critical down payment on my proposed 21st Century Research Fund for America by adding $2 billion for biomedical research at the [NIH]. This will enable NIH to pursue new methods of diagnosing, treating, preventing, and curing diseases such as cancer, diabetes, Alzheimer's, and HIV/AIDS." William J. Clinton, Statement on Signing the Omnibus Consolidated and Emergency Supplemental Appropriations Act, 1999, October 23, 1998 (*The American Presidency Project*, by Gerhard Peters and John T. Woolley, https://www.presidency.ucsb.edu/node/225175)

NIH R&D Appropriations for FY2000

Bill: Omnibus Appropriations Act, 2000; Department of Health and Human Services Appropriations Act, 2000

Public Law: 106-113 **Enacted:** November 29, 1999 **Effective:** November 29, 1999

Nominal change		Real change		Classification
Millions ($)	YOY%	Millions ($2012)	YOY%	
$2,227.0	14.9%	$2,150.5	11.8%	Exogenous

Congress again appropriated significant increases in both nominal and real NIH research funding for FY2000, again largely motivated by bipartisan support for increasing the NIH's budget and long-run public health and fiscal sustainability objectives. President Clinton continued to prioritize basic and applied research funded by the NIH and NSF under the umbrella of the 21st Century Research Fund for America, but framed his goal of increasing NIH funding by 50% over five years as "well ahead of schedule" because of the $2 billion increase appropriated for FY1999; the administration requested $15.9 billion for the NIH in FY2000, up just 2% from the previous year, while prioritizing a larger increase for the NSF. The Senate Appropriations Committee remained committed to doubling NIH funding over five years, and rebuked the administration's "failure to recognize" the need for a "steady and sustained commitment of resources" to biomedical and health research; the Committee proposed another $2 billion increase in NIH funding, granting $17.6 billion for their FY2000 allowance, an increase of $1.7 billion (10.5%) over the administration's request. The Senate committee reiterated that NIH funding was a key "investment in the future health and

economic well-being of our nation," one that would help ease the long-term fiscal burden on Medicare and Medicaid. The House Appropriations Committee proposed $17.0 billion for the NIH, a more modest increase of $1.0 billion (6.5%) over the budget request but $648.9 million below the Senate allowance. But the House bill offset part of this large increase in NIH funding with cuts to other Clinton administration priorities, and the ensuing conference bill included an across-the-board cut to discretionary spending and delay in NIH appropriations that the administration objected to; President Clinton vetoed this first version of the FY2000 Labor-HHS-Education appropriations bill that came to his desk, citing "delays in important medical research" as a key reason for his veto. The House and Senate returned to the drawing board and a second conference bill ended up increasing NIH funding to $17.9 billion—a larger $2.3 billion increase over FY1999 levels than originally proposed by either appropriations committee. President Clinton signed this second bill into law, again lauding the increases in NIH funding that vastly exceeded his recommendations; he was particularly pleased about a $300 million increase in HIV/AIDS research funding in the bill. This significant increase in NIH appropriations appears to have been driven by bipartisan support for NIH research, public health concerns, and long-run fiscal objectives, and appears unrelated to concerns about inflation or other short-run macroeconomic prerogatives. As such, we classify this policy event as exogenous. Most pertinent narrative evidence:

- "During the last six years, I have sought to strengthen science and technology investments in order to serve many of our broader goals for the Nation in the economy, education, health care, the environment, and national defense. My budget strengthens basic research programs, which are the foundation of the Government's role in expanding scientific knowledge and spurring innovation. Through the 21st Century Research Fund, the budget provides strong support for the Nation's two largest funders of civilian basic research at universities: the [NSF] and the [NIH]." (Budget Message of the President, FY2000, February 1, 1999, p. 7)
- "Biomedical research is a foundation for combating disease and providing new technologies, from the eradication of smallpox to the disappearance of polio in the Western Hemisphere to prevalence of cardiac pacemakers and organ transplants that help restore normal lives. In last year's budget, the President made a commitment to increasing the [NIH] budget by nearly 50 percent over five years. Last year, NIH received a historic $2 billion increase, putting us ahead of schedule in meeting the President's commitment to expanding biomedical research. This year, with an investment of $15.9 billion in NIH, the budget renews that commitment to biomedical research." (Budget of the United States, FY2000, p. 89)
- "This budget also reflects an effort to reestablish an optimum balance between health care research and other scientific disciplines—a concern voiced in recent years throughout the science community. Substantial recent increases to the [NIH] have advanced the President's commitment to increase long-term NIH funding well ahead of schedule. The budget adds prudently to the NIH while providing a seven-percent boost for the [NSF], which supports a broad range of university research" (Ibid, p. 108)
- "The [House Appropriations] Committee provides $16,964,547,000... for the 24 appropriations, which together fund the programs of the [NIH]... The total in the bill is $1,351,077,000 above the FY1999 comparable level and $1,031,761,000 above the Administration request. This funding level provides a 9.1 percent increase for the research components of NIH... The Committee views NIH as one of its very highest priorities and has made difficult resource allocation decisions throughout the bill to provide what

it believes is the necessary funding level for NIH. NIH is the world's leading biomedical research institution; its investments in research save lives and reduce healthcare costs while creating jobs and economic growth in a global economy. This research has produced major advances in the treatment of cancer, heart disease, diabetes, and mental illness that have helped thousands of American families... The U.S.'s ability to translate scientific discoveries into new product development has resulted in its lead over Europe and Japan in pharmaceutical and biotechnology patents. While the Committee is firm in its commitment to budget restraints, it believes that funding of biomedical research is an important investment in the future health and economic well-being of our nation." (H. Rpt. 106-370, October 7, 1999, pp. 64-65)

- "But remarkable as they are, past accomplishments pale in comparison to the promise medical research embodies for the future. It holds the key to declining disability rates and to lessening the fiscal burden on Medicare and Medicaid. It will lead to a better understanding of human biology at the molecular level, substituting genetically engineered pharmaceuticals for invasive surgery and intensive care units. Robotic chemistry, new screening techniques, and bioinformatics will speed the development and testing of promising new treatments for disease and illness. Nevertheless, tomorrow's hopes are challenged by today's problems. New, potentially deadly pathogens are emerging, while micro-organisms once thought to have been conquered are becoming resistant to traditional antibiotics. The U.S. infant mortality rate still compares poorly to other nations. And the mounting tide of aging baby boomers shoulders its way into old age under the growing shadow of Alzheimer's disease, stroke, and osteoporosis. Research is the bridge that supports the continuum of scientific progress-from inventive ideas to practical application. The keystone of that bridge is the [NIH]. The Committee is disappointed over the administration's failure to recognize that medical and behavioral research demands a steady and sustained commitment of resources. In order to fulfill that commitment—as well as the Senate's goal of doubling NIH over five years—the Committee is recommending that NIH funding be increased by $2,000,000,000 in FY2000 to $17,613,470,000. This level of funding will support a total of approximately 10,000 new and competing research grants, or approximately 900 more than were supported in FY1999" (S. Rpt. 106-166, September 29, 1999, pp. 109-110)
- "After a long struggle over education issues, Congress cleared a $318.5 billion [FY2000 Labor-HHS-Education appropriations bill] on Nov. 19... Republicans believed that acting on legislation this year would put them in a better position to bargain with Clinton and help them avoid a rerun of 1998 when the administration was able to score points on the politically important issue of education. So in September, House appropriators decided to plow ahead with a gimmick-laden plan to increase funding for the [NIH] and for the education of the disabled, while cutting hundreds of millions of dollars from training and jobs programs. The bill approved in subcommittee did not provide funding for many of Clinton's education priorities... Although the House never passed its bill, the House and Senate began negotiating a compromise... The product, which was attached to the conference report for the second District of Columbia spending bill (HR 3064), included a slew of special interest projects for lawmakers and a cut in all federal discretionary spending of 0.97 percent. Clinton vetoed the bill, citing the across-the-board cut, among other things. After the veto, the White House and appropriators began negotiating in earnest... The final deal included $17.9 billion for NIH, compared with $15.6 billion in fiscal 1999, reflecting both parties' interest in

spending on medical research." ("Dispute Over Education Leads to Veto; Final Deal Wrapped Into Omnibus Bill," *CQ Almanac 1999*, 55th ed., 2-94-2-106. Washington, DC: Congressional Quarterly, 2000)

- "I am vetoing HR 3064 because the bill, including the offsets section, is deeply flawed. It includes a misguided 0.97 percent across-the-board reduction that will hurt everything from national defense to education and environmental programs. The legislation also contains crippling cuts in key education, labor, and health priorities and undermines our capacity to manage these programs effectively. The enrolled bill delays the availability of $10.9 billion for the [NIH], the Centers for Disease Control, and other important health and social services programs, resulting in delays in important medical research and health services to low-income Americans. The bill is clearly unacceptable." William J. Clinton, Message to the House of Representatives Returning Without Approval Appropriations Legislation for the District of Columbia and Labor, Health, and Education Programs, November 3, 1999 (*The American Presidency Project*, by Gerhard Peters and John T. Woolley, https://www.presidency.ucsb.edu/node/230094)
- "The conference report would provide $17.9 billion for the [NIH], a 15 percent increase above fiscal 1999 levels. The earlier, vetoed version of the bill would have delayed $7.5 billion in NIH funding until Sept. 29, 2000. The delay was designed to limit fiscal 2000 spending and help Republicans keep their vow not to dip into the Social Security surplus to fund other federal programs... NIH officials and colleges and universities that receive grants from the institution warned that the delay could derail vital research. After negotiations with the White House, the amount of money that would be held back until Sept. 29 was reduced to $3 billion" ("Dispute Over Education Leads to Veto; Final Deal Wrapped Into Omnibus Bill," *CQ Almanac 1999*, 55th ed., 2-94-2-106. Washington, DC: Congressional Quarterly, 2000)
- "I have signed into law H.R. 3194, the Consolidated Appropriations Act for FY2000... It also provides a $34.5 billion investment in health programs, 11.7 percent above the FY1999 enacted level, including a historic increase of $2.3 billion for the [NIH]. These new initiatives will strengthen the public health infrastructure, provide critical prevention and treatment services to individuals with mental illness, and invest in pediatric training programs. I am pleased that the bill includes... an estimated $300 million in additional funds for AIDS-related research at the NIH." William J. Clinton, Statement on Signing Consolidated Appropriations Legislation for FY2000, November 29, 1999 (*The American Presidency Project*, by Gerhard Peters and John T. Woolley, https://www.presidency.ucsb.edu/node/229325)

NIH R&D Appropriations for FY2001

Bill: Consolidated Appropriations Act, 2001; Departments of Labor, Health and Human Services, and Education, and Related Agencies Appropriations Act, 2001

Public Law: 106-554 **Enacted:** December 21, 2000 **Effective:** December 21, 2000

Nominal change		Real change		Classification
Millions ($)	YOY%	Millions ($2012)	YOY%	
$2,660.5	15.5%	$2,782.6	13.7%	Exogenous

Congress again appropriated significant increases in both nominal and real NIH research funding for FY2001, again largely motivated by long-run public health objectives and bipartisan support for increasing the NIH's budget. In his State of the Union address, President

Clinton touted that scientists would finish sequencing the human genome later that year and underscored that federal tax dollars had funded "a revolution in our ability to detect, treat, and prevent disease." The President's FY2001 budget request proposed an additional $1 billion (5.6%) for the NIH over FY2000 funding levels, prioritizing research in diabetes, brain disorders, cancer, genomics, and biomedical information and technology, as well as efforts to develop an AIDS vaccine. The Senate Appropriations Committee, however, again admonished the administration for its "failure to recognize that medical and behavioral research demands a steady and sustained commitment of resources," and proposed a much larger $2.7 billion increase (15.2%) for the NIH, in line with the Senate's commitment to double the NIH's budget in five years; the committee noted that recent "spectacular achievements" in molecular and cell biology, neuroscience, and genomics "can be traced in large part to the support and funding Congress has traditionally afforded NIH." The committee also cautioned that "serious and persistent perils still plague society," and funding increases for cancer, heart disease, and HIV/AIDS research were among their top priorities. The House Appropriations Committee, on the other hand, only approved the $1 billion increase requested by the administration, noting that they were supportive of the effort to double the NIH's budget, but that the top-line allocation for their appropriations bill only allowed a 5.6% increase; the bill reportedly reflected "the Committee's attempt to establish priorities within the very stringent limitations" (H. Rpt. 106-654, p. 4). The FY2001 Labor-HHS-Education appropriations bill was bundled into a last-minute omnibus spending bill, and the conferees settled on a $2.5 billion increase for the NIH, much closer to the Senate allowance than the funding level backed by the House and White House; election year politics reportedly made House Republicans even more willing to support Democrats' domestic spending priorities, including biomedical research. In his statement on signing the omnibus, President Clinton once again expressed strong support for the much larger than requested increase in NIH funding, notably for cancer, diabetes, Alzheimer's, and HIV/AIDS research. This significant increase in NIH appropriations appears to have been driven by bipartisan support for NIH research and public health concerns, and appears unrelated to any concerns about inflation, unemployment, or other short-run macroeconomic prerogatives. As such, we classify this policy event as exogenous. Most pertinent narrative evidence:

- "In the new century, innovations in science and technology will be key not only to the health of the environment but to miraculous improvements in the quality of our lives and advances in the economy. Later this year, researchers will complete the first draft of the entire human genome, the very blueprint of life. It is important for all our fellow Americans to recognize that Federal tax dollars have funded much of this research and that this and other wise investments in science are leading to a revolution in our ability to detect, treat, and prevent disease. For example, researchers have identified genes that cause Parkinson's, diabetes, and certain kinds of cancer. They are designing precision therapies that will block the harmful effects of these genes for good. Researchers already are using this new technique to target and destroy cells that cause breast cancer. Soon, we may be able to use it to prevent the onset of Alzheimer's. Scientists are also working on an artificial retina to help many blind people to see and—listen to this—microchips that would actually directly stimulate damaged spinal cords in a way that could allow people now paralyzed to stand up and walk. These kinds of innovations are also propelling our remarkable prosperity... To accelerate the march of discovery across all these disciplines in science and technology, I ask you to support my recommendation of an unprecedented $3 billion in the 21st-century research fund, the largest increase in civilian research in a generation. We

owe it to our future." William J. Clinton, State of the Union Address, January 27, 2000 (*The American Presidency Project*, by Gerhard Peters and John T. Woolley, https://www.presidency.ucsb.edu/node/227524)

- "The budget continues its commitment to biomedical research by providing an increase of $1 billion over the 2000 level for NIH. This funding level will support research on diabetes, brain disorders, cancer, genetic medicine, disease prevention strategies, biomedical information and technology—including nanotechnology—and the development of an AIDS vaccine. NIH's highest priority continues to be investigator-initiated, peer-reviewed research project grants. In the last year, NIH-supported researchers, who are leading the international effort to sequence the human genome, achieved a scientific milestone by unraveling for the first time the genetic code of an entire human chromosome. This achievement is the first step in the genetic revolution which could profoundly alter our approaches to preventing, treating, and curing disease." (Budget of the United States, FY2001, p. 103)
- "It is no accident that many of society's greatest scientific achievements are the product of research supported in the United States. Science for the sake of improving the health and well-being of its citizens is an idea that has grown in America. It is predicated upon the goal of creating an environment that fosters creativity on the part of individual researchers and institutions, creativity in pursuit of opportunities that are aligned with the needs of individuals. As a result, this country can claim the world's greatest biomedical research establishment, built and nurtured in large part by the [NIH]. Through what some have described as a republic of science, NIH supports nearly 39,000 researchers grants at approximately 2,400 institutions across the country. Beyond that, research supported by NIH has helped to foster today's burgeoning economy by also acting as a catalyst in the growth and development of the biotechnology, bio-engineering, and pharmaceutical industries. Neither is it happenstance that as society shoulders its way into the 21st century there are more opportunities in basic and clinical research than ever before. Advances that have produced an explosion of new knowledge in molecular and cell biology, neuroscience, and DNA research, for example, will enhance our ability to understand disease and find new treatments, cures, and prevention strategies. The spectacular achievements of the past as well as the hope for the future can be traced in large part to the support and funding Congress has traditionally afforded NIH." (S. Rpt. 106-293, May 12, 2000, p. 115)
- "The [Senate Appropriations] Committee is once again disappointed over the administration's failure to recognize that medical and behavioral research demands a steady and sustained commitment of resources. In 1998, the Committee set out a vision that would double NIH funding within five years. That endeavor has already spawned efforts to advance the clinical development of treatments for a broad range of conditions including diabetes, rheumatoid arthritis, Alzheimer's disease, and multiple sclerosis. But much remains to be done. Serious and persistent perils still plague society. And investing in NIH is the single most important action our nation can take to overcome the challenges of cancer, heart disease, HIV/AIDS and other diseases and disorders. The Committee therefore recommends $20,512,735,000 for NIH, an increase of $2,700,000,000, which maintains the goal of doubling NIH funding by 2003." (Ibid, pp. 115-116)
- "The [House Appropriations] Committee provides $18,812,735,000, for the 24 appropriations, which together fund the programs of the [NIH]... The total in the bill is

$1,000,000,000 above the FY2000 comparable level, when adjusted for one-time transfers, and the same as the Administration request. This funding level provides a 5.6 percent increase in total for the research components of NIH... The funding levels provided in the bill for each of the Institutes and Centers reflect what the Committee would have provided if it were able to provide a 15 percent increase for NIH, the third-year installment of the doubling effort. In real terms, the Committee's allocation only allowed for a 5.6 percent increase..." (H. Rpt. 106-645, June 1, 2000, pp. 55-56)

- "For health care, the biggest appropriations battle will be the continuing drive to double the NIH's fiscal 1998 budget by 2003. To do that, as [Senators] Specter, Porter, and Harkin all want, the final Labor-HHS bill must increase the NIH budget by $2.7 billion, for a total of $20.5 billion. The Senate bill would do that, but the House draft includes only enough money for a $1 billion increase—the amount requested by Clinton... the conference agreement includes a $2.7 billion increase for the [NIH], a boost that would keep Congress on track toward Specter and Harkin's goal of doubling NIH's fiscal 1998 budget by 2003. Clinton, who does not share that goal, proposed a $1 billion increase. Specter, however, said biomedical research that can lead to new cures and preventions for diseases is a higher priority than many of Clinton's other proposed spending increases. "If the president wants to have his programs and cut NIH, let him say so," Specter said." ("Bill for Labor, Education, and [HHS] Becomes Vehicle for 11th-Hour Omnibus Package," *CQ Almanac 2000*, 56th ed., 2-97-2-114. Washington, DC: Congressional Quarterly, 2001)
- "Congress was unable to avert its annual pileup of overdue appropriations bills at the end of the session. With election-year partisanship at a fever pitch, the fiscal 2001 appropriations impasse lumbered into a lame-duck session that lasted until mid-December, when an omnibus package was used to close the books on four spending bills and move other unrelated legislation... The final package... also includes a $2.5 billion increase in funding for the [NIH], just shy of the $2.7 billion increase appropriators wanted for biomedical research... Despite its concessions, the administration described the final measure as a victory, especially on the domestic policy front. And while Clinton's victories may have been less sweeping than in his past battles with the GOP Congress, there were still plenty of them, in part because in this election year, the Republicans themselves were willing to accept, more readily than usual, more spending for hiring teachers, repairing schools, conducting biomedical research, financing loans for low-income college students and other programs." ("Longest Appropriations Cycle in Five Years Ends With Omnibus Spending Bill," *CQ Almanac 2000*, 56th ed., 2-3-2-7. Washington, DC: Congressional Quarterly, 2001)
- "I have signed into law H.R. 4577, the Consolidated Appropriations Act, FY2001... The legislation reflects my Administration's longstanding commitment to education, worker training and assistance, and medical research, and continued opposition to unrelated anti-environmental riders, which have no place in these appropriation bills. As a result of extensive negotiations, my Administration was able to secure significant funding increases for many programs that represent significant victories for the American people... I strongly support the increase of $2.5 billion, or 14 percent, over the FY2000 level provided to the [NIH] for biomedical research. The $20.3 billion will enable NIH to continue to pursue new methods for diagnosing, treating, and curing diseases such as cancer, diabetes, Alzheimer's, and HIV/AIDS. The bill also provides $130 million for the newly-established Center for Research on Minority Health and Health Disparities,

which will coordinate and support NIH's trans-Institute, billion-dollar research portfolio on minority health." William J. Clinton, Statement on Signing the Consolidated Appropriations Act, FY2001, December 21, 2000 (*The American Presidency Project*, by Gerhard Peters and John T. Woolley, https://www.presidency.ucsb.edu/node/228609)

NIH R&D Appropriations for FY2002

Bill: Departments of Labor, Health and Human Services, and Education, and Related Agencies Appropriations Act, 2002

Public Law: 107-116 **Enacted:** January 10, 2002 **Effective:** January 10, 2002

Nominal change		Real change		Classification
Millions ($)	YOY%	Millions ($2012)	YOY%	
$2,752.6	13.9%	$3,136.8	13.6%	Exogenous

Congress again appropriated significant increases in both nominal and real NIH research funding for FY2002, again largely motivated by long-run public health objectives and bipartisan support for biomedical research as well as new concerns about biological and chemical weapons following the 9/11 terrorist attacks. President George W. Bush's first budget request proposed a $2.6 billion increase for the NIH early in the year, touting the importance of maintaining support for biomedical research and noting promising "progress toward development of a vaccine for HIV/AIDS." The House Appropriations Committee again approved the full $2.6 billion increase requested by the administration, which would have represented a 12.3% increase in research funding relative to enacted levels for the prior year; the committee elaborated that "NIH as one of its very highest priorities" and that federal funding for "biomedical research is an important investment in the future health and economic well-being of our nation." Once again the Senate Appropriations Committee proposed significantly more funding for the NIH—an increase of $3.4 billion (16.8%) over FY2001, roughly $750 million than requested by the administration—in line with the Senate's bipartisan commitment to double the NIH's budget over FY1998-2003. Well into the FY2002 appropriations cycle, the 9/11 terrorist attacks and ensuing 2001 anthrax terrorist attacks abruptly reduced partisanship and galvanized bipartisan support for additional NIH funding related to bioterrorism; see "Department of Defense R&D Appropriations for FY2002" for more details. The House Committee approved a $100 million increase in funds for countering bioterrorism, some for related NIH research, and the Senate bill included almost as much funding for bioterrorism initiatives. The conference bill split the difference between the Senate and House allowances for the NIH, providing a net increase of $3 billion, while also appropriating $243 million for "countering potential biological, disease and chemical threats to civilian populations." In his statement on signing the bill, President Bush thanked Congress for bipartisan support in drafting the legislation and touted the sizable increase in NIH funding as a supporting a key initiative of the administration. The increases in NIH appropriations appear to have been driven by bipartisan support for NIH research, long-term public health concerns, and new concerns about bioterrorism, and appear unrelated to concerns about unemployment or other short-run macroeconomic prerogatives. As such, we classify this policy event as exogenous. Most pertinent narrative evidence:

- "Budget Highlights: ... Continues commitment to double NIH, by providing a $2.8 billion increase for NIH, the largest annual funding increase in NIH's history." (Budget of the United States, FY2002, p. 8)

- "The [NIH] supports and conducts research to gain knowledge to help prevent, detect, diagnose, and treat disease and disability. NIH supports nearly 60,000 awards and contracts to universities, medical schools, and other research and research training facilities while conducting over 1,200 projects in its own laboratories and clinical facilities. In 2002, NIH-supported research will aim to add to the body of knowledge about biological functions, develop new and improved instruments and technologies for use in research and medicine, and develop new or improved approaches to diagnosing and treating diseases... progress toward development of a vaccine for HIV/AIDS by 2007 is encouraging. Diverse approaches to HIV vaccine design are being pursued, including refinements in the envelope protein strategy, using other HIV accessory proteins as immunogens, and improved DNA vaccine strategies. By 2002, NIH funding will have grown by $9.5 billion, or 70 percent, since 1998" (Ibid, pp. 100-101)
- "In FY1999, the [House Appropriations] Committee began increasing support for developing an infrastructure and resources for the medical and public health response to terrorist acts involving biological or chemical weapons. This effort involved the activities of the Office of Emergency Preparedness (OEP) within the Office of the Secretary; the Centers for Disease Control and Prevention (CDC); and the [NIH]. Although progress has been made, the tragic events of September 11, 2001 impressed upon the Committee the importance of ensuring that the Country is prepared at the Federal, State and Local levels to respond rapidly to any incident of bioterrorism. The Committee recommendation includes $393,319,000 for countering bioterrorism and improving preparedness... an estimated $92,700,000 will be used to fund research supported by the [NIH]. These amounts total $100,000,000 over comparable levels in FY2001." (H. Rpt. 107-229, October 9, 2001, p. 5)
- "The [House] Committee provides $22,874,971,000, for the 26 appropriations, which together fund the programs of the [NIH]... The total in the bill is $2,579,711,000 above the FY2001 comparable level and the same as the budget program request. This funding level provides a 12.3 percent increase in total for the research components of NIH, the same as the budget program request... The Committee views NIH as one of its very highest priorities and has made difficult resource allocation decisions throughout the bill to provide what it believes is the necessary funding level for NIH. NIH is the world's leading biomedical research institution; its investments in research save lives, relieve suffering, and reduce healthcare costs while creating jobs and economic growth in a global economy. This research has produced major advances in the treatment of cancer, heart disease, diabetes, and mental illness that have helped thousands of American families... While the Committee is firm in its commitment to budget restraints, it believes that funding of biomedical research is an important investment in the future health and economic well-being of our nation." (Ibid, p. 56
- "The unparalleled scientific advances of the past, however, are not self-sustaining—nor is the promise of future breakthroughs self-fulfilling. Despite remarkable progress, there are new and growing challenges to confront. Infectious diseases are now the second-leading cause of death worldwide. At least 20 well-known diseases—including tuberculosis, malaria, and cholera—have reemerged as major threats to health, while 30 previously unknown disease agents have been identified. On another front, while society's overall health status has improved, troubling disparities persist among African Americans, Hispanics, Native Americans, Alaskan natives, Asians, and Pacific Islanders. The graying of America is another area of concern. Ten years from now, 75 million

baby boomers will begin to turn 65. By 2050, the number of Americans over 65 will more than double, and the number of individuals over 85 will grow five-fold. With that demographic explosion comes a greater risk of disease and disability, as well as enormous strain on Medicare, Medicaid, and the Nation's health care infrastructure. But there is also good cause to hope for the future. The Human Genome Project has revolutionized our understanding of the fundamental mechanisms of life. As scientists learn more about how to decipher our DNA code, 95 percent of which has now been sequenced, we can look forward to a day when genetic tests will routinely predict a person's susceptibility to disease; diagnoses will be far more precise; treatments will attack diseases at the molecular level; and drugs will be matched to a patient's likely response" (S. Rpt. 107-84, October 11, 2001, pp. 119-120)

- "The [Senate Appropriations] Committee has a long tradition of support for the NIH, the single largest source for medical research funding. In 1998, the Committee played a lead role in launching an effort to double funding for the NIH by FY2003. That decision was rooted in the firm belief that sustained and sufficient funding is essential to accelerate the pace of research advances, ensure the timely application of new discoveries into clinical practice, and maintain the Nation's research infrastructure... The Committee recommends $23,695,260,000 for the NIH, an increase of $3,400,000,000 over the FY2001 appropriation and $748,358,000 more than the budget request. This amount maintains the goal of doubling funding for the NIH by FY2003." (Ibid, p. 120)
- "The fiscal 2002 appropriations season came to a surprisingly calm conclusion after the September terrorist attacks forced all sides to substantially adjust their budget goals. Republican leaders agreed to spend more on domestic programs to help minimize partisan bickering over the 13 regular spending bills. Democrats agreed to the first installment of President Bush's defense buildup without a whimper." ("Spending Fights Put on Hold." *CQ Almanac 2001*, 57th ed., 2-3. Washington, DC: Congressional Quarterly, 2002)
- "Substantial increases for medical research and low-income school children paved the way for Congress to clear the [Labor-HHS-Education] appropriations bill by wide margins the week of Dec. 17... The House and Senate versions of the bill both provided $123.4 billion in discretionary spending. Both focused spending increases on ailing schools and bio-terror-related research at the NIH... The [House] appropriators went to great lengths to defuse controversies... Overall, the bill included enough spending increases to keep lawmakers from both parties happy. Among highlights: $393 million for measures to defend against biological or chemical attacks, a $102 million increase above fiscal 2001. This was the bill's most direct response to the terrorist attacks... The [Senate Appropriations] bill included $23.7 billion for the NIH, a $3.4 billion increase over fiscal 2001. Labor-HHS Appropriations Subcommittee Chairman Tom Harkin, D-Iowa, and Arlen Specter of Pennsylvania, the ranking subcommittee Republican, shared a goal of doubling the fiscal 1998 NIH budget over five years. They said the $2.6 billion increase recommended by the House would fall $800 million short... The final deal gave the NIH a $3 billion increase, $400 million more than in the House bill and $400 million less than in the Senate version." ("HHS, Education Get Big Increases." *CQ Almanac 2001*, 57th ed., 2-34-2-37. Washington, DC: Congressional Quarterly, 2002)
- "Today I have signed into law H.R. 3061, the "Departments of Labor, [HHS], Education, and Related Agencies Appropriations Act, 2002." The legislation provides funding

for key domestic programs, including the important education initiatives that have been a top priority of my Administration. I appreciate the bipartisan effort that has gone into producing this Act. The bill abides by the agreed-upon aggregate funding level for FY2002 of $686 billion and supports several of my Administration's key initiatives with: — $23.2 billion for the [NIH] to support biomedical research to help prevent, detect, diagnose, and treat disease and disability." George W. Bush, Statement on Signing the Departments of Labor, Health and Human Services, and Education, and Related Agencies Appropriations Act, 2002, January 10, 2002 (*The American Presidency Project*, by Gerhard Peters and John T. Woolley, https://www.presidency.ucsb.edu/node/212089)

NIH R&D Appropriations for FY2003

Bill: Consolidated Appropriations Resolution, 2003; Departments of Labor, Health and Human Services, and Education, and Related Agencies Appropriations Act, 2003

Public Law: 108-7 **Enacted:** February 20, 2003 **Effective:** February 20, 2003

Nominal change		Real change		Classification
Millions ($)	YOY%	Millions ($2012)	YOY%	
$3,359.5	14.9%	$3,675.4	14.0%	Exogenous

Congress again appropriated significant increases in both nominal and real NIH research funding for FY2003, again largely motivated by long-run public health objectives, bipartisan support for biomedical research, and new concerns about bioterrorism. In his first State of the Union Address since the 9/11 terrorist attacks and 2001 anthrax attacks, President George W. Bush highlighted that bioterrorism funding was one of four pillars of a new homeland security strategy, noting that "knowledge gained from bioterrorism research will improve public health." The President's FY2003 budget request asked for $5.9 billion for countering bioterrorism threats, including $1.7 billion for related research funded by the NIH, notably for the development of an anthrax vaccine as well as the development of other vaccines, therapeutics, diagnostic tests, and monitoring technologies. In total, the administration requested $27.2 billion for the NIH, an increase of $3.7 billion (15.8%) over FY2002 funding levels, with cancer research a particularly high priority. With the Bush administration having signed onto the Senate's bipartisan objective of doubling the NIH's budget over FY1998-2003, the Senate Appropriations Committee provided only a minor additional increase of $25 million over the budget request in their bill; as the commitment to double the NIH's budget was about to be realized in FY2003, the committee touted that the effort had already "enabled the NIH to support far more promising research than it was ever able to before, and to advance into new areas of science." While House Republicans were trying to pivot to fiscal discipline and a slimmer Labor-HHS-Education appropriations bill cleared the House, the conference bill nonetheless provided the full $27.2 billion for the NIH in the Senate allowance, thus meeting the Senate's high-priority objective of doubling the NIH's budget in five years. The increases in NIH appropriations again appear to have been driven by bipartisan support for NIH research, long-term public health concerns, and newer concerns about bioterrorism, and appear unrelated to concerns about unemployment or other short-run macroeconomic prerogatives. As such, we classify this policy event as exogenous. Most pertinent narrative evidence:

- "My budget nearly doubles funding for a sustained strategy of homeland security, focused on four key areas: bioterrorism, emergency response, airport and border security,

and improved intelligence. We will develop vaccines to fight anthrax and other deadly diseases... Knowledge gained from bioterrorism research will improve public health." George W. Bush, State of the Union Address, January 29, 2002 (*The American Presidency Project*, https://www.presidency.ucsb.edu/node/211864)

- "On October 4, 2001, a Florida man named Robert Stevens was diagnosed with inhalation anthrax. The source of the anthrax attacks is still unknown. But the effects of the attacks are clear: five people were murdered; hundreds treated; thousands tested; and a new American vulnerability laid bare. The consequences of new, larger, more sophisticated attacks could be much worse. We must have no illusions about the threat of germ terror. We learned that we must strengthen effective means to detect and react quickly to bioterrorism—and that a failure to do so endangers our people and our nation. So the President's 2003 Budget requests $5.9 billion to enhance our defenses against bioterrorism... the President's Budget includes an aggressive $2.4 billion research and development program to develop technologies that will strengthen our bioterrorism response capabilities in the mid-and long-term. Almost $1.7 billion would be provided to the [NIH] to perform fundamental research leading to the development of vaccines, therapeutics, diagnostic tests, and reliable biological agent collection, rapid identification and monitoring technologies, and to create a safe and reliable anthrax vaccine." (Budget of the United States, FY2002, pp. 18-19)
- "This NIH funding increase will also finance important research needed for the war against terrorism. Over its history, NIH has been an important contributor to the nation's wartime efforts. During World War II, NIH was instrumental in developing the oxygen mask to prevent pilots from blacking out at high altitudes. Now, as the country faces new bioterrorism threats, NIH is prepared to research the effects of bioterrorism and develop treatments in the event of an attack. The budget includes $1.8 billion for bioterrorism research, including development of an improved anthrax vaccine, and laboratory and research facilities construction and upgrades related to bioterrorism." (Ibid, p. 144)
- "While the nation fights the war against terrorism, it also continues to fight the war on cancer. Each day more than 1,500 people in the United States die from this disease; the annual death toll from cancer exceeds fatalities from all wars fought by the United States in the last century. Thirty years ago, when the war on cancer was declared, many scientists believed that cancer was one disease that would have a single cure. Recent research indicates that cancer is actually hundreds of diseases, all of which require different treatment regimens. Promising research is leading to breakthroughs in treating various forms of cancer. The budget includes a $5.5 billion investment in cancer research at the [NCI] and other NIH Institutes." (Ibid, p. 144)
- "With this year's appropriation, the [Senate Appropriations] Committee marks a historic event: Funding for one of our great national treasures, the [NIH], has been doubled in just five years. Through past investments in the NIH, countless lives have been saved; new vaccines, cures, diagnostics, and treatments have been developed; and a thriving biomedical research industry has been created. That extraordinary record of achievement inspired the Committee in 1998 to embark upon the ambitious goal of doubling the Nation's investment in biomedical research. This goal could not have been achieved without widespread support from scientists, who made a compelling case that the additional funds could be put to good use, and from the American people, millions of whom look to the NIH as their best hope for medical cures and treatments. They,

more than anyone else, have reason to celebrate the completion of the doubling effort. By steadfastly keeping NIH funding on track to achieve this goal, the Committee has enabled the NIH to support far more promising research than it was ever able to before, and to advance into new areas of science, even as the doubling project was underway... As the Committee marks the conclusion of the doubling effort, it notes that the job of investing in biomedical research is far from over. Heart disease, drug abuse, mental disorders, cancer, diabetes, Parkinson's, Alzheimer's, and other debilitating diseases and conditions continue to affect millions of Americans on a daily basis. The Nation must sustain the momentum of these investments, so future generations can continue to benefit from the improvements in human health that flow from the NIH. The Committee recommends $27,192,926,000 for the NIH. This amount is $3,737,083,000 above the FY2002 appropriation and $25,000,000 above the budget request." (S. Rpt. 107-216, July 22, 2002, pp. 97-98)

- "Although Congress got an unusually early start on the [FY2003 Labor-HHS-Education] appropriations bill, the measure never made it to a floor vote in either chamber because of a larger disagreement over spending levels. The programs covered by the bill were funded at fiscal 2002 levels until Jan. 11, 2003, under a continuing resolution (PL 107–294). The only action on the bill was in the Senate, but the drama came in the House, where the bill turned into a roadblock that brought the appropriations process to a halt. The annual Labor-HHS spending bill—historically the largest and most controversial of the appropriations measures—frequently languishes until the end of the session. At that point, lawmakers often are willing to set aside budget constraints and provide whatever extra money is needed to finish the bill and get out of town. This time, however, fiscal conservatives decided to use the bill to make a stand for tighter fiscal discipline. They got an agreement from Speaker Dennis Hastert, R-Ill., to make it the first of the appropriations bills brought to the floor after the August recess, putting it before most of the other domestic spending measures... In the Senate, by contrast, a more generous Labor-HHS bill (S 2766) glided through the Appropriations Committee with relatively little trouble in mid-July. Iowa Democrat Tom Harkin, chairman of the Labor-HHS-Education Appropriations Subcommittee, worked with ranking Republican Arlen Specter of Pennsylvania to write a bill that boosted funding for education and health services..." ("Labor Bill Brings Process to a Halt," *CQ Almanac 2002*, 58th ed., 2-24-2-26. Washington, DC: Congressional Quarterly, 2003)
- "The [FY2003 Labor-HHS-Education appropriations bill] cleared as part of the omnibus spending package and was enacted Feb. 20 (H J Res 2—PL 108-7). The Labor-HHS portion provided $424.1 billion, a 6 percent increase over fiscal 2002 but significantly less than appropriators initially expected... HHS funds included $27.2 billion for the NIH, an increase of $3.8 billion, or 16 percent, over fiscal 2002. The amount completed a congressional commitment to double funding over five years for the 27 institutes and centers specializing in different areas of health research." ("Fiscal Year 2003: Labor-HHS-Education," *CQ Almanac 2003*, 59th ed., 2-18-2-19. Washington, DC: Congressional Quarterly, 2004)

NIH R&D Appropriations for FY2009

Primary Bill: American Recovery and Reinvestment Act of 2009

Public Law: 111-5 **Enacted:** February 17, 2009 **Effective:** February 17, 2009

Secondary: Omnibus Appropriations Act, 2009; Departments of Labor, Health and Human Services, and Education, and Related Agencies Appropriations Act, 2009

Public Law: 111-8 **Enacted:** March 11, 2009 **Effective:** March 11, 2009

Nominal change		Real change		Classification
Millions ($)	YOY%	Millions ($2012)	YOY%	
$9,486.4	33.9%	$9,730.5	32.8%	Endogenous

Congress appropriated significant increases in both nominal and real NIH research funding for FY2009, overwhelmingly through ARRA, the largest fiscal stimulus bill enacted in response to the Great Recession; see "Energy R&D Appropriations for FY2009" for more details. The appropriations process broke down during the lame-duck period of the Bush administration, and Democrats correctly bet that they could secure more funding for their policy priorities if they delayed work until after the 2008 election and Barack Obama were elected. Early in the Obama administration, ARRA appropriated $8.2 billion for the NIH Office of the Director, of which $7.4 billion was to be transferred to the various NIH institutes and centers "to support additional scientific research." ARRA also appropriated $1.3 billion for the National Center for Research Resources, largely for grants to construct, renovate, and repair non-federal research facilities, as well as $500 million for construction and repairs at the NIH's main campus in Bethesda, MD. As ARRA was being drafted, the House and Senate appropriations committees emphasized in their accompanying reports that emergency NIH funding for additional shorter-than-usual research grants, facilities repairs and renovation, and purchases of research equipment and instrumentation could and would all quickly result in additional spending. In March 2009, the FY2009 omnibus bill appropriated $30.3 billion in base funding for the NIH, an increase of $937.5 million (3.2%) over the previous year that roughly split the difference between the House and Senate allowances; the outgoing Bush administration had requested $29.2 billion in FY2009 funding for the NIH, slightly below the $29.4 billion appropriated for FY2008, but the initial budget request ended up having little bearing on enacted funding levels. Because the increases in NIH's funding levels for FY2009 appear to have been largely intended as a form of fiscal stimulus to quickly combat the economic downturn and boost employment, we classify this policy event as endogenous. Most pertinent narrative evidence:

- "The [Senate Appropriations] Committee has sounded the alarm for more Federal biomedical research funding for several years, and the situation is now at a crisis point. Since the end of the 5-year doubling effort, in FY2003, funding for the [NIH] has declined, in real terms, by 12.3 percent. The average researcher now has a less than 1 in 5 chance of getting an NIH grant application approved, and the average age at which researchers receive their first RO1 grant has risen to 42. It is little wonder that many young scientists are balking at a career in biomedical research, putting our Nation at risk of losing a generation of talented investigators who could pursue treatments and cures. Meanwhile, several other countries are ramping up their investments in biomedical research and threatening the leadership of the United States in this field. Regrettably, the administration's budget ignores these warning signs and proposes to freeze NIH funding at the FY2008 level of $29,229,524,000. Under this plan, the success rate for research project grants would fall to 18 percent, the lowest level on record. In real terms, NIH funding would be reduced by more than $1,000,000,000... The Committee rejects the administration's approach and instead recommends an overall NIH funding increase of $1,025,000,000, for a total of $30,254,524,000. That amount

would allow NIH funding to keep up with the biomedical inflation rate (3.5 percent) for the first time in 6 years. It would also increase the estimated number of new, competing research project grants to 10,471—the most ever at NIH" (S. Rpt. 110-410, July 8, 2008, pp. 90-91)

- "This [University Research Facilities] program... supports renovation and construction of university research facilities. These institutions need adequate infrastructure to compete for the biomedical research grants supported by the [NIH] to advance the nation's scientific enterprise and maintain its international standing. Funding has not been provided for the past three years. The [NSF] estimates that academic institutions have about $3.9 billion in deferred projects to repair and renovate biomedical science research space... Bill language for the $1.5 billion has been tailored to limit awards to renovation and repair rather than new construction to ensure that funds can be spent quickly and to permit the purchase of instrumentation... Economic recovery funding [of $1.5 billion] will support 21st-century science and engineering research to bring the nation needed health breakthroughs. Funding for biomedical research supported by the NIH has almost flat-lined after the doubling period at the beginning of the decade, imperiling high-risk, high-return research that was sparked during the doubling. This funding will help return NIH to a predictable investment stream and secure the earlier investments Congress has made. Funds will be allocated by competitive peer review to universities nationwide, as is current NIH funding, and to NIH intramural research. Since NIH is currently able to support less than 20 percent of approved applications, it will be able to disburse this funding without delay through its regular grant cycles. Funds provided in FY2010 will provide the second year of support for the new research generated by FY2009 funding." (H. Rpt. 111-4, January 26, 2009, pp. 51-52)
- "The [Senate Appropriations] Committee recommends an additional $2,700,000,000 for the Office of the Director, half of which will be transferred to the Institutes and Centers. The Committee strongly urges that, to the extent possible, the funds should be used for purposes that can be completed within two years. In particular, the Committee recommends placing a priority on: short-term new grants that focus on specific scientific challenges; new research that expands the scope of ongoing projects; research on public health priorities such as influenza, tuberculosis, and malaria; and stem cell research." (S. Rpt. 111-3, January 27, 2009, p. 56)
- "The following are some of the major provisions of the economic stimulus bill signed into law Feb. 17:... $10.0 billion to conduct biomedical research in such areas as cancer, Alzheimer's disease, heart disease, and stem cells, and to improve the facilities of the [NIH]." ("Details of the Economic Stimulus Law," *CQ Almanac 2009*, 65th ed., edited by Jan Austin, 7-7-7-9. Washington, DC: CQ-Roll Call Group, 2010)
- "Today I have signed into law H.R. 1, the "American Recovery and Reinvestment Act of 2009." The Act provides a direct fiscal boost to help lift our Nation from the greatest economic crisis in our lifetimes and lay the foundation for further growth. This recovery plan will help to save or create as many as three to four million jobs by the end of 2010, the vast majority of them in the private sector... It will make investments to foster reform in education, double renewable energy while fostering efficiency in the use of our energy, and improve quality while bringing down costs in healthcare." Barack H. Obama, Statement on Signing the American Recovery and Reinvestment Act of 2009, February 17, 2009 (*The American Presidency Project*, by Gerhard Peters and John T. Woolley, https://www.presidency.ucsb.edu/node/286325)

NIH R&D Appropriations for FY2010

Bill: Consolidated Appropriations Act, 2010; Departments of Labor, Health and Human Services, and Education, and Related Agencies Appropriation Act, 2010

Public Law: 111-117 **Enacted:** December 16, 2009 **Effective:** December 16, 2009

Nominal change		Real change		Classification
Millions ($)	YOY%	Millions ($2012)	YOY%	
-$7,922.3	-21.1%	-$8,834.7	-22.4%	Endogenous

Congress appropriated significant decreases in both nominal and real NIH research funding for FY2010, entirely driven by the reversal of a surge in emergency ARRA stimulus funding provided for the NIH in FY2009. The Obama administration requested $30.8 billion for NIH funding in FY2010, down from $40.7 billion—including $10.4 billion in ARRA funding—appropriated for FY2009; excluding ARRA funding, the budget request reflected only a modest $441.7 million (1.5%) increase over regular order appropriations for the NIH in FY2009, below the rate of inflation. The administration was pushing to double cancer research and proposed an additional $268 million in NIH cancer research funding to build off the investments provided by ARRA, but did not push for broader increases in biomedical research programs apart from a $19 million earmark for increased autism research. The House Appropriations Committee explained that "the funds provided in this bill are intended to supplement the assistance provided in the Recovery Act to address continuing needs and priorities" in their accompanying report; the committee recommended $31.3 billion for the NIH, adding $500 million to the budget request. The Senate Committee similarly noted that it viewed the ARRA funding increases as a "one-time adjustment" and that "the record-high increase for the NIH in the ARRA greatly mitigates the need for more funding than the administration requested in FY2010," only approving the top-line budget request; the Senate committee also cautioned against politicians "with no professional expertise in medical research" making "funding decisions about hundreds of diseases and health conditions," and soundly rejected the administration's efforts to earmark more funding specifically for cancer and autism research. The conference committee settled on $31.0 billion in NIH funding for the year, exactly splitting the difference between the higher House and lower Senate allowances. The budget request and deliberations over NIH appropriations reflected the surge in FY2009 NIH funding from ARRA and relatedly diminished needs for additional funding in FY2010; because the decrease in NIH research funding appears to have been largely driven by the reversal of a one-off fiscal stimulus appropriated for FY2009 to combat the recession, we classify this policy event as endogenous. Most pertinent narrative evidence:

- "The Budget includes over $6 billion within the [NIH] to support cancer research. This funding is central to the President's sustained, multi-year plan to double cancer research. These resources will be committed strategically to have the greatest impact on developing innovative diagnostics, treatments, and cures for cancer. This initiative will build upon the unprecedented $10 billion provided in [ARRA], which will support new NIH research in [FY2009-10]" (Budget of the United States, FY2010, p. 68)
- "The country is experiencing the longest and deepest economic downturn since the Great Depression, with more than seven million jobs lost during the current recession. In June 2009, the unemployment rate reached 9.5 percent... More than four million, or 29 percent of the unemployed, had been out of work for six months or more—the highest proportion of long-term joblessness on record. Many families cannot pay their

bills or mortgage payments, and trillions of dollars of wealth have been stripped from Americans' retirement accounts... In response to this crisis, this Committee led the way toward enactment of [ARRA], which provided an unprecedented $124,150,000,000 to save and create jobs, invest in health care and education, provide fiscal relief to States and communities, and establish a foundation for long-term fiscal stability. The Recovery Act is beginning to save or create more than 3.5 million jobs over the next two years and deliver relief to millions of struggling families. The funds provided in this bill are intended to supplement the assistance provided in the Recovery Act to address continuing needs and priorities, and support essential activities that did not receive funding in the Recovery Act." (H. Rpt. 111-220, July 22, 2009, pp. 4-5)

- "The [House] Committee recommends an appropriation of $31,258,788,000 for the [NIH], which is $941,764,000 above the FY2009 appropriation and $500,000,000 above the budget request. The Recovery Act provided an additional $10,400,000,000 for NIH in fiscal years 2009 and 2010. FY2009 has been a year of unprecedented opportunity for NIH. The combination of Recovery Act funding and the FY2009 Omnibus Appropriations Act increased the NIH appropriation by almost 40 percent. NIH is required to spend all Recovery Act funding in two years in order to spur economic recovery. NIH has risen to that challenge and has created new types of grants that aim to produce defined results in a two-year period... NIH is on track to obligate all Recovery Act funding by the end of FY2010. The Committee is convinced that investing now in NIH research will generate untold breakthroughs that will improve health and reduce healthcare expenditures in the future. The nation's return on investment in NIH includes declines in death rates for cardiovascular diseases and an increase in cancer survivorship, as just two examples. NIH is the largest single engine for biomedical research in the world. The pace of discovery in the biomedical sciences has never been as rapid or as promising. NIH funding supports more than 300,000 scientists and research personnel affiliated with more than 3,100 organizations in all 50 States." (Ibid, p. 106)
- "This year, the [Senate Appropriations] Committee wrote the bill under unique circumstances created by the passage, in February, of [ARRA]. That act appropriated a total of $125,143,703,000 for programs in this bill, including $98,238,000,000 in the Education Department and $10,380,703,000 for the [NIH]. The vast majority of ARRA funding must be obligated by September 30, 2010, and most will be obligated during FY2010, the same period covered by this Committee's appropriations bill. The unprecedented funding levels in ARRA created an unusual context for deliberations on this bill. Several programs that are historically among the highest priorities for this Committee—such as... the [NIH]—also received large increases in ARRA. In some cases, the increases provided in ARRA were higher than had ever been awarded to these programs. With so much money flowing through these programs from ARRA in FY2010, the Committee adopted a general policy, which it considers a one-time adjustment, that it would not provide additional large increases to these programs in the regular FY2010 appropriations bill. Instead, the Committee emphasized several other programs that are also important but did not receive large increases in ARRA." (S. Rpt. 111-66, August 4, 2009. pp. 4-5)
- "The [Senate Appropriations] Committee recommends an overall funding level for the [NIH] of $30,758,788,000, the same as the budget request. This amount is $441,764,000 more than the regular FY2009 level, not including the $10,380,703,000 appropriated in [ARRA]. The Committee understands that the recommended FY2010 funding level

falls below the amount needed to keep up with biomedical inflation and that the NIH could face severe financial pressures in FY2011. But the Committee notes that the record-high increase for the NIH in the ARRA greatly mitigates the need for more funding than the administration requested in FY2010. While additional funding for the NIH could help ease the budgetary pressures in FY2011, that alone is not a sufficient reason to go beyond the administration's budget request in FY2010, especially when many other important programs in this bill that did not receive increases in the ARRA face immediate pressures of their own. The Committee rejects the administration's proposals to earmark an increase of $268,000,000 for research on cancer and an increase of $19,000,000 for research on autism. The devastating effects of cancer and autism are well known, and additional federally supported research in these areas is certainly warranted. However, the President's plan would set a dangerous precedent. The Committee has long subscribed to the view that funding levels for individual diseases should be determined without political interference... In the long run, no one's interest would be served if Members of Congress with no professional expertise in medical research were asked to make funding decisions about hundreds of diseases and health conditions." (Ibid, p. 87)

- "Democrats won major increases for health and education programs under the [FY2010 Labor-HHS-Education appropriations bill]. The measure was enacted as part of a year-end omnibus appropriations package. President Obama signed the omnibus into law on Dec. 16 (HR 3288—PL 111-117)... The House passed a stand-alone Labor-HHS-Education bill in July with $163.4 billion for discretionary programs. The Senate Appropriations Committee approved a slightly smaller, $163.1 billion version later the same month. The measure never reached the Senate floor and was instead folded into the six-bill omnibus spending package... Republicans complained that the bill was far too costly, particularly given that the programs it covered had gotten a total of $136.6 billion in February under an economic stimulus law (PL 111-5). Democrats argued that health and education programs had been severely underfunded for years under President George W. Bush and a GOP-controlled Congress." ("Bill Boosts Health, Education Funds," *CQ Almanac 2009*, 65th ed., edited by Jan Austin, 2-37-2-39. Washington, DC: CQ-Roll Call Group, 2010)
- "The following are major provisions of the Labor-HHS-Education section of the omnibus. Increases of less than 2 percent did not make up for inflation: ... $31 billion for the [NIH], which provided most of the nation's federal research grants. The amount was an increase of $692 million over regular fiscal 2009 funding; if $10.4 billion in emergency fiscal 2009 funds was included, it became a $9.7 billion reduction. The amount was slightly more than Obama requested." (Ibid)

NIH R&D Appropriations for FY2011

Bill: Department of Defense and Full-Year Continuing Appropriations Act, 2011; Title VIII—Labor, Health and Human Services, Education, and Related Agencies

Public Law: 112-10 **Enacted:** April 15, 2011 **Effective:** April 15, 2011

Nominal change		Real change		Classification
Millions ($)	YOY%	Millions ($2012)	YOY%	
-$257.6	-0.9%	-$1,057.0	-3.5%	Exogenous

Congress appropriated a modest decrease in nominal NIH research funding for FY2011, resulting in a more significant decline in real terms, as the regular order budget process broke down in late 2010 and the newly elected House Republican majority demanded sharp cuts to nondefense discretionary spending early in 2011; see "Energy R&D Appropriations for FY2011" for more details. The Obama administration requested $32.0 billion for the NIH, which would have represented a $1.0 billion (3.2%) increase over FY2010 funding levels, and continued to prioritize increased funding for cancer and autism research. The Senate Appropriations Committee merely approved the budget request, noting that the NIH would receive "less than what would have been desired in stronger economic time" but at least the modest increase would allow funding to keep up with biomedical inflation; the committee noted that long-term concerns about economic uncertainty and the national debt rising to "frightening levels" had influenced their bill. The House Appropriations Committee had also initially recommended the requested $1 billion increase in NIH funding, but the regular appropriations process broke down, and with it NIH funding was cut well below those committee allowances. Congress narrowly avoided a series of government shutdowns with repeated CRs that incrementally cut spending until a bipartisan deal in April 2011 extended funding for the remainder of FY2011, rendering a net $40 billion reduction in discretionary spending; see "NASA R&D Appropriations for FY2011" for more details. That budget deal resulted in a $260 million cut to NIH appropriations relative to enacted funding for FY2010. The decrease in NIH research funding appears related to concerns about long-term deficit reduction and partisan disagreement about the appropriate size and role of the federal budget, and unrelated to any concerns about inflation, unemployment, or other short-run macroeconomic prerogatives. As such, we classify this policy change as exogenous. Most pertinent narrative evidence:

- "To accelerate progress in biomedical research, the Budget continues to support research both on the campuses of the [NIH] and for approximately 300,000 scientists and other research personnel at institutions across the country. Investments will focus on priority areas including genomics, translational research, science to support health care reform, global health, and reinvigorating the biomedical research community. The Budget also includes $6,036 million to continue to expand research related to cancer, and $143 million to expand research related to Autism Spectrum Disorders. Finally, under the President's Executive Order and subsequent NIH Guidelines for Human Stem Cell Research, NIH approved 40 responsibly-derived stem cell lines—nearly double the previous number of lines available—for path-breaking research. Additionally, NIH will pursue the discovery, development, and pre-clinical testing of novel compounds for the prevention and treatment of symptoms associated with Alzheimer's disease." (Budget of the United States, FY2011, p. 21)
- "[The budget] expands support for biomedical research, by providing an increase of $1 billion... NIH investments will focus on priority areas including genomics, translational research, science to support health care reform, global health, and reinvigorating the biomedical research community... the Budget will support the completion of a comprehensive catalog of cancer mutations for the 20 most common malignancies, setting the stage for complete genomic characterization of every cancer as part of medical care within ten years." (Ibid, pp. 73-74)
- "Federal financing of science research, which has risen quickly since the Obama administration came to power, could fall back to pre-Obama levels if the incoming Republican leadership in the House of Representatives follows through on its list of campaign

promises. In the Republican platform, Pledge to America, the party vows to cut discretionary nonmilitary spending to 2008 levels. Under that plan, [R&D] at nonmilitary agencies—including those that sponsor science and health research—would fall 12.3 percent, to $57.8 billion, from Mr. Obama's request of $65.9 billion for FY2011. An analysis by the American Association for the Advancement of Science looked at what would happen if all of the agencies were cut to the 2008 amounts. The [NIH] would lose $2.9 billion, or 9 percent, of its research money." ("Money for Scientific Research May Be Scarce With a Republican-Led House," by Kenneth Chang, *New York Times*, November 3, 2010)

- "The [Senate Appropriations] Committee wrote this year's bill in a period of great uncertainty. Although the economy is expanding again, far too many Americans still can't find a job, and the threat of a double-dip recession looms large. In the longer term, the national debt continues to rise to frightening levels. As the largest nondefense Federal appropriations bill being considered by Congress this year, this bill must respond to both sets of challenges, addressing today's hard economic realities while taking every possible opportunity to reduce waste, fraud, and abuse." (S. Rpt. 111-243, August 2, 2010, p. 4)
- "The [Senate Appropriations] Committee recommends an overall funding level for the [NIH] of $32,007,237,000, the same as the budget request. This amount is $1,002,036,000 more than the FY2010 level. The Committee recognizes that the NIH faces an imposing "funding cliff" following the historic increase—nearly $10,400,000,000—provided by [ARRA]. Negotiating the softest possible landing is critical to maintaining the scientific momentum gained over the past two years and ensuring that young investigators in particular can find a bright future in the field of biomedical research. While the 3.2 percent increase proposed by the administration and recommended by the Committee is less than what would have been desired in stronger economic times, it keeps up with biomedical inflation—a distinction that was all too rare during the mid-2000s. The Committee hopes that this will mark the first of several years of growth for the NIH that, if not spectacular, are at least steady and predictable." (Ibid, p. 95)
- "Congress completed none of the 12 appropriations bills for fiscal 2011, which began on Oct. 1, 2010. To avoid a government shutdown, lawmakers cleared a series of short-term continuing resolutions that froze most government spending at fiscal 2010 levels. The last of these stopgap bills (PL 111-322) was good through March 4, 2011... The [Labor-HHS-Education bill] was typically the largest of the appropriations bills and one of the most difficult to pass... Versions of the fiscal 2011 measure won approval in the Senate Appropriations Committee and in the House Labor-HHS-Education Subcommittee but went no further. Programs under the bill were funded mostly at fiscal 2010 levels through March 4, 2011, under the continuing resolution signed into law on Dec. 22 (PL 111-322)... The Senate committee rejected, 2-18, an amendment by [Senator] Arlen Specter, D-Pa., to increase funding for the [NIH] by $1 billion. NIH was slated to receive $32 billion under both [House and Senate] measures, $1 billion more than in fiscal 2010." ("Action Aborted on all FY2011 Bills," *CQ Almanac 2010*, 66th ed., edited by Jan Austin, 2-5-2-14. Washington, DC: CQ-Roll Call Group, 2011)
- "The Departments of Labor, Health and Human Services, and Education got a total of $157.7 billion in discretionary funding under the spending package (PL 112-10), a reduction of $5.5 billion, or about 3 percent... The [NIH] received $30.7 billion, a $260 million reduction." ("Appropriations Bills for Fiscal 2011," *CQ Almanac 2011*,

67th ed., edited by Jan Austin, 2-8-2-12. Washington, DC: CQ-Roll Call Group, 2012)

NIH R&D Appropriations for FY2013

Bill: Consolidated and Further Continuing Appropriations Act, 2013; Division F; Title V—Labor, Health and Human Services, and Education, and Related Agencies

Public Law: 113-6 **Enacted:** March 26, 2013 **Effective:** March 26, 2013

Nominal change		Real change		Classification
Millions ($)	YOY%	Millions ($2012)	YOY%	
-$1,506.6	-5.2%	-$1,699.7	-5.9%	Exogenous

Congress significantly cut both nominal and real appropriations for NIH research in FY2013, entirely because the legislative resolution to the 2011 debt ceiling crisis had capped discretionary spending, and further automatic "sequestration" spending cuts were unexpectedly triggered in FY2013; see "Department of Defense R&D Appropriations for FY2012-2013" for more details. The Obama administration proposed $30.6 billion in NIH funding for FY2013, a nominal freeze from FY2012 appropriations. The regular appropriations process completely broke down in FY2013, and the House Appropriations Committee never passed the Labor-HHS-Education bill drafted by the subcommittee. The Senate Appropriations Committee added $100 million to the administration's request for the NIH and rejected an administration proposal to divert funds from research to program evaluation, but the eventual NIH funding level for FY2013 resembled neither the Senate bill nor the budget request. Several CRs kept the federal government funded at levels constrained by the BCA discretionary spending caps, and the FY2013 omnibus appropriations bill kept most funding for Labor-HHS-Education appropriations frozen at FY2012 levels. The implementation of the sequestration spending cuts was marginally delayed by two months, but then the sequester took effect in March 2013; see "Energy R&D Appropriations for FY2013" for more details. In testimony before the House Appropriations Committee, NIH Director Francis S. Collins had warned that the sequestration cuts being triggered on January 2 would cut NIH funding for FY2013 by $2.5 billion, a "devastating" reduction of roughly 7.8% below enacted funds for the previous year. With the partial delay, sequestration resulted in NIH funding being cut to $29.3 billion, down roughly 5% from the previous year. This decrease in NIH research funding levels appears to have been driven by concerns about long-term deficit reduction, a breakdown in the regular appropriations process, and partisan disagreement about the appropriate size and role of the federal budget, and unrelated to any concerns about inflation, unemployment, or other short-run macroeconomic prerogatives. As such, we classify this policy change as exogenous. Most pertinent narrative evidence:

- "In this Budget, we are sustaining our level of investment in non-defense [R&D] even as overall spending declines, thereby keeping us on track to double R&D funding in the key R&D agencies. We are supporting research at the [NIH] that will accelerate the translation of new discoveries in biomedical science into new therapies and cures, along with initiatives at the Food and Drug Administration that will speed the approval of new medicines. We make important investments in the science and research needed to tackle the most important environmental challenges of our time, and we are investing in fields as varied as cyber-security, nano-technology, and advanced manufacturing. This Budget also puts an emphasis on the basic research that leads to the breakthroughs of tomorrow, which increasingly is no longer being conducted by the private sector, as

well as helping inventors bring their innovations from laboratory to market." (Budget Message of the President, FY2013, February 13, 2012, p. 4)

- "Biomedical research contributes to improving the health of the American people as well as the economy. The Budget includes $31 billion for NIH to support research on-campus and at academic and independent research institutions across the country. Tomorrow's advances in health care depend on today's investments in basic research on the fundamental causes and mechanisms of disease, new technologies to accelerate discoveries, advancing translational sciences, and encouraging new investigators and new ideas. In 2013, NIH will implement new grants management policies to increase the number of new research grants awarded and continue to focus on resources for new investigators." (Budget of the United States, FY2013, pp. 109-110)
- "And as we meet here to discuss the [NIH], the House is preparing to debate a budget plan for the upcoming fiscal year. The House majority is renewing its demands for more and more drastic cuts that, in my view, will harm medical research and many other priorities vital to our well-being and to our future. What the NIH does, and the research it supports at universities, hospitals, and institutes across the country, is unquestionably important to each of us. It alleviates suffering. It saves lives. And so many of you know that I am a cancer survivor—26 years this month. I am here because of the grace of God and because of biomedical research. Just last year, researchers found that anomalies in a single gene were present in nearly all of the most common types of ovarian cancer, a finding that may lead to more effective diagnostics and treatments. That is but one example of why NIH is the gold standard for biomedical research, not only in the United States, but in the world... Despite these benefits, recent budget choices have shrunk NIH. Total funding for the NIH is now $86 million less than it was just two years ago, and that is without considering inflation, meaning that those same dollars are able to support even less research. When adjusted for increasing costs of medical research, the NIH appropriation has lost 5 percent of its purchasing power since 2010, and 16 percent since 2003. NIH estimates that it will be able to support 767 fewer research project grants in 2012 than it did in 2010, and 2,700 fewer grants than in 2004." Representative Rosa DeLauro, House Subcommittee Ranking Member, March 20, 2012 (Hearings Before the House Appropriations Committee on Labor-HHS-Education Appropriations for FY2013, Part 6, pp. 174-175)
- "If, in fact, the sequesters were to kick in on January 2nd, 2013, that would result, according to the CBO, in a loss of about 7.8 percent of the NIH budget, $2.5 billion. As a result of that, 2,300 grants that we would have planned to give in FY'13 would not be able to be awarded. It would be devastating" Dr. Francis S. Collins, Director, NIH, March 20, 2012 (Ibid, p. 210)
- "Weighing the relative merits of such a wide range of priorities is difficult, especially when funding is tight. The [Senate] Committee has tried to strike a balance between investing in the future prosperity of the Nation, providing a safety net for people who are most vulnerable in today's struggling economy, and increasing the fiscal accountability and effective use of taxpayer dollars... Just because times are lean doesn't mean that innovation should cease." (S. Rpt. 112-176, June 24, 2012, pp. 8-9)
- "The [Senate Appropriations] Committee provides $30,731,459,000 for NIH activities within the jurisdiction of this bill... The budget request is $30,631,459,000, the same as the FY2012 level. The Committee notes that the net amount for NIH in the budget request would actually be a cut of more than $200,000,000 below the FY2012 level

following implementation of the administration's proposal to increase the program evaluation tap on PHS agencies from 2.5 percent to 3.2 percent. As explained in the introduction to the HHS title in this report, the Committee rejects that proposed increase and maintains the tap at 2.5 percent" (Ibid, pp. 77-78)

- "In a rare instance of bipartisan unity, congressional Democrats and Republicans agreed to punt the fiscal 2013 appropriations process past the November elections and into the following year... The agreement had been negotiated by the White House and a bipartisan congressional leadership team in August. Neither party wanted the threat of a government shutdown hanging over the elections, a likely problem if they had tried to reach a yearlong agreement. Both also preferred to remove the issue from the expected year-end clash over tax law and over a pending across-the-board spending cut, collectively known as the fiscal cliff... None of the 12 fiscal 2013 spending bills had cleared. The House passed all but the controversial Labor-HHS-Education bill, while the Senate passed five of the 12. Democrats signed off on the six-month measure, known as a continuing resolution, or CR, only after it was agreed that it would reflect the $1.047 trillion fiscal 2013 discretionary spending cap set in the 2011 Budget Control Act ("Congress Delays Spending Bills, Extends Funds Through March 2013," *CQ Almanac 2012*, 68th ed., 2-3-2-5. Washington, DC: CQ-Roll Call Group, 2013)
- "Since FY2003, however, NIH funding has increased more gradually. Funding peaked in FY2010 before declining in FY2011, and again in FY2013... the FY2013 total, provided in the Consolidated and Further Continuing Appropriations Act, 2013 (P.L. 113-6), was reduced [to $29.3 billion] by the March 2013 sequestration and was 5% lower than the prior year." ("Brief History of NIH Funding: Fact Sheet," by Judith A. Johnson, December 23, 2013, *Congressional Research Service*)

NIH R&D Appropriations for FY2016

Bill: Consolidated Appropriations Act, 2016; Departments of Labor, Health and Human Services, and Education, and Related Agencies Appropriations Act, 2016

Public Law: 114-113 **Enacted:** December 18, 2015 **Effective:** December 18, 2015

Nominal change		Real change		Classification
Millions ($)	YOY%	Millions ($2012)	YOY%	
$1,782.1	6.3%	$1,880.4	6.8%	Exogenous

Congress appropriated significant increases in both nominal and real NIH research funding for FY2016, enabled by Congress growing frustrated with the BCA of 2011 and reaching a bipartisan deal that relaxed those spending caps for FY2016-17, avoiding another government shutdown; see "Defense R&D Appropriations for FY2016" and "Energy R&D Appropriations for FY2016" for more details. The Obama administration lamented that the NIH was funding the fewest competitive research grants in over a decade because of the BCA and proposed once again easing the BCA's sequester; the FY2016 budget request proposed $31.1 billion for the NIH, $1 billion more than appropriated for FY2015, placing particular emphasis on Alzheimer's and cancer research as well as a new Brain Research through Application of Innovative Neurotechnologies (BRAIN) initiative. The House Appropriations Committee noted that in the current fiscal environment, they had to prioritize essential "must-do" budget activities over "nice-to-do" ones, with the NIH falling in the former camp; in their allowance, the committee increased NIH funding by $100 million over

the budget request, reportedly "reflecting the Committee's ongoing emphasis on biomedical research that can lead to a lifesaving cure." The Senate Appropriations Committee, meanwhile, proposed $32.1 billion for FY2016 NIH funding, an increase of $900 million over the House allowance and $2.0 billion over enacted funding for FY2015, with particular emphasis on increasing the number of competitive research grants; the bill would allow for 11,500 grants, up 26% from FY2015 levels; in justifying their sizable increase for the NIH, the committee explained that NIH research "raised life expectancy, improved quality of life, and is an economic engine helping to sustain American competitiveness." The committee also argued that increasing NIH research funding would help "reduce healthcare costs." The Bipartisan Budget Act of 2015 (Pub. L. 114–74) increased discretionary spending limits for FY2016-17, enabling a $5.4 billion increase in top-line Labor-HHS-Education appropriations relative to FY2015, and the ensuing FY2016 omnibus appropriations bill prioritized NIH funding, providing the higher Senate allowance of $32.1 billion, $1 billion more than the budget request. The enacted increases in NIH research funding appear to have been driven by renewed bipartisan support for biomedical research, easing concerns about long-term deficit reduction, and growing frustration with the BCA sequester. The policy changes appear to have been unrelated to concerns about unemployment or other short-run macroeconomic prerogatives, and as such, we classify it as exogenous. Most pertinent narrative evidence:

- "When Congress failed to enact the balanced long-term deficit reduction required by the Budget Control Act of 2011, a series of automatic cuts known as sequestration went into effect, canceling more than $80 billion in budgetary resources across the Federal Government in 2013. Beyond the economic impacts, these cuts also had severe programmatic impacts, shortchanging investments that contribute to future growth, reducing economic opportunity, and harming vulnerable populations. For example: ... Hundreds of important scientific projects went unfunded. The [NIH] funded the lowest number of competitive research project grants in over a decade, providing roughly 750 fewer competitive grants in 2013 compared to the previous year. These unfunded grants included more than a hundred competitive renewal applications that were considered highly meritorious for additional funding in peer review, limiting research into brain disorders, infectious disease, and cancer." (Budget of the United States, FY2016, p. 9)
- "The Budget provides $31.3 billion to support biomedical research at NIH, providing about 10,000 new NIH grants that will help to better understand the fundamental causes and mechanisms of disease. The Budget provides increased resources for Alzheimer's, cancer and other diseases that affect millions of Americans, and enhanced support for the BRAIN initiative that is helping to revolutionize understanding of the human brain." (Ibid, p. 18)
- "As part of its review of existing programs and the budget request, the [House Appropriations] Committee carefully examined the programs funded in this bill, with an eye toward ensuring that scarce and precious taxpayer dollars are spent on essential "must do" priorities rather than on "nice-to-do" activities. As a result of that examination, high-priority programs have received greater emphasis in this bill, while programs that represent less pressing needs or are not basic federal responsibilities have been eliminated... Funding for the [NIH] is funded at $100,000,000 above the budget request, to a total of $31,184,000,000 in the Committee bill, reflecting the Committee's ongoing emphasis on biomedical research that can lead to lifesaving cures. Within the funds, the Committee supports research into Alzheimer's disease and the precision medicine initiative" (H. Rpt. 114-195, July 10, 2015, pp. 4-5)

- "The [Senate] Committee recommendation includes $32,084,000,000 for the [NIH], an increase of $2,000,000,000. This is the largest increase the NIH has received since Congress doubled the agency's funding in 2003. The Committee strongly believes that in this difficult budget environment, the Labor-HHS-Education appropriations bill must reprioritize how funding is allocated and must clearly recognize the essential role biomedical research plays in every American's life. NIH-funded research has raised life expectancy, improved quality of life, and is an economic engine helping to sustain American competitiveness. NIH-funded biomedical research is the catalyst behind many of the advances that are now helping Americans live longer and healthier lives. Because of the Federal investment in biomedical research, U.S. cancer death rates are falling 1 percent each year, with each 1 percent decline saving our Nation about $500,000,000,000. U.S. death rates from heart disease and stroke have declined more than 60 percent in the last half-century. Between 1997 and 2006, the death rate among adults with diabetes declined by 23 percent. The Committee recommendation places a high priority on funding for the NIH and believes this funding is necessary to address our Nation's growing health concerns, spur medical innovation, sustain America's competitiveness, and reduce healthcare costs. Over the past decade, the NIH has lost approximately 22 percent of its purchasing power for research... under the Committee's recommendation, these trends will begin to reverse. Within this bill, Research Project Grants, NIH's funding mechanism for investigator-initiated research, will increase by over 7 percent. The Committee recommendation is estimated to support over 11,500 new and competing grants in FY2016, an increase of nearly 2,500 grants or more than 26 percent above the FY2015 estimate. The Committee recommendation allocates funding to areas holding the most extraordinary promise of scientific advancement while allowing NIH to maintain flexibility to pursue unplanned scientific opportunities and address unforeseen public health needs." (S. Rpt. 114-74, June 25, 2015, p. 8)
- "The Labor-HHS-Education spending measure continued to be the largest and arguably the most contentious spending bill. Even though it pays for popular programs, such as the [NIH], Head Start preschool, and the Low-Income Home Energy Assistance Program (LIHEAP), the legislation's other domestic programs have long been favorite targets of budget cutters... The measure has rarely reached the House or Senate floor in recent years, although appropriators in both chambers managed to report fiscal 2016 bills from their committees. As leaders reached an agreement in October on increases to overall spending limits from their sequestration-reduced levels, debate over Labor-HHS-Education began to focus on policy riders, particularly those related to the health care law, abortion and labor issues. To prevent a funding lapse before the end of fiscal 2015, lawmakers cleared a two-and-a-half-month government-wide continuing resolution in September and wrapped up all of the 12 annual spending bills, including Labor-HHS-Education, in a $1.15 trillion omnibus spending agreement (PL 114-113) in December. The omnibus provided labor, health, and education programs with $162.1 billion in base discretionary funding, $5.4 billion more than the fiscal 2015 level of roughly $156.8 billion." ("A Big Bill Grows Modestly Larger," *CQ Almanac 2015*, 71st ed., edited by CQ-Roll Call, 2-22-2-23. Washington, DC: CQ-Roll Call, Inc., 2016)
- "The omnibus provided a total of $732.2 billion for HHS, 6 percent more than the fiscal 2015 level, including $608.5 billion, most of it mandatory... The measure raised spending for many health care and family services programs, including a $2 billion increase for NIH, which received a total of $32.1 billion for fiscal 2016." (Ibid)

- After a period of belt-tightening in Washington—including automatic budget cuts imposed in 2013—the spending measure for 2016 provides a notable $66 billion increase in federal outlays above previously agreed-upon limits, divided equally between military and nonmilitary programs. It also represents a return to a more traditional appropriations process, with lawmakers directing money to an array of their priorities, including a $1.4 billion increase for military construction projects and $2 billion increase for the [NIH], as well as an array of individual items that some lawmakers were still discovering buried in the 2,009-page spending bill. In keeping with a bipartisan compromise, hashed out in an era of divided government and deep-rooted philosophical differences, all sides claimed victory." ("Congress Passes $1.8 Trillion Spending Measure," by David M. Herszenhorn, *New York Times*, December 18, 2015)

NIH R&D Appropriations for FY2018

Bill: Consolidated Appropriations Act, 2018; Departments of Labor, Health and Human Services, and Education, and Related Agencies Appropriations Act, 2018

Public Law: 115-141 **Enacted:** March 23, 2018 **Effective:** March 23, 2018

Nominal change		Real change		Classification
Millions ($)	YOY%	Millions ($2012)	YOY%	
$2,789.7	8.7%	$2,034.3	6.6%	Exogenous

Congress appropriated significant increases in both nominal and real funding for NIH research for FY2018, largely motivated by long-run public health objectives, bipartisan support for biomedical research, and diminished concerns about long-run fiscal sustainability. The increase in NIH funding was facilitated by Congress again growing frustrated with the BCA sequester and discretionary spending caps, and once again overruling the fiscal restraint set in place in 2011; see "Energy R&D Appropriations for FY2018" for more details. Shortly after the 2016 election, Congress enacted on a sweeping bipartisan basis the 21st Century Cures Act (Pub. L. 114–255); among other policy changes, the "Cures Act" authorized $4.8 billion in additional NIH funding over the next decade, with particular emphasis on the Beau Biden Cancer Moonshot research initiative, a top priority of President Obama and Vice President Biden, whose son Beau had just died of a brain tumor. The bill also prioritized several other NIH projects, notably the BRAIN research initiative and Precision Medicine Initiative, while also authorizing additional funds to combat the opioid epidemic, another emergent top health policy concern. The incoming Trump administration's FY2018 budget signaled a "major reorganization" of the NIH and seemed to propose $25.9 billion in NIH discretionary funding, which would have represented a $5.8 billion reduction from FY2017 levels, but details were lacking, and the request was effectively ignored on Capitol Hill. The House Appropriations Committee instead proposed $35.2 billion for the NIH, $1.1 billion more than appropriated for FY2017, including funds for the BRAIN, Precision Medicine, and Cancer Moonshot initiatives authorized by the Cures Act, while also prioritizing research on Alzheimer's disease and antibiotic-resistant bacteria. The Senate Appropriations Committee proposed an even larger $2 billion increase in their allowance for the NIH, recommending $36.1 billion for FY2018, providing slightly more funding for the new Cures Act initiatives than their House counterparts. The Senate Committee also rejected the administration's proposal to eliminate the NIH's Fogarty International Center, stressing the importance of supporting international health research in developing countries, as underscored by the recent Zika virus. The FY2018 budget process broke down after President

Trump was inaugurated, but Congress thoroughly rejected the administration's proposed cuts to the NIH's budget, and the consolidated appropriations bill that eventually funded FY2018 Labor-HHS-Education appropriations provided the NIH with an even larger $3 billion increase over FY2017 funding levels, enabled by the Bipartisan Budget Act of 2018 lifting discretionary spending limits for FY2018 and FY2019. The enacted increases in NIH research funding appear to have been driven by bipartisan support for NIH biomedical research addressing public health concerns, continued frustration with the BCA's spending limits, and easing concerns about long-term deficit reduction. The policy change appears unrelated to concerns about unemployment or other short-run macroeconomic prerogatives, and as such, we classify it as exogenous. Most pertinent narrative evidence:

- "The Senate approved complex health care legislation on Wednesday that would increase funding for disease research, address weaknesses in the nation's mental health systems, and vastly alter the regulatory system for drugs and medical devices. The vote sealed a final legislative victory for President Obama, who strongly supported the bill against Democrats and consumer groups. In many ways, the bill, known as the 21st Century Cures Act, is a return to a more classic approach to legislation, which policy victories and some disappointments for both parties and potential benefits for nearly every American whose life has been touched by illness, drug addiction, and mental health issues. Years in the making, the measure passed 94 to 5 after being overwhelmingly approved by the House last week... Mr. Obama has noted that the bill includes money to combat the opioid epidemic, to advance his Precision Medicine Initiative... and to support Vice President Joseph R. Biden Jr.'s "moonshot" to cure cancer. Mr. Biden—whose son, Beau, died of a brain tumor last year—presided on a procedural vote to move the bill forward in the Senate Monday night, a moving moment for most members of the Senate. While Republicans and Democrats often fight over government spending, the bill benefited from its largess to one agency that has broad support, the [NIH]. "I don't think there is enough money that we can put into the N.I.H.," said Representative Steve Cohen, Democrat of Tennessee, "because it is important and it affects all Americans independent of political party, race, sexual orientation—you name it." The bill gives the health institutes the authority to finance high-risk, high-reward research using special procurement procedures, as opposed to more conventional grants and contracts. It also requires the agency's director to establish "Eureka prize" competitions to advance biomedical research and improve treatments for serious illnesses." ("Sweeping Health Measure, Backed by Obama, Passes Senate," by Jennifer Steinhauer and Robert Pear December 7, 2016, *New York Times*)
- "After two and a half years of discussion, debate, and lobbying and after two different versions of the legislation, Congress passed, and President Barack Obama signed in December a package of biomedical innovation bills (HR 34) sponsors called the 21st Century Cures Act... The new law directed $4.8 billion to the [NIH] over ten years, specifically for programs including Obama's cancer "moonshot" initiative... The House originally passed the bill in July 2015 but saw its momentum stall in the Senate, where Democrats and Republicans were at odds over how much extra money to provide the NIH and how to pay for it. The NIH funding was seen as essential for getting votes from Democrats... A final deal was struck around Thanksgiving, with the election of President-elect Donald Trump seen as a motivating force for Democrats to get the best deal that they could on funding for NIH and opioids... Sponsors of the legislation... grappled with how to structure the NIH and other funding. While the previous

version of the bill would have created a mandatory funding stream, Republicans in both chambers, including House Speaker Paul D. Ryan of Wisconsin, resisted that. As a compromise, the lawmakers pursued a hybrid approach in the updated bill. The funding was fully offset and set aside in what were referred to as "innovation" funds. Appropriators must approve withdrawals from those accounts each year." ("Congress Completes 'Cures' Bill To Speed Up Drug Approval Process," *CQ Almanac 2016*, 72nd ed., edited by CQ-Roll Call, 8-3-8-5. Washington, DC: CQ-Roll Call, Inc., 2017)

- "The Budget institutes policies to ensure that Federal resources maximally support the highest priority biomedical science by reducing reimbursement of indirect costs (and thus focusing a higher percentage of spending on direct research costs) and implementing changes to the [NIH's] structure to improve efficiencies in the research enterprise. In 2018, [HHS] and NIH will develop policies to reduce the burden of regulation on recipients of NIH funding consistent with the Administration's initiatives on regulatory reform and the goals articulated for the new Research Policy Board established in the 21st Century Cures Act." (Budget of the United States, FY2018, p. 10)
- "According to the budget blueprint, released on March 16, 2017, the Trump Administration is requesting $25.9 billion in discretionary funding for NIH in FY2018. The blueprint states that this would be a reduction of $5.8 billion from the annualized funding levels provided under the FY2017 CR. It is not clear from the blueprint whether this total includes funding for the Cures Act. The FY2018 Trump budget blueprint states that it "includes a major reorganization of NIH's Institutes and Centers to help focus resources on the highest priority research and training activities." Further detail on the Administration's request, including any proposals for mandatory spending, is expected to be released later this year." ("NIH Funding: FY1994-FY2018," by Judith A. Johnson, March 17, 2017, *Congressional Research Service*)
- "Within the funds provided, the [House Appropriations] Committee has focused increases on priority areas and reduced funding for programs that are no longer authorized, are of limited scope or effectiveness, or do not have a clear Federal role. First and foremost among these priority areas, the Committee continues to build on the investment made last year in biomedical research by increasing funding for the [NIH] by $1,100,000,000. This increase builds on the prior $2,000,000,000 increase included in the Consolidated Appropriations Act, 2017, and continues funding from the 21st Century Cures Act. Within the total increase, the Committee provides an increase of $80,000,000 to the Precision Medicine Initiative, which holds the promise of designing personalized, targeted cures and treatments. The Committee also includes an increase of $400,000,000 to help find a cure for Alzheimer's disease and an increase of $76,000,000 for the BRAIN initiative to help better understand how the brain functions and learns. The Committee has also placed a high priority on combatting opioid addiction by including an additional $500,000,000 for grants to States, as outlined in the 21st Century Cures Act. The Committee also continues support for programs addressing opioid addiction... To protect public health and the Nation in the event of a bioterrorism or other pandemic crisis, the Committee recommendation also includes increases to the BioShield and the Biomedical Research and Advanced Development Authority (BARDA) programs as well as a $178,000,000 increase for detecting and preventing a pandemic flu outbreak." (H. Rpt. 115-244, July 24, 2017, pp. 3-4)
- "The [House Appropriations] Committee recommends $35,184,000,000 for the [NIH], which is $1,100,000,000 above the FY2017 enacted level and $8,580,443,000 above

the FY2018 budget request... The Committee also continues to support the Cancer Moonshot Initiative with a total of $300,000,000 in FY2018... While the Committee appreciates the Secretary's efforts to find efficiencies in NIH research spending, the Administration's proposal to drastically reduce and cap reimbursement of facilities and administrative (F&A) costs to research institutions is misguided and would have a devastating impact on biomedical research across the country." (Ibid, pp. 49-50)

- "The [Senate Appropriations] Committee recommendation includes $36,084,000,000 for the NIH, an increase of $2,000,000,000. Even in a difficult funding environment, the Committee believes it is critical to prioritize funding for NIH and build on the last 2 years of funding increases in a predictable and consistent way. Without continued investment in the NIH, we jeopardize our current scientific progress, risk losing a generation of scientists, and stunt our Nation's global competitiveness. The Committee rejects the Administration's proposal to cap [F&A] costs for NIH grantees at 10 percent. While the Committee understands the desire to identify budget and administrative savings, F&A costs are not optional; they are a fundamental part of doing research. The Committee also disagrees with the proposal to eliminate the John E. Fogarty International Center and provides funding to maintain the Center at NIH. Disease knows no borders. It is critical to ensure that NIH continues to have the resources to build scientific expertise in developing countries and, as we saw with the Zika virus, continue its strong partnerships internationally to protect the health and safety of Americans. Finally, the Committee recommendation allocates funding to areas holding the most promise of scientific advancement, while allowing NIH to maintain flexibility to pursue unplanned scientific opportunities and address unforeseen public health needs. The Committee recommendation is estimated to support over 10,600 new and competing grants..." (Senate Report 115-150, September 7, 2017, pp. 8-9)
- "The [NIH] is the global leader in medical research and the [Senate] Committee provides an increase of $2,000,000,000 for a third year in a row after a decade of stagnant funding... an increase of 5.9 percent above FY2017... The Committee continues its commitment to funding research on Alzheimer's disease and increases funding by $414,000,000 to a total of approximately $1,828,000,000 in FY2018; increases funding for the Precision Medicine Initiative by $10,000,000; increases funding for antibiotic resistance research by $50,000,000; and increases funding for the BRAIN Initiative by $140,000,000. In addition, funding is provided to ensure that every Institute and Center receives an increase above FY2017 to continue investments in innovative research that will advance the fundamental knowledge and speed the development of new therapies, diagnostics, and preventive measures to improve the health of all Americans. Revolutionary discoveries often come from unexpected, untargeted research. The Committee continues to support these basic advances as well as the clinical and translational research that moves basic discoveries from "bench-to-bedside."" (Ibid, p. 80)
- "The House Appropriations Labor-HHS-Education Subcommittee approved a $156 billion fiscal 2018 spending bill on July 13 that would increase funding to the [NIH] while cutting funds for family planning, teacher training programs and the Special Olympics. The bill was approved on a 9-6 party-line vote. The largest of the nondefense spending bills, the measure rejected numerous proposals from the Trump administration such as allowing federal funds to pay for students to attend private schools and cutting funding for the NIH, which would see a $1.1 billion increase the next year, bringing its

budget to around $35 billion. Democrats praised certain increases but found plenty to criticize in the bill... The Senate Labor-HHS-Education Appropriations Subcommittee approved by voice vote on Sept. 6 a bipartisan draft bill that would increase funding for the [NIH] by $2 billion... The bill would provide $36.1 billion for the [NIH], a $2 billion increase over its fiscal 2017 levels. That built upon similar increases for each of the previous two years. Alzheimer's research would get the biggest boost at NIH, with a $414 million increase, resulting in $1.8 billion total for those programs." ("Labor-HHS-Education: Boost for NIH Is Endorsed by Lawmakers." In CQ Almanac 2017, 73rd ed., edited by CQ-Roll Call, 2-35-2-37. Washington, DC: CQ-Roll Call, Inc., 2018)

- "In dividing up the spoils of that budget agreement, Congress rebuked the Trump administration's initial vision for the federal government in many ways... Not only did the administration's request for deep cuts to the [NIH] go nowhere, but Congress gave the agency an additional $3 billion. "Sometimes you save the president from themselves," said Representative Tom Cole, Republican of Oklahoma and the chairman of the House Appropriations subcommittee that funds the health institutes... "In order to get the defense spending, primarily, but all the rest of our priorities funded, we had to give away a lot of stuff that we didn't want to give away" to Democrats, Mick Mulvaney, the White House budget director, told reporters" ("Congress Approves $1.3 Trillion Spending Bill, Averting a Shutdown," by Thomas Kaplan, *New York Times*, March 22, 2018)
- "From FY2016 through FY2019, the NIH has seen funding increases of over 5% each year in nominal dollars. The FY2018 program level total represented an increase of $3.0 billion (+8.7%) from FY2017, making this the largest single-year nominal dollar increase since FY2003 (excluding one-time funds provided by the American Recovery and Reinvestment Act of 2009" ("NIH Funding: FY1994-FY2019," by Judith A. Johnson and Kavya Sekar, October 15, 2018, *Congressional Research Service*)

4.5 Narrative Analysis of NSF R&D Appropriations

The U.S. emerged victorious from World War II with the conviction that scientific breakthroughs had been instrumental to the war effort, above and beyond the Manhattan Project. Near the end of the war, OSRD Director Vannevar Bush urged President Roosevelt to build on the successes of wartime research and expand the federal government's role in supporting basic research for peaceful purposes (Bush 1945). Compelled by concerns that the U.S. was lagging behind the Soviet Union in science and technology know-how and manpower as the Cold War escalated, a fraught push eventually led to the creation of the National Science Foundation (Kleinman 1995). Having vetoed an earlier version of the bill, President Harry Truman signed on May 10, 1950 the National Science Foundation Act of 1950 (Pub. L. 81-507) , establishing the new independent agency, which was directed and authorized to "(1) to develop and encourage the pursuit of a national policy for the promotion of basic research and education in the sciences; (2) to initiate and support basic scientific research in the mathematical, physical, medical, biological, engineering, and other sciences, by making contracts or other arrangements (including grants, loans, and other forms of assistance) for the conduct of such basic scientific research and to appraise the impact of research upon industrial development and upon the general welfare; (3) at the request of the Secretary of Defense, to initiate and support specific scientific research activities in connection with

matters relating to the national defense by making contracts or other arrangements (including grants, loans, and other forms of assistance) for the conduct of such scientific research," among other purposes. The new agency was established under the supervision of both a Director and a National Science Board (NSB), intended to set NSF policy, subject to authorizations, appropriations, and directives of Congress and the White House, and to serve as an advisory board on science policy for Congress and the White House. Congress first appropriated $225,000 for "organizational and administrative" expenses in FY1951 to help the new agency establish itself; our analysis starts in FY1952 with the first substantive appropriations for research.

The NSF's budget has overwhelmingly gone toward research and related activities as well as scientific facilities and major equipment, particularly for research universities and a handful of NSF-led basic research programs, in addition to fellowships supporting education in science and technology fields, all the way from K-12 education through post-doctoral research. The NSF historically maintained a relatively high degree of bipartisan support, as both parties broadly valued federal investments in basic scientific research and a competitive STEM workforce—advancing both civilian and military prerogatives—whereas the applied R&D work funded by certain other agencies sparked greater debate about the appropriate roles of the federal government versus the private sector. The new agency's budget grew rapidly early in the Cold War, fueled by concerns about lagging behind the Soviet Union in scientific manpower, almost without interruption until inflationary concerns began to take hold in the late 1960s and 1970s. The agency saw renewed rapid growth under the Reagan and Clinton administrations as well as early on in the George W. Bush administration. The NSF's budget jumped again early in the Obama administration, as a result of ARRA, but the fiscal retrenchment that followed the Great Recession resulted in the only sustained period of falling real appropriations for the agency since the 1970s.

NSF R&D Appropriations for FY1952

Bill: Supplemental Appropriation Act, 1952

Public Law: 82-253 **Enacted:** November 1, 1951 **Effective:** November 1, 1951

Nominal change		Real change		Classification
Millions ($)	YOY%	Millions ($2012)	YOY%	
$3.3	1,455.6%	$17.0	1,375.1%	Exogenous

Congress significantly increased both nominal and real NSF R&D appropriations for FY1952, largely motivated by growing fears of lagging behind the Soviet Union in science and technology fields and a lack of coordinated national science policy—the same concerns that had led Congress to create the new agency just a year earlier. President Truman's FY1952 budget message explained that NSF funding was needed to "initiate the important work of formulating a national policy for basic research, stimulating such research, and training scientific personnel." The administration belatedly requested an appropriation of $14 million for the young agency in FY1952, just shy of the maximum allowed under the current NSF authorization. But the frugal House Appropriations Committee gutted that request to a mere $300,000, just 2% of the requested funding, zeroing out requested funding for basic scientific research and fellowships while the young agency was setting up shop; the committee thought "early aid-in the present [Korean War] emergency is not very tangible" for those grant and fellowship programs; the NSF's funding bill was a supplemental appropriations bill largely funding the war effort. The NSF had received just $225,000 in operational funding for

FY1951, which the budget noted "will not permit the Foundation to proceed beyond initial preparations," a priority of the administration. The Senate Appropriations Committee approved $6.3 million for the NSF, and the conference committee roughly split the difference between the House and Senate allowances, settling on $3.5 million for FY1952 in the first supplemental appropriations bill for the year; see "Energy R&D Appropriations for FY1952" for more details. While nowhere close to the budget request, the smaller net increase in NSF research funding appears to have nonetheless been motivated by similar national security concerns and long-run scientific manpower objectives, and does not appear to have been influenced by concerns about unemployment or any other short-run macroeconomic prerogatives. As such, we classify this policy event as exogenous. Most pertinent narrative evidence:

- "Throughout our history, scientists and scientific knowledge have contributed to our progress as a Nation. If you want to keep up that progress, we need to stimulate scientific discovery and research and train more young men and women for our laboratories and research centers. To carry out these objectives, I have just signed the [NSF] Act of 1950. This act is of tremendous importance because it will add to our knowledge in every branch of science. I am confident that it will help us to develop the best scientific brains in the Nation. It will enable the United States to maintain its leadership in scientific matters, and to exert a more vital force for peace." Harry S. Truman, Rear Platform and Other Informal Remarks in Idaho, Oregon, and Washington, May 10, 1950 (*The American Presidency Project*, by Gerhard Peters and John T. Woolley, https://www.presidency.ucsb.edu/node/223046)
- "the [NSF], established by law last year, is now organized and planning its program. The limited funds available to it in the current fiscal year will not permit the Foundation to proceed beyond initial preparations. An appropriation request for the fiscal year 1952 will be submitted this spring to enable the Foundation to initiate the important work of formulating a national policy for basic research, stimulating such research, and training scientific personnel." (Budget Message of the President, FY1952, January 15, 1951, p. M51)
- "The House Appropriations Committee recommended on Friday that the [NSF] receive $300,000 for the current fiscal year, a cut of 98 percent from the $14,000,000 fund asked by President Truman on the advice of the foundation's executive board. The foundation planned to spend $8,000,00 for basic scientific research this year and $5,000,00 for fellowships... The $14,000,000 total was set as a modest minimum investment by the Government in the nation's scientific future... the [NSF] was finally established by Congress and the President on May 10, 1950, after four years of study of the proposed legislation, 1,200 pages of testimony by 150 leading authorities on science, education, and medicine. But Congress approved only a $225,000 appropriation to cover 'organizational and administrative' expenses last year... The primary function of the foundation, according to [NSF Director] Dr. Waterman, would be to 'develop and encourage the pursuit of a national policy for the promotion of basic research and education.'" ("National Science Foundation Hopes Senate Will Reverse House on 98% Cut in Funds," by Robert K. Plumb, *New York Times*, August 19, 1951)
- "The American Chemical Society which has a membership of 67,000 chemists, called upon Congress yesterday to appropriate for the [NSF] the full amount of $14,000,000 requested for the next fiscal year. This request, regarded as the minimum necessary for the foundation to carry out its functions, was reduced on Aug. 20 by the House of

Representatives to $300,000, a cut of 98 percent. The amount was only $75,000 more than was appropriated last year for the organizational and administrative expenses of the foundation... "The council and board of directors of the American Chemical Society," the resolution said, "urge the Senate and the House of Representatives to appropriate for the work of the [NSF] the full amount requested by the Director of the Budget for the fiscal year 1952." Dr. Charles Allen Thomas, president of the Monsanto Chemical Company and past president of the society and now chairman of its boars, declared in a statement that "it seems obvious that the Congress should support the agency it has created or abolish it." ("Chemists Demand Full Science Fund," by William L. Laurence, *New York Times*, September 8, 1951)

- "The [House Appropriations] bill contains $300,000 for this activity, which is a reduction of $13,700,000 in the Budget estimate of $14,000,000. The amount included in the bill provides funds for operation on substantially the same basis as in fiscal year 1951 and will permit partial organization of this new agency and planning for future development. Funds are not provided in the bill for research support at colleges and other educational institutions for which a budget estimate of $8,155,000 was submitted. Nor are funds provided in the bill for the training of scientific manpower (fellowship program) for which the budget submission contained $5,060,000. The committee after much consideration and with some reluctance, has denied funds for these two programs, which make up in excess of 90 percent of the estimate, with the idea that their early aid-in the present [Korean War] emergency is not very tangible. The sum provided in the bill will support a nucleus staff of about thirty employees—the number of employees on the payroll at the time of hearings on the estimate." (H. Rpt. 82-890, August 17, 1951, p. 28)
- "The increase recommended by the [Senate Appropriations] committee is to provide a total of $6,300,000, in order to enable the Foundation to begin operations as contemplated by the 1950 act. The committee also recommends that language be added to the bill authorizing the award of graduate fellowships, expenses of attendance of meetings of organizations concerned, and continuing funds available until expended." (S. Rpt. 82-891, October 6, 1951, p. 17)
- "The first Supplemental Appropriation bill for fiscal 1952 (HR 5215) carried a total of $1,676,246,976 in additional appropriations. The measure was designed to take care of fund needs which developed after Congress began consideration of the regular appropriation bills and to provide funds for the emergency agencies to carry out provisions of the Defense Production Act and the Civil Defense Act... the [NSF] was allowed $3,500,000" ("First 1952 Supplemental," *CQ Almanac 1951*, 7th ed., 03-159-03-162. Washington, DC: Congressional Quarterly, 1952.)

NSF R&D Appropriations for FY1953

Bill: Independent Offices Appropriation Act, 1953

Public Law: 82-455 **Enacted:** July 5, 1952 **Effective:** July 5, 1952

Nominal change		Real change		Classification
Millions ($)	YOY%	Millions ($2012)	YOY%	
$1.3	35.7%	$6.2	33.9%	Exogenous

Congress significantly increased both nominal and real NSF R&D appropriations for FY1953, largely motivated by growing fears of lagging behind the Soviet Union in science

and technology fields and a lack of coordinated national science policy—the same concerns that had led Congress to create the new agency just a two years earlier. President Truman's wartime FY1953 budget message explained that an increase in NSF funding was needed to address the "increasing need for specialized and professional personnel in the present [Korean War] emergency." The administration requested an appropriation of $15 million for the young agency in FY1953, the maximum allowed under the current NSF authorization. But the more economical House Appropriations Committee thought that full increase "should be deferred until the financial condition of the Treasury has improved," reflecting fiscal pressures from the war effort, and only allowed $3.5 million for the NSF. The Senate Appropriations Committee restored $1.5 million of the administration's request that had been cut, and the conference committee settled on $4.75 million, just shy of the Senate allowance. The net increase in NSF research funding appears to have been motivated by national security concerns and overcoming the "emergency" of an inadequate science and engineering base during mobilization, and does not appear to have been influenced by concerns about unemployment or any other short-run macroeconomic prerogatives. As such, we classify this policy event as exogenous. Most pertinent narrative evidence:

- "During the last decade we have seen how basic scientific research can alter the foundations of world power. We have seen that this research yields a stream of new knowledge that fortifies our economic welfare as well as our national strength. We have learned that a strong, steady, and wide-ranging effort in science is as essential to our sustained national security as the production of weapons and the training of military personnel... the [NSF] will formulate a broad national policy designed to assure that the scope and the quality of basic research in this country are adequate for national security and technological progress. The [NSF] also will stimulate or sponsor basic research in subjects that otherwise might receive inadequate attention. While the research program of the [NSF] is not intended to supersede the basic research programs of other agencies, the [NSF] should ultimately become the principal agency through which the Federal Government gives support to basic research that is not directly related to the statutory functions of other Federal agencies. The proposed increase for research support by the [NSF] has been taken into account in arriving at the recommendations for the basic research programs for the [DOD] and other agencies... The 1953 Budget recommendation for the [NSF] provides for an expansion of this program to help meet the increasing need for specialized and professional personnel in the present emergency. To make its greatest contribution speedily and effectively, the [NSF] needs in the fiscal year 1953 an appropriation of the full 15 million dollars authorized by law." (Budget Message of the President, FY1953, January 21, 1952, pp. M61-62)
- "the [NSF] reported to Congress today its general plans for speedily placing the nation's [R&D] programs in a state of 'operational readiness' for possible war or an extended period of preparedness, perhaps lasting many years... The President declared that the funds expended "represent a long-term investment in the national security no less than the funds presently being invested in the expansion of productive capacity to carry us through a long period of partial mobilization." A forward to the report, prepared by Dr. James B. Conant, Chairman of the National Science Board, which makes foundation policy said: "It will be several years before concrete accomplishments can be listed, but measured solely in terms of a contribution to national defense in a period of lengthy, partial mobilization, I, for one, have no question but that the money will be well spent. The relations of science to war are so well known as to require no elaboration, but what

is often little realized is the relation of highly trained scientific talent to the progress of the technological armament race to which a divided world is now committed"... Dr. Conant said that the United States had not yet caught up with European nations in developing "scientific pioneers" and declared that it was one of the purposes of the foundation "to right this balance." ("Science Readiness for Crisis Mapped," *New York Times*, January 16, 1953)

- "[The NSF] is responsible for developing a national policy for the promotion of basic research and education in the sciences, for supporting basic research, for awarding graduate fellowships, and for fostering the interchange of scientific information. This [House Appropriations] bill includes $3,500,000 for salaries and expenses of this activity which is the amount provided for the current fiscal year, and is which is the amount provided for the current fiscal year, and is $11,500,000 below the budget estimate. The committee is aware of the importance of this activity and the program which it sponsors, and it is reluctant to retard development of it. However, it is a new activity that is unlikely to provide assistance to the country in the immediate emergency. The committee feels, therefore, that expansion to the full amount of the authorization ($15,000,000) should be deferred until the financial condition of the Treasury has improved." (H. Rpt. 82-1517, March 14, 1952, p. 16)
- "The increase recommended by the committee [for NSF] is a partial restoration of the House reduction. The amount provided is $5,000,000, which is $10,000,000 below the budget estimate." (S. Rpt. 82-1603, May 28, 1952, p. 13)
- "[Conference Report NSF] Amendments Nos. 61 and 62—*Salaries and expenses*: Appropriate $4,750,000, instead of $3,500,000 as proposed by the House and $6,000,000 by the Senate..." (H. Rpt. 82-2315, June 25, 1952, p. 20)

NSF R&D Appropriations for FY1954

Bill: First Independent Offices Appropriation Act, 1954

Public Law: 83-176 **Enacted:** July 31, 1953 **Effective:** July 31, 1953

Nominal change		Real change		Classification
Millions ($)	YOY%	Millions ($2012)	YOY%	
$3.3	68.4%	$16.5	67.6%	Exogenous

Congress significantly increased both nominal and real NSF R&D appropriations for FY1954, largely motivated by growing fears of lagging behind the Soviet Union in science and technology fields. President Truman's FY1954 budget message explained that the NSF was needed to "formulate an adequate scientific research policy for the Nation, to remedy gaps in our basic scientific knowledge, and to overcome shortages of specialized manpower" and proposed a sizable increase in funding from $4.75 million to $15 million (+216%) for the foundation, in part related to reorganizing and consolidating existing basic research activities under the new agency. It was reported that the Soviet Union was currently graduating roughly three times as many engineers as the U.S., which had not been the case during WWII. The spendthrift House Appropriations Committee was keen on program consolidation and "elimination of duplication in connection with all scientific research work" but approved less than $1 million in increased funding for the agency. Their Senate counterparts approved an increase to $10 million, or just over half of the requested increase, and negotiated a net increase for the NSF in conference committee. The increase in NSF

research funding appears to have been motivated by national security concerns and overcoming "shortages of specialized manpower," and does not appear to have been influenced by unemployment or any other short-run macroeconomic prerogatives. As such, we classify this policy event as exogenous. Most pertinent narrative evidence:

- "The [NSF] was created by the Congress in recognition of the need to formulate an adequate scientific research policy for the Nation, to remedy gaps in our basic scientific knowledge, and to overcome shortages of specialized manpower. However, sufficient funds have not been appropriated to permit the Foundation to perform these functions effectively. As I have pointed out in previous Messages, the Foundation should become the primary instrumentality through which the Federal Government gives support to basic research that is not directly related to the statutory functions of other Federal agencies. For this reason, the appropriation recommended for the Foundation in 1954 contains amounts for support of basic research and for fellowships that would otherwise be included in the estimates of other departments and agencies. I urge the Congress, in the light of these considerations, to provide the Foundation in the fiscal year 1954 the full 15 million dollars authorized by present law. The law should be amended so as to permit a higher level of appropriations in the future." (Budget Message of the President, FY1954, January 9, 1953, pp. M43)
- "the [NSF], in its second annual report to President Truman, warned today of a critical shortage of scientists in the United States that is expected to grow worse in the next few years. The situation was contrasted to that in the Soviet Union, where governmental programs call for a steady annual increase in the schooling of technical and scientific experts. In the United States, the report said there will be only 15,000 engineering graduates in 1955, contrasted with 50,000 in the Soviet Union, where there had been only 9,000 in 1943... Much of the report was devoted to the thesis that too little emphasis was laid in this country on basic research and training in the sciences. Basic research was described as "a defense in depth which is essential to establishment and maintenance of technological supremacy."" ("Lack of Scientists is Called Critical," *New York Times*, January 17, 1953)
- "Russia is leading this country in a critical race to train young scientists and engineers, a House Appropriations Committee reported today. Dr. Alan T. Waterman, Director of the [NSF], testified that Russia expects to graduate 50,000 engineers in 1955, compared to 17,000 in this country. Waterman said science and engineering graduates of American colleges next year will only total 38 percent of the number graduated in 1950 "at a time when our [R&D] effort has approximately tripled." He outlined this "critical situation" while testifying on a 15 million dollar budget requested by the Foundation for the fiscal year starting July 1... "Looking at our national problem in its broadest scope," he testified, "we face a period off great international tension in which our military and economic strength for both the immediate and long-range future is intimately tied to our progress in research."" ("Russia Tops U.S. in Race to Train Young Scientists," *The Boston Globe*, April 6, 1953)
- "The [House Appropriations] committee is much interested in the coordination and elimination of duplication in connection with all scientific research work. It requests the [NSF] during fiscal year 1954, to exert every effort to assist in the coordination of all Federal research, including the elimination of duplication. In the opinion of the committee, a definite showing of substantial savings in this connection would encourage Congress to consider the provision of additional funds for scientific research. The bill

contains $5,724,400 for this agency which is a reduction of $9,275,600 in the estimate, and an increase of $974,400 in the 1953 appropriation." (H. Rpt. 83-276, April 17, 1953, p. 19)

- "Mr. Chairman and members of the committee, the [NSF] is appearing before you today to appeal from action by the House of Representatives in H.R. 4663, the First Independent Offices Appropriation bill, which would reduce the President's revised budget for the Foundation from $12,250,000 to $5,724,400. The Foundation respectfully requests a restoration to the level of the President's revised appropriation request, $12,250,000 for fiscal year 1954... In an effort to relieve the crucial shortage in scientific manpower facing this country, the Foundation provides financial support for the training of scientists and engineers through the award of fellowships for graduate scientific training. The Foundation is the sole Federal agency supporting- general purpose predoctoral graduate scientific training, the general purpose fellowship programs of the [NIH] and the [AEC] having been terminated by the coordinated action of these agencies, the Foundation, and the Bureau of the Budget... The action of the House committee, unless modified, will delay the coordination and elimination of duplication that it seeks. The expressed purpose of the administration's intention to centralize Government support of basic research is an important step toward achieving those very ends—but the centralization cannot go forward until the [NSF] is financially able to carry forward those programs of other agencies. Unless a sufficient appropriation to the Foundation comes before such a merger, the national interest may be prejudiced by a reduction in the overall level of needed basic research activity. Such a reduction is likely to occur even this year if the action of the House should stand since the budgets of other agencies for basic research have been decreased by more than the amount of the recommended increase in the Foundation's budget." Alan T. Waterman, NSF Director, April 24, 1953 (Hearings Before the Senate Appropriations Committee on the First Independent Offices Appropriations, 1954, pp. 318-320)
- "The increase recommended by the [Senate Appropriations] Committee is to provide a total of $10,000,000, which is $5,000,000 below the budget estimate." (S. Rpt. 83-237, May 12, 1953, p. 10)
- "[Conference Report NSF] Amendments Nos. 54 and 55—*Salaries and expenses*: Appropriate $8,000,000, instead of $5,724,400 as proposed by the House and $10,000,000 by the Senate..." (H. Rpt. 83-881, July 18, 1953, p. 11)

NSF R&D Appropriations for FY1955

Bill: Independent Offices Appropriation Act, 1955

Public Law: 83-428 **Enacted:** June 24, 1954 **Effective:** July 1, 1954

Nominal change		Real change		Classification
Millions ($)	YOY%	Millions ($2012)	YOY%	
$4.3	53.1%	$21.2	52.0%	Exogenous

Congress significantly increased both nominal and real NSF R&D appropriations for FY1955, largely motivated by sustained concerns that the U.S. was lagging behind the Soviet Union in science and technology fields. President Eisenhower's FY1955 budget message explained that half of the requested $6 million increase in NSF funding was related to transferring "general-purpose basic research" programs from the DOD to the NSF; the

administration remained keen to consolidate federal basic research efforts and formulate an "adequate scientific research policy," the reason the NSF had been recently created. The more frugal House Appropriations Committee approved only $3 million of the requested increase for the NSF, predicated on the assumption that DOD would be decreasing their request by a corresponding sum because of the programmatic transfer, eliminating the other $3 million that President Eisenhower wanted for an expansion of basic research. But their Senate counterparts approved the full $14 million request in order to "extend the overall support of basic research by the Federal Government" and negotiated a partial funding increase to $12.25 million in conference. The increase in NSF research funding appears to have been motivated by national security concerns and "solving the scientific manpower problem" facing the nation, and does not appear to have been influenced by unemployment or any other short-run macroeconomic prerogatives. As such, we classify this policy event as exogenous. Most pertinent narrative evidence:

- "Budget expenditures for other Government activities, which contain more elements controllable through the budget process, are reduced an estimated 2.2 billion dollars below the fiscal year 1953 and 1.5 billion dollars below the present estimate for 1954. This is a reduction, over the two fiscal years, of about 25 percent in the cost of these numerous day-to-day operations of the Government... On the other hand, estimated expenditures for the Tennessee Valley Authority, urban development and redevelopment, college housing loans, the [NSF], fish and wildlife resources, the school lunch program, and several other programs of domestic importance will be the largest in our history." (Budget Message of the President, FY1955, January 21, 1954, p. M11)
- "the [NSF] was created by Congress in recognition of the need to formulate an adequate scientific research policy for the Nation. It is now engaged in intensive studies to that end and is giving particular attention to the size and composition of the research activities of the Federal Government. Congress, at its last session, amended the basic act of the Foundation, removing the ceiling on appropriations to this agency in order to permit steps toward increasing the responsibility of the Foundation for the general-purpose basic research of the Federal Government. Approximately one-half of the 6-million-dollar increase I am recommending in the appropriation for the Foundation for the fiscal year 1955 is in reality a transfer of the responsibility and the financing for certain basic research programs from [DOD] to the [NSF]. The remainder of the increase is needed to expand basic research." (Ibid, p. M72)
- "President Eisenhower directed the [NSF] today to survey the Government's [R&D] program. They now cost more than $2,000,000,000. The President's objectives, embodied in an Executive Order, are to speed the attainment of Federal research goals, stimulate basic research, achieve whatever economies are possible, and safeguard the strength and independence of educational institutions. In his new conference this morning, the President remarked that more than $2,000,000,000 in his budget was earmarked for [R&D]. He said this great sum would require the services of the finest scientific brains in the country for supervision and coordination of the many research programs and that it also meant that [R&D] amounted to a big business. He recalled that in 1940 the total sum for these purposes was $100,000,000... "[O]nly a small fraction of the federal funds [for R&D] is being used to stimulate and support the vital basic research which makes possible our practical scientific progress. I believe strongly that this nation must extend its support of research in basic science." ("President Orders Scientific Survey," *New York Times*, March 18, 1954)

- "The [House Appropriations] committee is very much interested in the coordination and elimination of duplication between and among Government agencies... and would like to see the [NSF] have greater authority over activity in this field. The greatest weakness in the present program is that the Foundation has no control over research desired by other Federal agencies, or over the products of its scientific research programs. The bill contains $11,000,000 for this agency which is an increase of $3,000,00 over the appropriation for 1954 and is $3,000,000 less than the amount of the budget estimate. The increase of $3,000,000 to the [NSF] is granted on the assumption that the [DOD] is reducing its request in its budget for basic research with universities and institutions by $3,000,000. The committee is of the opinion that the Foundation is over-staffed in administration and it certainly should not increase over the present level. No limitation has been placed on personal services in the bill this year, but funds for increased staff are specifically denied." (H. Rpt. 83-1428, March 26, 1954, p. 23)
- "The increase recommended by the [Senate] Committee is to provide the full estimate of $14,000,000, in order to extend the overall support of basic research by the Federal Government through contracts and grants" (S. Rpt. 83-1339, May 13, 1954, p. 10)
- "[Conference Report NSF] Amendments Nos. 30 and 31—*Salaries and expenses*:... appropriate $12,250,000, instead of $11,000,000 as proposed by the House and $14,000,000 by the Senate." (H. Rpt. 83-1882, June 15, 1954, p. 9)

NSF R&D Appropriations for FY1956

Bill: Independent Offices Appropriation Act, 1956

Public Law: 84-112 **Enacted:** June 30, 1955 **Effective:** July 1, 1955

Nominal change		Real change		Classification
Millions ($)	YOY%	Millions ($2012)	YOY%	
$3.8	30.6%	$16.8	27.0%	Exogenous

Congress significantly increased both nominal and real NSF R&D appropriations for FY1956, largely motivated by sustained concerns that the U.S. was lagging behind the Soviet Union in science and technology fields. President Eisenhower's FY1956 budget message proclaimed that "national interest requires that we support a strong program of basic research and that we train a greater number of highly qualified scientists and engineers." The administration requested $31 million for the foundation, including a $7.75 million (+63%) increase over FY1955 funding levels for the 'Salaries and expenses' budget account supporting basic research. The more economical House Appropriations Committee denied the requested 'Salaries and expenses' increase in its entirety, but the Senate Appropriations Committee approved the full budget request and negotiated a net increase for the agency during conference. The increase in NSF research funding again appears to have been motivated by national security concerns and "solving the scientific manpower problem" facing the nation, and does not appear to have been influenced by unemployment or any other short-run macroeconomic prerogatives. As such, we classify this policy event as exogenous. Most pertinent narrative evidence:

- "Despite our tremendous technological strides in recent years, our national interest requires that we support a strong program of basic research and that we train a greater

number of highly qualified scientists and engineers. Accordingly, this budget recommends increased [NSF] grants for basic research and for training more graduate students, college instructors, and high school science teachers." (Budget Message of the President, FY1956, January 17, 1955, p. M57)

- "In its fourth annual report, sent to Congress by President Eisenhower, [the NSF] said that American physicists believed that there was a "national danger of underestimating the strength of the Soviet Union." It asserted today that in the interest of scientific progress American scientists must be informed on research developments throughout the world. Because of the particular need for data on Russian science, it said, the American Institute of Physics had, at its request, begun to develop a plan to translate important current reports on physics research in the Soviet Union. It added that the institute had questioned more than 600 of its members and received replies that such translations were needed because of the technical value of the research now in progress in Russia and the "national danger" here of underestimating that research." ("Wider Vigil Asked on Soviet Science," *New York Times*, January 15, 1955)
- "The [House] Committee recommends the same amount for [Salaries and expenses] as in 1955 of $12,250,00 a reduction of $7,750,000 in the budget estimate. Appropriations for this agency have been increasing steadily each year, and the Committee has denied the increase requested... The agency should also continue to keep its administrative costs at a minimum as required last year." (H. Rpt. 84-304, March 26, 1955, p. 13)
- "The [Senate Appropriations] committee recommends the full amount of the budget estimate of $20,000,000 for research support and training activities, a restoration of $7,750,000 over the House allowance" (S. Rpt. 83-1339, May 13, 1954, p. 10)
- "However backward Soviet technology may have been in the past, it is increasingly clear that today Russia is developing nuclear weapons, jet aircraft, armored vehicles, and other materials that compare favorably with our own. Behind this growing Soviet firepower is growing scientific and engineering manpower. What is especially disturbing is the fact that, while the potential for Russian technological development is on the increase, America is in danger of a decline, as shown in the falling number of young persons being graduated with bachelor's and advanced degrees in science and engineering... The strength of American manpower in science and technology is preeminently a matter of national interest. Defense needs, centering in military [R&D], attract the most attention, but actually, our entire economy is dependent upon a relatively small group of about 650,000 engineers and 200,000 scientists. To them, we look for progress all along the industrial front, for improvement in our communications and transportation, for answers to the unresolved riddles of diseases. The need for people with these crucial skills is widely recognized: the problem now is how to meet it... Because scientific and educational leaders feel strongly that the problem of finding talented youngsters with such a bent for science and technology is crucial, the [NSF] has asked the College Entrance Examination Board to investigate the aptitudes, career motivations, and lack of motivations of students graduating from high school." ("The Science of Producing Good Scientists," *New York Times*, July 31, 1955)
- "When Lewis L. Strauss, Chairman of the [AEC], warned that this country was falling behind in the development of scientists and engineers, he expressed a fear that had been troubling educators and laymen for some time. All available evidence shows that this country is not training enough physicists, chemists, engineers, and technicians to meet our civilian and military needs... The root of the problem of attracting competent

science teachers is salaries. In comparison with industry, teachers receive much less money for their work. As a result, some of the best teachers are being drawn off by business and industry. Industry itself, however, is unable to get an adequate supply of scientists or engineers. In a recent study by the [NSF], it was found that at least half of 200 large companies engaged in [R&D] in essential industries had reported shortages of research scientists and engineers... It is well known that the Soviet Union has increased its output of scientists, engineers and technicians of all kinds." ("Crisis in U.S. Science," by Benjamin Fine, *New York Times*, August 25, 1955)

NSF R&D Appropriations for FY1957

Bill: Independent Offices Appropriation Act, 1957

Public Law: 84-623 **Enacted:** June 27, 1956 **Effective:** July 1, 1956

Nominal change		Real change		Classification
Millions ($)	YOY%	Millions ($2012)	YOY%	
$24.0	150.0%	$113.1	143.4%	Exogenous

Congress significantly increased both nominal and real NSF R&D appropriations for FY1957, largely motivated by fears that the U.S. was lagging behind the Soviet Union in science and technology fields. The Eisenhower administration requested a $25 million (+156%) increase in funding for the foundation in their FY1957 budget request, part of a "vitally necessary" effort to bolster basic research and science education. It was estimated and reported that the Soviet Union was graduating roughly twice to two-and-a-half times as many science and engineering students at the time, which was a serious national security concern. The more frugal House Appropriations Committee approved $35.9 million for the foundation, meeting most of the requested increase in the NSF's budget, whereas their Senate counterparts allowed the full $41.3 million budget request; the conference committee settled just shy of the higher Senate allowance. The increase in NSF research funding again appears to have been motivated by national security concerns and "solving the scientific manpower problem" facing the nation, and does not appear to have been influenced by unemployment or any other short-run macroeconomic prerogatives. As such, we classify this policy event as exogenous. Most pertinent narrative evidence:

- "Because of the direct importance of basic research to our defense program and our national welfare and economic progress, this budget proposes a substantial increase in Federal support of general-purpose research and education in the sciences. This increase is considered by our national security and scientific research agencies to be vitally necessary... For these reasons, I recommend that the appropriation for the regular activities of the [NSF] be substantially increased from 16 million dollars in the current fiscal year to 41 million dollars in the fiscal year 1957. This will enable the Foundation to extend an additional 13 million dollars of support to meritorious basic research projects in colleges and universities, and will provide 7 million dollars for the construction of special-purpose facilities needed for basic scientific research, including the Nation's first major radio astronomy center; and will make available an additional 5 million dollars for expanding the Foundation's experimental program designed to improve science teaching in our schools and colleges and to encourage a greater number of able students to enter careers in science. A supplemental appropriation for the

Foundation of 28 million dollars will be required in the current year to complete financing of the United States program for the International Geophysical Year. The additional amount is mainly for the earth-circling satellite project, in which [DOD] is also participating." (Budget Message of the President, FY1957, January 16, 1956, pp. 48-49)

- "the [NSF] warned Congress today that the promotion of science was an urgent problem. The statement was contained in its annual report transmitted to Congress by President Eisenhower... In his budget message last week, however, the President asked for an increase in appropriation for the foundation. The foundation received $16,000,000 this year. The President asked for $41,000,000 for the fiscal year 1957, which begins July 1, 1956... Without referring specifically to reports that the Soviet Union was turning out more scientists than the United States, [NSF Chairman of the Board Chester] Barnard said: "During recent months it has been quite evident in many ways that the promotion of science is not merely important but an urgent national problem." ("More Science Aid Termed 'Urgent,' *New York Times*, January 27, 1956)
- "Soviet Russia graduated more than twice as many science students last year than did schools in the United States, the [NSF] reported last night. And the Soviet crop of new engineers alone equaled—in number—the United States total of graduates of engineering and all other sciences, the report showed. In numbers, the Soviet Union turned out 126,000 science and engineering graduates compared to 59,000 graduates of American universities. Russia's new engineers totaled 59,000 compared to 22,600 engineering graduates in the United States... the statistics show the weight of emphasis on science in Russia's educational system." ("Reds Graduate Twice as Many Science Students as U.S.," by Nate Haseltine, *The Washington Post*, August 2, 1956)
- [Hearing Q&A:] "General, while you are here, the next item we have on the agenda is the [NSF], with which you are familiar... The House in this particular case cut, again, the [NSF budget]. They are here to ask for the restoration. Generally speaking, from your experience in many of these technical, scientific, and engineering fields, do we have, as a Nation, a lack in that field of basic scientists, trained people, say, as compared to what the Senator from Illinois suggested, with the Russians, or some other countries?" Senator Warren G. Magnuson, Appropriations Subcommittee Chairman, Hearing Q&A, April 27, 1956 (Hearings Before the Senate Appropriations Committee on the Independent Offices Appropriations Act, FY1957, p. 370)
- [Hearing Q&A:] "Yes, sir... We are falling behind, Senator, not so much in the quality of our work, and in fact there I do not think we are behind, but we are behind in the quantity, the number of trained men. When one speaks of a scientist, a physicist, an engineer, he cannot be made overnight. It takes some years to train that man. Unfortunately, the facts and figures which have been presented so far and gathered by the CIA and other agencies, and by the Joint Atomic Energy Committee indicate that the Russians last year graduated two and a half times as many engineers as we in the United States, and they are continuing to accelerate that rate. We have a serious bottleneck at the high school level. There is a shortage of teachers of physics, science, and mathematics; there is a shortage of students who do not enter these technical courses, with the result that if we go along as we are going now, all the appropriations for machines are not going to do any good if you do not have men to operate them. The kind of technical specialization that is required in these days of atomics and electronics and aerodynamics is of a very highly skilled character. You

cannot make these men overnight." Brigadier General David Sarnoff, Chairman of the National Security Training Administration, Hearing Q&A, April 27, 1956 (Ibid, p. 371)

- "The Nation has been aroused to the urgency of improving the quality of our scientific manpower as a whole, as well as the pressing need for increasing the numbers of scientists in some specialized fields of science. This urgency is well known. It is further attested by the comment General Sarnoff has just made. If we are to be successful in solving the scientific manpower problem now confronting the Nation, we must vigorously attack it on both a short-range and a long-range basis... The very fact that it takes from 7 to 9 years of training after high school to produce a competent research scientist dictates the need for immediately beginning a forward-looking, well-rounded program. The Foundation's budget request provides for just such a program" Alan T. Waterman, NSF Director, General Statement, April 27, 1956 (Ibid, p. 379)
- "The [Senate Appropriations] committee recommends and increase of $5,385,000, to provide the budget estimate of $41,300,000 for the operation of the [NSF]." (S. Rpt. 84-2041, May 24, 1956, p. 8)
- "The compromise [FY1957 Independent Offices] bill included $40 million for the [NSF], of which $9.5 million was earmarked for the supplementary training of high school science and mathematics teachers." ("Independent Offices Funds," *CQ Almanac 1956*, 12th ed., 03-628-03-630. Washington, DC: Congressional Quarterly, 1957)

NSF R&D Appropriations for FY1958

Bill: Independent Offices Appropriation Act, 1958

Public Law: 85-69 **Enacted:** June 29, 1957 **Effective:** July 1, 1957

Secondary: Second Supplemental Appropriation Act, 1958

Public Law: 85-352 **Enacted:** March 28, 1958 **Effective:** March 28, 1958

Nominal change		Real change		Classification
Millions ($)	YOY%	Millions ($2012)	YOY%	
$9.8	24.4%	$40.7	21.2%	Exogenous

Congress significantly increased both nominal and real NSF R&D appropriations for FY1958, largely motivated by the "Sputnik crisis" and heightened fears about lagging behind the Soviet Union in science and technology fields. After Sputnik's launch, the Eisenhower administration requested supplemental FY1958 funds for the NSF in their FY1959 budget, in addition to requesting even more funding for FY1959. The second FY1958 supplemental appropriations bill provided an additional $10.8 million for the NSF, on top of $40 million appropriated for the NSF in the FY1958 Independent Offices appropriations bill. The administration had requested $65 million—a $25 million increase—for the NSF in their FY1958 budget request, intended to boost basic research and help "overcome the acute shortage of skilled scientists and engineers," but the House Appropriations Committee refused to increase the budget, deeming additional research efforts for the International Geophysical Year and those by the military services as adequate. Sputnik's launch radically changed that calculus and Congress approved emergency funding for increased basic research. The increase in NSF research funding appears to have been motivated by national security concerns and a geopolitical emergency, and does not appear to have been influenced by unemployment or any other short-run macroeconomic prerogatives. As such, we classify

this policy event as exogenous. This policy event is dated to 1958Q1, when the emergency Second Supplemental Appropriation Act, 1958 took effect, resulting in a significant increase in NSF research funding, whereas the Independent Offices Appropriation Act, 1958 had not previously resulted in a significant increase in real NSF R&D appropriations. Most pertinent narrative evidence:

- "An increase of 25 million dollars in the appropriations for the regular program of the [NSF] is recommended for the fiscal year 1958. This will enable the Foundation to deal more effectively with two problems of national importance in the field of science. First, only a very small proportion of the billions of private and public funds devoted to [R&D] is for the basic research on which progress in the applied scientific fields of health, industrial technology, and weapons development depends. The Foundation will increase its grants for basic research projects and for special research facilities. Second, to help overcome the acute shortage of skilled scientists and engineers, the Foundation will make a major effort to improve training in science, particularly by increasing the number of qualified teachers, by interesting a larger number of able students to enter scientific careers, and by granting fellowships to graduate and post-doctoral students." (Budget of the United States, FY1958, pp. 60-61)
- "In much the same way, we have tremendous potential resources on other non-military fronts to help in countering the Soviet threat: education, science, research, and, not least, the ideas and principles by which we live. And in all these cases the task ahead is to bring these resources more sharply to bear upon the new tasks of security and peace in a swiftly-changing world... In the area of education and research, I recommend a balanced program to improve our resources, involving an investment of about a billion dollars over a four-year period... It also provides a five-fold increase in sums available to the National Science Foundation for its special activities in stimulating and improving science education... In the field of research, I am asking for substantial increases in basic research funds, including a doubling of the funds available to the National Science Foundation for this purpose." Dwight D. Eisenhower, State of the Union Address, January 9, 1958 (*The American Presidency Project*, by Gerhard Peters and John T. Woolley, https://www.presidency.ucsb.edu/node/233817)
- "The [House Appropriations] Committee recommends a $40,000,000 appropriation in 1958 to maintain the same program level as provided for 1957. This is a reduction of $25,000,000 in the budget estimate. There is an addition to the [NSF] program itself the research effort of the International Geophysical Year which officially starts July 1, 1957, and which is supported by the Government at a cost of $39,000,000, plus many millions of dollars in logistics support by the Navy and other Government Departments. It seems appropriate the Committee to suggest that the present level of $40,000,000 is entirely adequate for 1958" (H. Rpt. 85-197, March 15, 1957, p. 12)
- "Basic scientific research, never adequately supported in the United States, is likely to be glutted with money as a result of the national humiliation over the Soviet earth satellites. Overnight, the starved status of basic research has become a public issue. the [NSF], the sole Government agency for the promotion of fundamental research, seems certain for the first time in its seven-year history to obtain from the Administration and from Congress all the money it wants... The [NSF] will seek funds to triple its research grants... The Defense Department has set up a new office—the Advanced Research Projects Agency—where scientists and engineers will have greater freedom to explore ideas for weapons. However, this office will be concerned mainly with applied

[R&D] rather than basic research... Scientists say that the rapid advances in Soviet science threaten the technological supremacy of the United States. They fear that the Russians may be close to important breakthroughs in the frontiers of scientific knowledge." ("Basic Research in the U.S. Is Spurred by Soviet's Gains," by Homer Bigart, *New York Times*, December 16, 1957)

- "Congress gave the [NSF] only $40,000,00 for 1958, the same amount as in 1957. The foundation had asked for $90,000,00, but the economy-minded administration cut the request to $65,000,000. From its inception in 1950, the foundation has had to struggle for funds. It even has trouble getting born. The agency was proposed by Dr. Vannevar Bush, the wartime director of the Office of Scientific Research and Development, in a report to President Roosevelt in 1945. Dr. Bush warned that the United States could no longer rely on Europe as a major source of basic research and that a new agency was needed to promote the flow of scientific knowledge. But Dr. Bush's dream of an agency for fundamental research guidance ran counter to Congress's notions of an office that would subsidize inventors and gadgeteers. When Congress finally passed a science foundation bill in 1948, President Truman killed it with a pocket veto. He favored the general aims of the bill. He objected to certain administrative provisions, insisting that the governing board of the foundation should be responsible to him. Dr. Bush finally won Mr. Truman over by telling him that an independent board would be a handy buffer against a bombardment of requests for special grants. The [NSF] Act finally became law in 1950. But one of the compromises that helped secure its passage was a statutory limitation of $15,000,000 for annual appropriations. In its early years, the foundation received barely enough money to get itself organized and make a few modest grants. Congress became more generous after the Russians produced a hydrogen bomb. The statutory ceiling was lifted in 1954." (Ibid)
- "The dependence of this Nation upon basic research has been well-established in the last few years and generally accepted In most quarters. Important as basic research may be in this age of technology we have failed to provide support that would take full advantage of our existing scientific manpower potential. In view of the recent spectacular evidence of scientific accomplishments in the Soviet Union, it is more than ever evident that every attempt should be made to encourage this Nation's immediate and long-range effort in basic research. At the present time, the most valid criterion we have for determining an appropriate level of support for basic research is the availability of capable research scientists. The fact that we are not fully utilizing the capabilities of existing scientific manpower is evidenced by the fact that the Foundation has not been able to support more than 25 percent of the proposals considered in any year. In fact, the increasing volume of research proposals received each year without a corresponding increase in funds has created a situation whereby the Foundation will not be able to support even the same percentage of its proposal workload in fiscal year 1958 as it supported in fiscal year 1957 unless additional funds are made available. Yet 75 percent of the research proposals submitted to the Foundation are of the quality that should be supported in the national interest." Supplemental Estimate in House Document No. 313 [for the NSF], February 26, 1958 (Hearings Before the Senate Appropriations Committee on the Second Supplemental Appropriations Act, FY1958, pp. 100-101)
- "The additional $9,900,000 requested is to expand present National Science Foundation programs. The Committee is in agreement these programs can be expanded profitably at this time on an emergency basis, and has approved $8,750,000 for such purpose."

(H. Rpt 85-1373, February 20, 1958, p. 13)

NSF R&D Appropriations for FY1959

Primary Bill: Independent Offices Appropriation Act, 1959

Public Law: 85-844 **Enacted:** August 28, 1958 **Effective:** August 28, 1958

Secondary: Supplemental Appropriation Act, 1959

Public Law: 85-766 **Enacted:** August 27, 1958 **Effective:** August 27, 1958

Nominal change		Real change		Classification
Millions ($)	YOY%	Millions ($2012)	YOY%	
$86.3	173.4%	$389.7	167.5%	Exogenous

Congress again significantly increased both nominal and real NSF R&D appropriations for FY1959, largely motivated by the "Sputnik crisis" and heightened fears about lagging behind the Soviet Union in science and technology fields. The Eisenhower administration's FY1959 budget request, submitted just a few months after Sputnik's launch, proposed a huge increase in NSF funding for FY1959, principally for research grants and "stimulating and improving science education." The administration requested $140 million in NSF funding for FY1959, triple the agency's current authorization, in addition to requesting $10 million in supplemental NSF appropriations for FY1958. Tellingly, Sputnik's launch also propelled the drafting and passage of the National Defense Education Act of 1958 (Pub. L. 85-864), signed September 2, 1958, a complimentary effort to regain a competitive edge in science and engineering. The House Appropriations Committee cut $25 million from the administration's NSF budget request, but their Senate counterparts succeeded in restoring most of these funds. The first FY1959 supplemental appropriation act also provided another $6.5 million for the NSF on top of $130 million appropriated in the FY1959 Independent Offices appropriations bill. The increases in NSF research funding appear to have been motivated by national security concerns and a geopolitical emergency, and appear unrelated to concerns about unemployment or any other short-run macroeconomic prerogatives. As such, we classify this policy event as exogenous. Most pertinent narrative evidence:

- "But what makes the Soviet threat unique in history is its all-inclusiveness. Every human activity is pressed into service as a weapon of expansion. Trade, economic development, military power, arts, science, education, the whole world of ideas—all are harnessed to this same chariot of expansion... we have tremendous potential resources on other non-military fronts to help in countering the Soviet threat: education, science, research, and, not least, the ideas and principles by which we live... In the area of education and research, I recommend a balanced program to improve our resources, involving an investment of about a billion dollars over a four-year period. This involves new activities by the Department of Health, Education, and Welfare designed principally to encourage improved teaching quality and student opportunities in the interests of national security. It also provides a five-fold increase in sums available to the [NSF] for its special activities in stimulating and improving science education... In the field of research, I am asking for substantial increases in basic research funds, including a doubling of the funds available to the [NSF] for this purpose." Dwight D. Eisenhower, State of the Union Address, January 9, 1958 (*The American Presidency Project*, by Gerhard Peters and John T. Woolley, https://www.presidency.ucsb.edu/node/233817)

- "Scientific and research efforts throughout the Nation must be expanded. This is a task not only for the Government but also for private industry, foundations, and educational institutions. The Government, on its part, will increase its efforts in this area. Supplemental appropriations for 1958 will be requested for the National Advisory Committee for Aeronautics and the [NSF], as well as the [DOD]. For 1959, new programs to promote education in science are being recommended and basic research activities are being generally expanded" (Budget Message of the President, FY1959, January 13, 1958, p. M7)
- "This budget proposes appropriations of $140 million for the National Science Foundation in 1959, more than three times the amount currently authorized. To permit immediate action in stepping up the Foundation's activities, the budget also includes a supplemental appropriation of $10 million for 1958. These recommendations will enable the [NSF] to proceed vigorously in expanding support for basic research. Of the 1959 appropriation, $58 million, double the 1958 amount, is provided for research grants, for research facilities and equipment, and for related activities." (Ibid, p. M33)
- "The [Senate Appropriations Committee] recommended the full budget request of $140 million for the [NSF], in lieu of the House-passed $115 million, and left the allocation of funds "to the judgment of the foundation. [Conferees agreed on $130 million]" ("Independent Offices," *CQ Almanac 1958*, 14th ed., 04-348-04-351. Washington, DC: Congressional Quarterly, 1959)
- "An increase of $25,000,000 is recommended by the committee, to provide the full amount of the budget estimate of $140,000,000 for the programs of the [NSF]... In recommending this restoration, the committee believes it is better to leave the allocation of funds to the judgment of the Foundation in order that they may carry out a balanced program than to attempt to select the programs or portions of programs to be accelerated or begun... Included in the restoration are funds in the amount of $10,300,000 for research facilities, including the Southern Hemisphere astrograph, university nuclear reactors, university computers, and the solar research telescope, as well as additional amounts for biological research facilities, the radio astronomy observatory and the optical astronomy observatory." (S. Rpt. 85-1656, June 5, 1958, p. 12)
- "the [NSF] said today that unless the pace in education and scientific research was stepped up the race with the Soviet Union would be lost. The report, reviewing ten months of planning since the launching of the first Soviet satellite, was made to President Eisenhower... It urged greater expenditures for education and basic research and a fuller understanding of the urgency of the problem on the part of the public... The Russian people, it said, apparently are dedicated to world leadership in science and technology, "not in the sense of military competition, but rather of achieving world supremacy without the need of military domination." ("Foundation Warns U.S. Must Step Up Science Efforts or Lose Race to Soviet," *New York Times*, August 30, 1958)
- "The [House Appropriations] Committee recommends an appropriation of $4,000,000 to complete funding for the construction of the National Radio Astronomy Observatory at Green Bank, W. Va. This is a reduction of $400,000 in the budget estimate but is in addition to $5,130,000 previously appropriated for construction. All the additional funds requested for a 140-foot radio telescope and the scientific equipment necessary for its operation have been allowed. There are other ancillary items which can be reduced, however, and the [NSF] is expected to exercise strict supervision over costs... The Committee recommends a $2,500,000 appropriation for the International Geophysical

Year, which is a reduction of $450,000 in the supplemental estimate. This will complete the funding for the United States International Geophysical Year Program. The additional amount will provide for unexpected costs in the Arctic and Antarctic programs, accelerate processing of the mass of data accumulated in the last year, and capitalize on some of the major discoveries that have already been made." (H. Rpt. 85-2221, July 17, 1958, pp. 24-25)

- "The [Senate Appropriations] committee recommends the restoration of $400,000, to provide the full budget estimate of $4,400,000 required to complete the funding for the National Radio Astronomy Observatory at Greenbank, W. Va., for a total cost of $9,530,000, including an 85-foot radio telescope and a 140-foot radio telescope with highly specialized electronic instrumentation and equipment... The committee agrees with the action of the House in providing $2,500,000, a reduction of $450,000 from the estimate, for completing the funding for the United States International Geophysical Year program." (S. Rpt. 85-2350, August 13, 1958, p. 14)

NSF R&D Appropriations for FY1960

Bill: Independent Offices Appropriation Act, 1960

Public Law: 86-255 **Enacted:** September 14, 1959 **Effective:** September 14, 1959

Nominal change		Real change		Classification
Millions ($)	YOY%	Millions ($2012)	YOY%	
$18.8	13.8%	$77.0	12.4%	Exogenous

Congress again significantly increased both nominal and real NSF R&D appropriations for FY1960, again largely motivated by the "Sputnik crisis" and fears of lagging behind the Soviet Union in science and technology fields. The Eisenhower administration's FY1960 budget requested a significant increase in NSF funding, notably for "a high level of support for research facilities and for education in the sciences, including fellowships for graduate training." As in recent years, the House appropriators were more skeptical of funding the NSF and more frugal in general, but their Senate counterparts were more sympathetic to the administration's request for basic research funding and restored some of the budget cuts from the House bill; Congress appropriated $152.8 million for the NSF in the FY1960 Independent Offices appropriations bill, nearly matching the administration's request. The increase in NSF research funding again appears to have been motivated by national security concerns and long-run scientific objectives, and does not appear to have been influenced by unemployment or any other short-run macroeconomic prerogatives. As such, we classify this policy event as exogenous. Most pertinent narrative evidence:

- "Expenditures for basic research, which provide the foundation for advancements in applied research and technology and assist in the support of our universities, will continue upward in 1960. Expenditures for the program of research grants by the [NSF] are expected to reach $80 million, an increase of $20 million above 1959 and more than double the 1958 amount." (Budget Message of the President, FY1960, January 19, 1959, pp. M65-66)
- "For support of basic research, science education, and related programs, $160 million in new obligational authority is recommended for the [NSF], an increase of $22 million over 1959. Most of this increase is for the support of basic research projects in universities.

The Foundation will continue to provide a high level of support for research facilities and for education in the sciences, including fellowships for graduate training." (Budget of the United States, FY1960, p. 105)

- "The [House Appropriations] Committee considered a budget estimate of $160,300,000 for the [NSF] and has approved $143,273,000, an increase of $9,273,000 over the 1959 appropriations. The amount recommended includes $60,450,000 for grants and contracts for basic research in support of science. This is an increase of $11,450,000, or about 25 percent for this program in 1960." (H. Rpt. 86-350, May 8, 1959, p. 10)
- "the [NSF] warned the Senate today that cuts made by the House in its budget for the coming year would seriously handicap Government support of basic scientific research. In testimony before a Senate Appropriations subcommittee, Dr. Alan T. Waterman, director of the foundation, appealed for restoration of the $17,027,000 cut... The House action is being viewed with considerable concern within the Administration, which in the last two years has taken a strong position in favor of increasing emphasis on basic research. The administration's budget recommends that appropriations for the foundation—the principal Government agency supporting basic research—be increased from $137,329,145 in the current fiscal year to $160,300,000 in the fiscal year beginning July 1. Of the House reductions, about $11,450,000 was in funds for support of basic research. The $60,450,000 approved by the House for basic research grants, Dr. Waterman said, is "inadequate to meet the foundation's objective." The House reductions, Dr. Waterman said, would also curtail "essential" research into weather modification and prevent construction of "vitally important" research facilities. Among these, he said, were an observatory in the Southern Hemisphere and nuclear research for universities." ("House Cut Called Curb on Sciences: National Foundation Urges Senate to Restore Funds for Basic Research," *New York Times*, May 27, 1959)
- "The [Senate Appropriations] committee recommends restoration of $17,027,000, to provide the full budget estimate for salaries and expenses of $160,300,000. Included in the restoration are funds in the amount of $3,300,000 for research facilities, including the Southern Hemisphere astrograph, university nuclear research equipment, and the National Institute for Atmospheric Research. The committee also includes restoration of $2 million for scientific studies concerning weather modification, as well as the restoration of $1,480,000 to provide the full budget estimate of $5,100,000 for the dissemination of scientific information." (S. Rpt. 86-423, June 22, 1959, pp. 9-10)
- "If present trends continue ten years from now the Soviet Union will lead the United States in many broad areas of science and will be far ahead of this country in terms of trained manpower... Science in the Soviet Union is receiving massive Government support, as does the educational system that provides it with talent. Both are centrally controlled in a manner that would be unthinkable in this country... There is no comparable centralization in the United States. Research money comes from a multitude of sources: the Federal Government via the [NSF] or one of the armed forces, educational institutions, industry, or foundations... Many of those interviewed were shocked at the recent action of the House of Representatives in cutting $17,027,000 from the meager $160,300,000 budget of the [NSF]. In December 1957, the Supreme Soviet voted $4,550,000,000 (at the official rate of exchange) for scientific development..." ("Broad Soviet Scientific Lead Is Expected Within Ten Years," *New York Times*, July 23, 1959)

NSF R&D Appropriations for FY1961

Bill: Independent Offices Appropriation Act, 1961
Public Law: 86-626 **Enacted:** July 12, 1960 **Effective:** July 12, 1960

Nominal change		Real change		Classification
Millions ($)	YOY%	Millions ($2012)	YOY%	
$21.0	13.6%	$89.4	12.8%	Exogenous

Congress again significantly increased both nominal and real NSF R&D appropriations for FY1961, again largely motivated by fears of lagging behind the Soviet Union in science and technology manpower and know-how. The Eisenhower administration's FY1961 budget prioritized basic research funding to "provide a strong foundation of fundamental scientific knowledge for the Nation's future advancement" and requested another significant increase in NSF funding, principally for basic research and modernizing research university laboratories. As in recent years, the House Appropriations Committee was more skeptical of NSF funding and more frugal in general; they approved $160 million for the foundation, $30 million less than the budget request and just $7.2 million above FY1960 funding levels; the committee significantly cut back funding for both the NSF and NASA, much to the chagrin of the administration and Senate Majority Leader Lyndon B. Johnson (D-TX); see "NASA R&D Appropriations for FY1960" for more details. NSF administrators plead their case to the more sympathetic Senate Appropriations Committee, which then fully restored the $30 million budget cut in their bill. The conference bill approved $175.8 million for the agency, roughly squaring the difference between the $160 million House allowance and $191.6 million Senate allowance. The increase in NSF research funding again appears to have been motivated by national security concerns and long-run scientific objectives, and does not appear to have been influenced by unemployment or any other short-run macroeconomic prerogatives. As such, we classify this policy event as exogenous. Most pertinent narrative evidence:

- "To provide a strong foundation of fundamental scientific knowledge for the Nation's future advancement, this budget provides, in various functional categories including major national security, expenditures totaling more than $600 million for support of basic research in 1961. Appropriations of $122 million are recommended for support of basic research by the [NSF], an increase of $34 million over 1960. The total includes $79 million for basic research projects and $15 million for grants to universities for modernization of graduate level laboratories under a program initiated in 1960." (Budget Message of the President, FY1961, January 29, 1960, pp. M58-59)
- "The budget estimate for the [NSF] for 1961 is $190,000,000, and the [House Appropriations] Committee has approved $160,000,000. This will provide an increase of $7,227,000 over the appropriation for the current fiscal year. The Foundation has as its basic objective the support of basic scientific research and the development of trained scientific manpower. Its budget is broken down into four or five parts, including support of basic research; support of basic research facilities; fellowship grants; support of institutes for the training of teachers; and dissemination of scientific information, surveys and reports, and certain special projects in scientific education. The amount recommended in the bill basically provides for continuing the same level of support as in the current fiscal year. An increase is recommended as follows: $1,750,000 for the teacher institutes program; $900,000 for fellowships; and a new item of $300,000 for the Hawaiian Geophysical Institute." (H. Rpt. 86-1519, April 14, 1960, p. 15)

- "The House Appropriations Committee reduced funds for the nation's space program today... A cut of 15 percent was [also] made in the budget of the [NSF], the principal Government agency supporting basic scientific research. The foundation's budget was trimmed from the $190,000,000 requested to $160,000,000. These two programs [NASA and NSF] are viewed within the Administration as vital in maintaining scientific and technological leadership over the Soviet Union. In its report, the committee gave no detailed explanation of why it felt the budgets of the two agencies should be cut... The Democratic Congressional chiefs, such as the Senate majority leader, Lyndon B. Johnson of Texas, have criticized the Administration for not spending enough to overtake the Soviets in space" ("House Unit Votes Cut of 38 million in Space Program," by John W. Finney, *New York Times*, April 15, 1960)
- "Mr. Chairman and members of the committee, the members of the National Science Board, and the staff of the [NSF] present today, appreciate this opportunity to appear before your committee to present the Foundation's case for restoration of the full amount of $31.6 million which the House bill No. 11776 cut from the budget estimate... House Report 1519 states on page 15, concerning the [NSF's] appropriation, that the amount recommended in the bill basically provides for continuing the same level of support as in the current fiscal year. It would appear, therefore, that the general basis for the House action on the appropriation request was the feeling that further growth in the Foundation's programs in support of basic science is not necessary at this time. This view certainly is most emphatically not shared by those who deal directly with our primary source of scientific strength; i.e., in the colleges and universities nor by those who have followed most closely our national needs in science and technology... For this purpose, the strongest attainable foundation for basic research, for research facilities and for training in science and engineering are critically needed." Statement of Alan T. Waterman, Director, NSF, May 19, 1960 (Hearings Before the Senate Appropriations Committee on the Independent Offices Appropriations Act, FY1961, p. 334)
- "The reduction made by the House in our budget estimate primarily affects the Foundation's ability to provide direct support for basic research and to assist in providing the modern research facilities essential to the highly complex research which is necessary to advance basic scientific knowledge. Many important and potentially fruitful areas of basic research in science are coming more clearly into focus. New and advanced instrumentation is making it possible to probe more deeply into the unknowns of nature. For example, in the field of biology, there are constantly expanding possibilities for understanding the molecular origin of life. The role of nucleic acids, DNA, and RNA, in protein synthesis is being studied by highly competent investigators... Much more can and should be done in the way of supporting work in this field. The atom is the essential unit in the structure of matter, and scientists are constantly devising new research methods for its study. Solid state physics, the study of electrical conductivity of substances at very low temperatures, and plasma physics which studies the action of gases consisting of electrons and atoms stripped of their electrons in electromagnetic fields offer promising opportunities for basic research..." (Ibid, p. 334)
- "The [Senate Appropriations] committee recommends adding $31,600,000 to the House amount, to provide the total budget estimate of $191,600,000... The committee believes that proper support of basic research and scientific manpower require the full amount estimated." (S. Rpt. 86-1611, June 17, 1960, pp. 8-9)

NSF R&D Appropriations for FY1962

Bill: Independent Offices Appropriation Act, 1962

Public Law: 87-141 **Enacted:** August 17, 1961 **Effective:** August 17, 1961

Nominal change		Real change		Classification
Millions ($)	YOY%	Millions ($2012)	YOY%	
$87.2	49.6%	$386.2	49.0%	Exogenous

Congress again significantly increased both nominal and real NSF R&D appropriations for FY1962, again largely motivated by fears of lagging behind the Soviet Union in science and technology manpower and know-how. The Kennedy administration's FY1962 budget requested a significant increase in NSF funding, proclaiming that "new scientific knowledge which stems from basic research is indispensable to the technological progress of modern industrialized society." Funding basic research and the "improvement of graduate school laboratories" were top policy priorities of the administration. As in recent years, the House Appropriations Committee was more skeptical of NSF funding and more frugal in general; they approved $250 million for the foundation, $27 million less than the budget request but $74 million more than appropriated for FY1961. The NSF warned the Senate appropriators that roughly three-fourths of the budget cuts in the House bill would come at the expense of basic research support and modernizing laboratory facilities, nixing "180 projects on high-quality research" and disrupting the training of roughly 1,000 graduate students; the more sympathetic Senate Appropriations Committee restored $26.5 million for the agency, nearly matching the budget request. The conference bill approved $263.3 million for the agency, roughly squaring the difference between $250 million in the House-passed bill and $276.5 million in the Senate allowance. The increase in NSF research funding again appears to have been motivated by national security concerns and long-run scientific objectives, and does not appear to have been influenced by unemployment or any other short-run macroeconomic prerogatives. As such, we classify this policy event as exogenous. Most pertinent narrative evidence:

- "Expenditures of $69 million in 1962 are estimated for graduate fellowships in science and mathematics and for other programs to train new scientists, to improve the teaching of science and mathematics, and to stimulate interest in scientific careers. This represents more than a fourfold expansion in the training programs of the [NSF] in 5 years." (Budget Message of the President, FY1962, January 16, 1961, p. M71)
- "New scientific knowledge which stems from basic research is indispensable to the technological progress of modern industrialized society. Expenditures of $119 million are estimated for general-purpose basic research grants by the [NSF], chiefly for research projects and facilities, including the support of national research centers and the improvement of graduate school laboratories. This represents an increase of $29 million over 1961 and a sevenfold expansion in these activities in 5 years." (Ibid, p. M73)
- "The [House Appropriations] Committee has approved $250,000,000 for the Foundation in 1962... This is an increase of $74,200,000 over this year and a $25,000,000 reduction in the budget estimate. Almost all of the Foundation programs are increased next year, but the largest portion is in grants for basic research and facilities." (H. Rpt. 87-449, June 2, 1961, p. 15)
- "[The House bill] provides a total of $250 million, an increase of about $74 million over the amount appropriated to the Foundation for fiscal year 1961. Since this increase is

quite substantial, the [Senate] committee may reasonably ask why we think it necessary to urge restoration to the full amount of $277 million requested in the budget... The support of science requirements that we find in the Foundation after years of experience are very much in excess of the amount that can reasonably be provided in the present economic budgetary situation. Therefore, the fiscal year 1962 budget for the Foundation as proposed by the President represents a balanced effort to move ahead with the task of strengthening and broadening our science potential by supporting the most urgent and most promising areas of need... On the actual budget item, about $21 million, or three-fourths of the reduction, would have to be applied to Foundation programs that provide direct support for basic research and assist in providing modern research facilities essential to the conduct of basic research. If the reduction stands, the Foundation would be able to support its basic research programs only to the extent of 33 percent of the estimated dollar value of research applications or proposals in fiscal year 1962, rather than 36 percent as proposed in the budget. This means that funds will not be available for about 180 projects on high-quality research in important and potentially fruitful areas during fiscal year 1962 involving some 1,000 prospective graduate students, who could of course receive their full training in the available sciences. It means that the investigators who made these proposals must curtail or cancel their research plans and devote their talents to other pursuits which very probably will not offer the same potential returns." Alan T. Waterman, Directer, NSF, June 22, 1961 (Hearings Before the Senate Appropriations Committee on the Independent Offices Appropriations Act, FY1962, pp. 692-693)

- "Restoration is recommended by the [Senate] committee of $26,500,000, to provide the budget estimate... less $500,000. The exception refers to the public understanding of science under the support of the scientific manpower program, budgeted at $1 million, which the committee feels should be limited to the House allowance of $500,000. The committee recommends a reduction of $5,400,000, to provide the revised estimate of $32,200,000 for the minimum amount available for tuition, grants, and allowances in connection with a program of supplementary training for secondary school science and mathematics teachers." (S. Rpt. 87-620, July 25, 1961, p. 25)

NSF R&D Appropriations for FY1963

Bill: Independent Offices Appropriation Act, 1963

Public Law: 87-741 **Enacted:** October 3, 1962 **Effective:** October 3, 1962

Nominal change		Real change		Classification
Millions ($)	YOY%	Millions ($2012)	YOY%	
$59.4	22.6%	$264.7	22.5%	Exogenous

Congress again significantly increased both nominal and real NSF R&D appropriations for FY1963, largely motivated by fears of lagging behind the Soviet Union in science and technology manpower and know-how. The Kennedy administration's FY1963 budget requested a significant increase in NSF funding to continue "our policy of building the research effort of the Nation." Funding for basic research and the construction of research facilities at research universities was a policy priority, and the numerical superiority of Soviet scientists and engineers remained a top national security concern—one that the NSF was drawing light to, bolstering their requests for funds. As in recent years, the House

Appropriations Committee was more skeptical of NSF funding and more frugal in general, and they approved $310 million for the foundation, $48 million less than the budget request but $47 million more than appropriated for FY1962; such fiscal restraint was broad-based, with the budget request being pared back for nearly every agency in the Independent Offices appropriations bill, and the annual increase in appropriations being entirely driven by high priority NASA programs. The Senate Appropriations Committee was once again more supportive of the NSF and restored $25 million that the House had cut from the budget request. The conference bill approved $322.5 million for the agency, exactly squaring the difference between $310 million in the House-passed bill and $335 million in the Senate allowance. The increase in NSF research funding again appears to have been motivated by national security concerns and long-run scientific objectives, and does not appear to have been influenced by unemployment or any other short-run macroeconomic prerogatives. As such, we classify this policy event as exogenous. Most pertinent narrative evidence:

- "Continuing our policy of building the research effort of the Nation, funds are recommended for the [NSF] to expand support for basic research and the construction of research facilities, particularly at colleges and universities, and to strengthen programs in science education." (Budget Message of the President, FY1968, January 18, 1962, p. 18)
- "Expenditures by the [NSF] for the support of science are estimated to be $257 million in 1963. Of this total, $164 million is for the support of basic research and research facilities, an increase of $40 million over 1962 largely for basic research projects in colleges and universities and for research facilities, including matching grants to improve graduate research laboratories. Expenditures of $93 million by the Foundation for Science Education will provide a $19 million increase over 1962 chiefly for graduate fellowships, matching grants to improve instructional laboratory equipment in colleges and universities, and for course content improvement projects to strengthen curricula in science and mathematics." (Budget of the United States, FY1963, p. 96)
- "The Soviet Union was pictured yesterday as having scored a dramatic success in educating scientific specialists while still being confronted by serious shortages of youthful skilled labor. This picture emerged from a comprehensive study of Soviet education published by the [NSF]. In the current decade, the Soviet Union will turn out 4,000,000 university graduates, including 2,500,000 engineers and scientists, Nicholas DeWitt, author of the study, predicts... Since the average quality of Soviet science and engineering graduates is comparable to that of American graduates, Mr. DeWitt remarked, the superiority in numbers must be considered a crucial advantage... "The dynamic growth of Soviet scientific manpower," Dr. Waterman wrote, "is found to have markedly accelerated, and there are currently indications that the Soviet Union intends to place even stronger emphasis upon engineering development and scientific research." ("Gain in Soviet Science Training And Lag in High Schools Found," by Fred M. Hechinger, *New York Times*, January 15, 1962)
- "[The House bill provides $1.1 billion] less than the budget request considered in developing the bill, or a reduction of approximately 8.4 percent. The bill provides $1,993,103,500 more than appropriations for similar purposes in 1962, due almost entirely to the expanded needs of [NASA]. The amounts approved by the [House Appropriations] Committee for almost every item reflect a reduction in the budget estimate." (H. Rpt. 87-2050, July 27, 1962, pp. 1-2)

- "The [House] Committee has included $310,000,000 for Foundation programs in 1963. The recommended amount is an increase of $46,750,000 over 1962 and $48,000,000 less than the budget estimate. There are increases provided in virtually every program... The Committee has included in general provisions of the bill a limitation of 20 percent on indirect overhead allowances on research grants" (Ibid, p. 16)
- "The appropriation of $310 million for the NSF in H.R. 12711 as passed by the House falls short by $48 million of the amount in the budget recommended by the President... If we are to meet the recognized need for balanced growth in the country's scientific and technological capability, it is my view and that of the National Science Board that such a reduction would not serve the public interest... At a time when science and technology are increasing at an ever-accelerating pace in every country, it is our firm conviction that we must without delay set about a most substantial increase in the support of basic research and advanced training in science and engineering as the best possible investment for the next decade. Only in this way will we succeed in producing the number and quality of highly trained scientists and engineers that we require, and at the same time capitalize upon maximum progress in research. A reduction of the magnitude proposed in H.R. 12711 is particularly unfortunate at a time when Foundation programs would be of great assistance to colleges and universities in meeting their responsibilities for the education and training of the increasing numbers of scientists and engineers who will be needed over the next decade. Since 1953 the number of scientists and engineers earning baccalaureate degrees has increased at the rate of about 4.1 percent per year. This rate of growth in the training of manpower is not sufficient in view of the rate of growth in expenditures for the national [R&D] effort which has averaged about 25 percent per year." Alan T. Waterman, Director, NSF, Letter to Hon. Warren G. Magnuson, Chairman, Senate Appropriations Subcommittee, August 16, 1962 (Hearings Before the Senate Appropriations Committee on the Independent Offices Appropriations Act, FY1963, pp. 692-693)
- "The [Senate Appropriations] committee recommends restoration of $25 million to provide a total of $335 million for salaries and expenses of the [NSF], which is $23 million below the budget estimate." (S. Rpt. 87-1923, August 27, 1962, p. 20)
- "In debating the [FY1963 appropriations] bill July 30, the House accepted an amendment offered by Rep. George P. Miller (D-CA) to limit indirect costs on research grants to universities and colleges to 25 percent of the direct cost of each grant [instead of 20%]... The limit applied principally to NASA and [NSF] grants but also affected other agencies in the bill. President Kennedy had urged Congress to remove such limitations from the Departments of Defense and Health, Education, and Welfare... Miller said his Committee on Science and Astronautics was "very much concerned" with the limitation, which was having "a very bad effect" on Government relations with the universities. Other Congressmen reported that many protests had been received from college administrators. James G. Fulton (R-PA), however, warned that research grants cost the Government $1 billion" ("Independent Offices Funds," *CQ Almanac 1962*, 18th ed., 04-183-04-188. Washington, DC: Congressional Quarterly, 1963)

NSF R&D Appropriations for FY1964

Bill: Independent Offices Appropriation Act, 1964

Public Law: 88-215 **Enacted:** December 19, 1963 **Effective:** December 19, 1963

Nominal change		Real change		Classification
Millions ($)	YOY%	Millions ($2012)	YOY%	
$30.7	9.5%	$127.3	8.8%	Exogenous

Congress again significantly increased both nominal and real NSF R&D appropriations for FY1964, again largely motivated by fears of lagging behind the Soviet Union in science and technology manpower. The Kennedy administration's FY1964 budget again requested significant increases in NSF funding for basic research "necessary to progress in science and technology" and training scientists, reflecting the "importance of science education." Shortly after releasing the budget request, President Kennedy sent Congress a special message on education presenting his case for the substantial increases in NSF funding requested in the budget, stressing the urgent need to expand "capacity for the graduate training of engineers, scientists and mathematicians" and citing concerns about the Soviet Union's scientific and technical manpower. But the House Appropriations Committee was fed up with the rapid budgetary growth of the new agency and the "rapidly rising cost of Government support of research," and only allowed a continuation of the NSF's current funding level for FY1964, axing in entirety the requested $265.8 million increase for the agency. NSF administrators brought their case to the Senate appropriators, requesting $45 million less than the initial budget proposal but still seeking to reverse the vast majority of funds disallowed by the House committee. The Senate Appropriations Committee was once again more supportive of the NSF than their House counterparts, but not nearly as enthusiastic as the Kennedy administration; they only restored $50 million that the House had cut from the budget request, with those funds earmarked for science and technology education programs. The conference bill approved $352.5 million for the agency, $30 million above the FY1963 funding level that the House committee wanted to stick to. The increase in NSF research funding again appears to have been motivated by national security concerns and long-run scientific objectives, and does not appear to have been influenced by unemployment or any other short-run macroeconomic prerogatives. As such, we classify this policy event as exogenous. Most pertinent narrative evidence:

- "[The budget] also proposes greater use of the authority of the [NSF] to support science and engineering education. It is designed, first, to obtain improved quality in all levels and types of education; second, to help break crucial bottlenecks in the capacity of our educational system by providing funds for building expansion; and third, to increase opportunities for individuals to obtain education and training by broadening and facilitating access to colleges and universities and by providing an expanded range of technical, vocational, and professional training opportunities for teachers and students. A recommended substantial augmentation of basic research by the [NSF]—necessary to progress in science and technology—will also contribute materially to graduate education." (Budget Message of the President, FY1964, January 17, 1963, pp. 25-26)
- "As an integral part of the new education program, a major expansion of [NSF] programs is provided in the 1964 budget. New obligational authority for 1964 will be more than 80% above the 1963 level... In addition to further strengthening the Foundation's support for basic research, research facilities, and national research programs, the 1964 budget provides for a sharp expansion in support for institutional science programs and science and engineering education—including teacher training institutes and science curriculum development, expansion and improvement of graduate and undergraduate science and engineering facilities in colleges and universities, and initiation of train-

ing grants to stimulate graduate education. This expansion reflects the importance of science education" (Budget of the United States, FY1964, p. 104)

- "Special urgency exists for expanding the capacity for the graduate training of engineers, scientists, and mathematicians. The President's Science Advisory Committee has recently reported that an unprecedented acceleration in the production of advanced degrees is immediately necessary to increase our national capability in these fields... I have recommended, therefore, in the proposed 1964 budget already before Congress, a strengthening of the [NSF] matching-grant program for institutions of higher education to expand and improve graduate and undergraduate science facilities... I recommend, therefore: That the [NSF] program for training institutes for teachers in the natural sciences, mathematics, engineering, and social sciences be expanded to provide upgrading the knowledge and skills and 46,000 teachers, as provided in my 1964 budget... The necessity of this program does not rest on the course of the Cold War. Improvement to our nation's development without respect to what others are doing. Nevertheless, it is worthwhile noting that the Soviet Union recognizes that educational efforts in the 1960s will have a major effect on a nation's power, progress, and status in the 1970s and 1980s. According to a recent report prepared for the [NSF], the Soviet institutions of higher education are graduating three times as many engineers and four times as many engineers and four times as many physicians as the United States. While trailing behind in this country in aggregate annual numbers of higher education graduates, the Soviets are maintaining an annual flow of scientific and technical professional manpower more than twice as large as our own" John F. Kennedy, Special Message to the Congress on Education, January 29, 1963 (*The American Presidency Project*, by Gerhard Peters and John T. Woolley, https://www.presidency.ucsb.edu/node/236499)
- "The [House Appropriations] Committee is concerned at the rapidly rising cost of Government support of research. The only increase recommended for the Foundation in 1964 is for cost of pay increases. Funds are not recommended for any of the new programs proposed in the 1964 budget estimate. The Committee requests that no new programs be started. The amount approved in the bill for 1964 is $323,200,000. This is $265,800,000 below the amount requested. The appropriations for the Foundation have grown rapidly year by year. In 1958 the appropriation was $49,750,000; a substantial increase to $134,000,000 was approved was $49,750,000; a substantial increase to $134,000,000 was approved in 1959; the amount for 1960 was $152,773,000; in 1961 the amount rose to $175,800,000l a considerable increase was granted in 1962 bringing the appropriation to $263,250,000; and in 1962 the appropriation went to its present level of $323,500,00." (H. Rpt. 88-824, October 7, 1963, p. 16)
- "The House Appropriations Committee disapproved today some ambitious plans by the Administration to increase the quality and quantity of science students and to raise the standards of some scientific institutions. It killed the entire $114,000,000 program put forth through the [NSF] and went on to cut $151,000,000 more from the foundation's requests for increases in present programs... Representative Albert Thomas, [D-TX] who is chairman of the Appropriations subcommittee that considers the foundation budget, explained that his panel was concerned with the growth of the foundation. Six years ago its appropriations totaled less than $50,000,000. "We put the Federal Government into the education business through the science foundation," he said. "We hear that research money is running out of the years of grant recipients in colleges. It's time to pause and take a look at the situation."" ("Budget for Science Foundation Is

Cut Heavily by House Panel," *New York Times*, October 8, 1963)

- "We request that our appropriation be restored to a total of $544 million, rather than $589 million as stated in our budget estimate. This reduction of $45 million reflects the changes in fiscal requirements brought about by the passage of time. Certain programs have been necessarily slowed down due to the limitations imposed by the continuing resolution under which the Foundation has operated in the absence of an appropriation... The appropriation proposed for the [NSF] in H.R. 8747 is $286.8 million less than the $589 million included in the President's budget. I do not believe that so drastic a reduction in the appropriation proposed for the [NSF] is in the public interest... The purposes of the Foundation's programs are much broader than the support of basic research, although this is a major and vital part of our efforts. The [NSF] has a critical role in developing the future as well as the present strength of American science. We are charged with the responsibility of strengthening the education and training of scientific and engineering personnel as well as increasing scientific knowledge... About 83 percent of the proposed appropriation will be administered through more than 800 colleges and universities. These funds will contribute directly to basic research activities of more than 10,000 scientists and engineers and to the education and training of about 45,000 students who are the major source from which we must meet the country's future needs in scientific manpower." Dr. Leland Haworth, Director, NSF, Letter to Hon. Warren G. Magnuson, Chairman, Senate Appropriations Subcommittee, October 30, 1963 (Hearings Before the Senate Appropriations Committee on the Independent Offices Appropriations Act, FY1964, pp. 2069-2070)
- "Restoration of $50 million is recommended by the [Senate Appropriations] committee, to provide a total amount of $373,200,000 for the [NSF], which is $215,800,00 below the budget estimate. The amount restored is recommended for addition to the educational programs... The committee is interested in the work being carried on in atmospheric research and desires that such work go forward under the schedule which has been drawn for it." (S. Rpt. 88-641, October 22, 1963, p. 21)
- "The [House Appropriations] Committee appropriated $323,200,000 for NSF; President Kennedy in his Jan. 29 education message had requested $589 million, including funds for new research programs. The Committee recommended new funds only to cover pay increases and denied funds for all new programs. It expressed concern about the "rapidly rising cost" of Government participation in research, noting that the appropriation for NSF had risen from $49,750,000 in 1958 to its current level... The House made no attempt to restore its Committee's $265,800,000 cut in NSF funds, and President Kennedy, in a speech to the National Academy of Sciences on Oct. 22, said the House's action was an example of the Federal Government's "failure" to support federally dependent, "important areas of research." He said he hoped the Senate would restore the funds... The [Senate Appropriations] Committee recommended $373,200,000 for NSF, $50 million more than approved by the House... Conferees allowed a compromise $353,200,000 for NSF, a figure $30 million more than the House passed and $20 million less than the Senate approved. In addition, the conferees directed that, "with good judgment," NSF funds could be used to continue Project Mohole, an exploration of the earth's mantle at an estimated cost of between $40 million and $75 million." ("Cut in NASA Funds Highlights Independent Offices," *CQ Almanac 1963*, 19th ed., 168-74. Washington, DC: Congressional Quarterly, 1964)

NSF R&D Appropriations for FY1965

Bill: Independent Offices Appropriation Act, 1965

Public Law: 88-507 **Enacted:** August 30, 1964 **Effective:** August 30, 1964

Nominal change		Real change		Classification
Millions ($)	YOY%	Millions ($2012)	YOY%	
$67.2	19.0%	$290.5	18.5%	Exogenous

Congress again significantly increased both nominal and real NSF R&D appropriations for FY1965, largely motivated by fears of lagging behind the Soviet Union in science and technology manpower. President Johnson's FY1965 budget requested significant increases in NSF funding; the administration was prioritizing "increasing support for graduate students in the sciences" and modernizing university science and technology laboratories and facilities, strategic investments in the nation's scientific workforce. The Johnson administration requested a $134.4 million increase for the NSF, but political support for the agency was waning on Capitol Hill—other domestic priorities of the new administration, notably the war on poverty, were beginning to stretch funding and tighten budget constraints; see "Energy R&D Appropriations for FY1965" for more details. The House Appropriations Committee only approved $420.4 million for the NSF—$67.2 million below the budget request. In a major reversal from recent years, the Senate Appropriations Committee concurred with the House instead of lobbying for more NSF funding. But the more modest net increase in NSF research funding again appears to have been motivated by national security concerns and long-run scientific objectives, and does not appear to have been influenced by unemployment or any other short-run macroeconomic prerogatives. As such, we classify this policy event as exogenous. Most pertinent narrative evidence:

- "In keeping with the continuing need to strengthen the scientific and technological resources of the Nation, the budget also provides for expansion of the [NSF's] basic research and science education programs. Major emphasis will be placed on increasing support for graduate students in the sciences and on strengthening science instruction and facilities in colleges and universities, one objective of which is to develop additional top-ranking centers of graduate study in the sciences." (Budget Message of the President, FY1965, January 21, 1964, p. 27)
- "The [NSF] continues to perform a vital role in support of science education and fundamental research. In keeping with proposals made a year ago as part of the Administration's education program, substantial increases are again recommended in the scope of the programs of the Foundation to develop additional academic institutions of scientific excellence and to strengthen science education. The need for highly trained manpower for engineering, mathematics, and the physical sciences—to which these programs would contribute significantly—was underscored by the President's Science Advisory Committee last year. Over 10,000 fellowships will be granted in 1965, an increase of nearly 80% over 1964. Increases are also provided in 1965 for the support of basic research... Total new obligational authority for the Foundation will rise from $353 million in 1964 to $488 million" (Budget of the United States, FY1965, pp. 122-123)
- "The [NSF] will embark soon on a far-reaching program to promote the growth of new educational centers of science and technology throughout the nation. It is a program with broad political and economic implications, for one of its main objectives is to help correct the regional concentration that has developed in scientific research both

in universities and industry... One of the principal recommendations of the report was that more first-rate centers of science were urgently needed, and therefore the Government should 'encourage' the growth of such centers from the present 15 to 20 to twice that number by 1970... In slashing the foundation's budget last year, Congress cut the funds for the science improvement program from a request of $33 million to $3 million. With this token sum, plus $25 million it has requested for the coming fiscal year, the foundation plans to make a start on the program this spring" (U.S. to Promote Growth of New Science Centers," by John W. Finney, *New York Times*, March 14, 1964)

- "Appropriation of $420,400,000 is recommended for the Foundation in 1965. This is $67,220,000 less than the budget estimate and $67,200,000 more than the amount provided in 1964. The [House Appropriations] Committee has specifically approved the $25,000,000 requested for developing centers of excellence in science and engineering. This program was initiated by the Foundation in 1964 and promises to be one of the best methods to truly broaden the development of scientific and engineering knowledge in every part of the Nation, particularly in those areas where assistance is needed most." (H. Rpt. 88-1413, May 18, 1964, p. 16)
- "The [Senate] committee agrees with the House allowance of $420,400,000 for salaries and expenses of the [NSF]... The committee recommends inserting authorization for the purchase (of one), maintenance and operation, and hire of aircraft. The committee is advised that the aircraft will be used at the National Center for Atmospheric Research in their fundamental research on the atmosphere, which promises to lead to significant scientific results and economic benefits. Also, that among their scientific programs the research on clouds could lead to new theories of weather modification." (S. Rpt. 88-1269, May 18, 1964, p. 20)

NSF R&D Appropriations for FY1966

Bill: Independent Offices Appropriation Act, 1966

Public Law: 89-128 **Enacted:** August 16, 1965 **Effective:** August 16, 1965

Nominal change		Real change		Classification
Millions ($)	YOY%	Millions ($2012)	YOY%	
$59.3	14.1%	$260.8	14.0%	Exogenous

Congress again significantly increased both nominal and real NSF R&D appropriations for FY1966, again largely motivated by fears of lagging behind the Soviet Union in science and technology manpower. President Johnson's FY1966 budget requested a 25% increase in NSF funding, prioritizing federal support for basic research and training graduate students in science and engineering. Reversing course from the prior year, the House Appropriations Committee met the administration roughly halfway, approving $480 million for the NSF—a $59.6 million increase from FY1965 funding but $50 million less than the administration's request for FY1966. The House committee struck a more positive tone about the NSF in their report, pivoting focus from the top-line budget to equity across the distribution of funding, adding a policy rider capping the share of NSF fellowships going to residents of any particular state. The Senate committee killed the effort to ensure a more equitable distribution of fellowships, but supported funding levels roughly in line with the House, resulting in a significant increase, albeit less than the administration wanted. The net

increase in NSF research funding again appears to have been motivated by national security concerns and long-run scientific objectives, and does not appear to have been influenced by unemployment or any other short-run macroeconomic prerogatives. As such, we classify this policy event as exogenous. Most pertinent narrative evidence:

- "In 1966, expenditures by the [NSF] will increase by 25%, primarily to help provide an adequate rate of growth in Federal support for basic research in universities. Consistent with these objectives, I recommend that Congress remove its restrictions on payments to universities for indirect costs of research grants." (Budget Message of the President, FY1966, January 25, 1965, p. 25)
- "The [NSF] helps develop the Nation's scientific capability by supporting science education and basic research. For 1966, new obligational authority of $530 million is recommended, an increase of $110 million over 1965. Nearly 70% of this increase is needed to provide adequate overall Federal support for research in universities. With the tapering off of growth in research support from other agencies, increased reliance must be placed on the Foundation in 1966 to underwrite the Nation's basic scientific research, particularly at universities. Increases are also estimated for grants by the [NSF] to accelerate the development of an additional number of selected academic institutions into centers of scientific excellence and to support science education. Expanded support for graduate education in the sciences will, in 1966, enable more than 8,800 fellowship recipients to further their scientific training and about 45,000 science teachers to update their knowledge through college and secondary school teacher training institutes." (Budget of the United States, FY1966, p. 127)
- "At the end of the war the advance of science was a source of pervading pessimism in our land—and around the world. There were fears that the onrush of man's knowledge would outrun man's wisdom and speed humanity toward its own extinction. With the establishment of the NSF, we committed ourselves to the development of peaceful science, and now our times are marked and moved by an optimism and hopefulness rare in all the history of mankind... While possessed of no special gift of foresight, the Federal Government has taken a forward-looking role, exercising both desirable initiative and appropriate self-restraint. Support for science has come from the Government without thought of making science subservient to the Government. The virtually undisputed leadership held by America today in the realm of science and technology is a conspicuously visible testament to the greater compatibility a free society affords to the spirit of free inquiry." Lyndon B. Johnson, February 15, 1965, Message to the Congress Transmitting Annual Report of the [NSF] (*The American Presidency Project*, by Gerhard Peters and John T. Woolley, https://www.presidency.ucsb.edu/node/238698)
- "The [House Appropriations] Committee recommends an appropriation of $480,000,000 for the Foundation in 1966. This is $50,000,000 less than the budget estimate and $59,600,000 more than the amount provided in 1965. No part of the reduction in the budget estimate shall be applied to the program to develop centers of excellence in science and engineering which promises to be one of the best methods to broaden the development of scientific and engineering knowledge in every part of the Nation, particularly in those areas where such assistance is needed most. Dr. Haworth and the present National Science Board are doing a tremendous job. The Board is composed of outstanding scientists, all of them leaders in universities and industry, and many of whom are still doing significant research. A limitation is included this year requiring that not more than 10 percent of the fellowships be awarded to residents of any one

State. This will assure that a more and better distribution of fellowship funds will be achieved." (H. Rpt. 89-320, May 6, 1965, p. 14)

- "The [Senate Appropriations] committee recommends deletion of the portion of the proviso restricting to 10 percent the fellowship awards to be granted to applicants of any one State of permanent residence. In this connection, the committee notes that the Foundation has been striving to accomplish a more equitable distribution among the States of grants and contracts, and urges the Foundation to continue in this direction (S. Rpt. 89-384, June 29, 1965, p. 18)
- "Conferees agreed to the Senate-approved appropriation of $479,999,000 in fiscal 1966 for the NSF... and accepted the Senate's earmarking $37.6 million in funds for a supplementary training program for secondary school mathematics and science teachers... [Conferees also agreed] to Senate deletion of House language which specified that no more than 10 percent of NSF fellowships could be awarded to residents of any one state. Conferees noted that the NSF had been striving for a "more equitable distribution" of fellowships among states. They urged that fellowships go "not only" to major colleges and universities" ("VA, NASA Get Top Funds in Independent Offices Bill," *CQ Almanac 1965*, 21st ed., 154-60. Washington, DC: Congressional Quarterly, 1966)

NSF R&D Appropriations for FY1969

Bill: Independent Offices and Department of Housing and Urban Development Appropriation Act, 1969

Public Law: 90-550 **Enacted:** October 4, 1968 **Effective:** October 4, 1968

Nominal change		Real change		Classification
Millions ($)	YOY%	Millions ($2012)	YOY%	
-$95.0	-19.2%	-$470.1	-21.9%	Endogenous

Reversing course, Congress appropriated significantly less for NSF R&D funding in FY1969, both in nominal and real terms, cuts largely motivated by concerns about inflation and efforts to reduce inflationary pressures from the federal budget; the agency's budget had been growing in nominal terms every year since its inception until this inflection point. The Johnson administration proposed a modest increase in NSF funding, but "[lessening] inflationary pressure" was an overarching objective for the FY1969 budget, and the administration aimed to cur funding or postpone projects when possible; see "NASA R&D Appropriations for FY1969" for more details. As with NASA, the appropriators took a hatchet to the NSF's budget in their FY1969 Independent Agencies committee bills, with the Senate committee cutting the NSF budget by almost as much as their House counterparts; they only restored $10 million (10%) of what the House cut "because of the current budgetary situation," and then acquiesced to the House allowance in conference. Consequently, the conference bill approved $400 million for the NSF, $100 million (20%) less than requested by the administration. House Appropriations Subcommittee Chairman Joe L. Evins (R-TN) was particularly frustrated by the exponential growth of the agency's budget—more than 2000% between FY1952 and the FY1969 budget request—and complained to NSF Director Leland Haworth that the government should try to encourage more private sector R&D with less of a federal subsidy. Attitudes toward university students had also soured for some members of Congress in the midst of protests against the Vietnam War and debate over the NSF budget reflected as much, with some legislators trying to deny federal benefits for

university "draft dodgers" and student protesters; the House of Representatives accepted a floor amendment to their version of the appropriations bill prohibiting NSF fellowships being paid to university students violating campus policies or "rioting." The House's eligibility restrictions on NSF fellowships also prevailed in conference. Beyond competing domestic and foreign priorities and souring attitudes toward university students, the reductions in the NSF's budget were partially motivated by short-run concerns about the federal budget exacerbating inflationary pressure, part of a broader related effort to reduce spending. As such, we classify this policy event as endogenous. Most pertinent narrative evidence:

- "expenditures for the [NSF's] broad range of science education and research programs are estimated to rise from $456 million in 1968 to $480 million in 1969. A portion of this increase will be for basic research, mainly in universities, emphasizing fundamental studies in fields of growing national concern, such as oceanography, and the environmental and social sciences. Most of the increase in expenditures will assist colleges and universities to improve further the quality of their science training and research activities." (Budget of the United States, FY1969, p. 158)
- "Although exact numbers cannot be determined at this time, we estimate that the programs as proposed will advance the research and educational endeavors of more than 85,000 individuals. These funds will support the research of about 6,000 faculty members working in all the basic fields and will promote the advanced education of about 18,000 university and college students in science and engineering through fellowships, traineeships, and employment as research associates or assistants. An estimated 50,000 teachers of science, engineering, and mathematics at the undergraduate, secondary and elementary school levels will participate in projects to improve their capabilities as educators and about 11,000 secondary and undergraduate students will participate in special research and educational projects." Dr. Leland Haworth, NSF Director, February 20, 1968 (Hearings Before the House Appropriations Committee on the Independent Offices Appropriations Act, FY1969, p. 1006)
- "I remember when the [NSF] Act was passed. Our efficient clerk tells us that the first appropriation was about $225,000. That is when you were launched in 1953. This grew to $3,500,000, then $4,500,000, then it jumped almost double to $8 million, in 1955 to $12,200,000, in 1956 $16 million, it reached a new peak... You have grown from $225,000 to $495 million. So we have been pretty generous... Can't we get industry to do a little more? They are the recipients and beneficiaries, in large measure. Industry likes for the government to subsidize all areas of research in devices that will help them grow" Senator Joe L. Evins, Chairman of the House Appropriations Subcommittee, February 20, 1968 (Ibid, p. 1041)
- "The [House Appropriations] Committee considered a budget request of $500,000,000 for the [NSF] and recommends an appropriation of $400,000,000... $95,000,000 below the appropriation for the present fiscal year... The Committee recognizes the competence of the Director and Members of the National Science Board and recommends that they make the necessary contractual adjustments in the institutional and fellowship grant programs to effectuate the economies proposed. The Committee recognizes the necessity of this action become of the current budgetary situation while appreciating the importance of the work and the long-range beneficial effect to the Nation of the programs of the [NSF]." (H. Rpt. 90-1348, May 3, 1968, p. 13)
- "Restoration of $10 million is recommended by the [Senate Appropriations] committee, to provide a total amount of $410 million for salaries and expenses of the [NSF], which

is $90 million below the budget estimate." (S. Rpt. 90-1375, July 9, 1968, p. 10)

- "HR 17023, as passed by Congress, included a provision designed to prevent [NSF] fellowships and other NSF aid from going to student rioters. Similar provisions have been added to other appropriations bills" ("Open Housing Funds Denied In HUD-NASA Money Bill," *CQ Almanac 1968*, 24th ed., 06-465-6-472. Washington, DC: Congressional Quarterly, 1969)
- "The one-story brick building stands as a monument to lagging Federal support for basic scientific research, which has been caught in a budget squeeze between the demands of the war in Vietnam and the urban problem. The squeeze has caused widespread concern among scientists... The amount of federal support for [R&D]—which reached $16.9-billion this year compared with $16.7-billion last year—has not yet declined. But the rate of growth has slumped sharply over the last four years in the face of continuing inflation in the cost of doing research and increasing numbers of competent scientists seeking research dollars. After a decade of expanding by an average of 22 percent a year, the Federal [R&D] budget has risen by only 2.5 percent a year since 1964. During that time it is estimated, the pool of scientists has swelled by about 20 percent. The resulting crush, many scientists fear, will damage the nation's world leadership in science and technology" ("Scientists Upset by Research Aid Cuts," by Robert Reinhold, *New York Times*, June 21, 1968)

NSF R&D Appropriations for FY1971

Bill: Independent Offices and Department of Housing and Urban Development Appropriation Act, 1971

Public Law: 91-556 **Enacted:** December 17, 1970 **Effective:** December 17, 1970

Nominal change		Real change		Classification
Millions ($)	YOY%	Millions ($2012)	YOY%	
$65.9	15.0%	$154.1	8.8%	Exogenous

Again reversing course, Congress significantly increased both nominal and real NSF R&D appropriations for FY1971; in another shift, this increase was largely motivated by new environmental concerns of the Nixon administration and the public. Despite recent concerns about inflationary pressure from the federal budget, the administration requested a $73 million (16.6%) increase for the NSF, prioritizing funding for environmental research. The Nixon administration had proposed an "anti-inflationary budget," cutting back funding for a number of agencies, and was trying to reorganize and re-prioritize limited funding for applied [R&D], but basic research efforts funded by the NSF was exempted; see "NASA R&D Appropriations for FY1971" for more details. The House Appropriations Committee initially approved $497 million for the NSF, a cut of $16 million relative to the FY1971 budget, but the Senate Appropriations restored the full amount of the request; in testimony trying to persuade the Senate to reverse those cuts, NSF Director William D. McElroy had stressed the agency's research focus on environmental challenges as well as the adverse effects of recent fiscal restraint on basic research funding for other agencies. The Senate approved an additional increase to $522.5 million during Senate floor amendments, but the additional $9.5 million for funding for graduate traineeships was stripped out of the bill during conference; the conferees instead settled on the $513 million budget request as a middle ground between the House and Senate bills. President Nixon vetoed the first

version of the FY1971 Independent Offices appropriations bill "to hold the line against a dangerous budget deficit," but the president's ire was not aimed at the NSF, and funding levels were left unchanged in revising the bill after a failed attempt to overrule the veto. The increase in NSF research funding appears to have been motivated by new environmental concerns and long-run scientific objectives, and does not appear to have been influenced by concerns about unemployment, anti-inflationary budget restraint, or any other short-run macroeconomic prerogatives. As such, we classify this policy event as exogenous. Most pertinent narrative evidence:

- "Where technology has polluted, technology can purify. Solutions to many of our problems can be found only through a greater understanding of our environment and man's impact upon it... I am confident that this challenge can be met by our leading research institutions and scientists. To encourage research related to environmental and other national problems, I am recommending that appropriations for the [NSF] be increased." (Budget Message of the President, FY1971, February 2, 1970, p. 29)
- "Outlays of the [NSF] will be $490 million in 1971—the same level as in 1969 and 1970. These funds support a broad range of programs to foster research and science education at all levels. Priority will be placed on research activities in important problem areas, particularly those affecting the environment." (Budget of the United States, FY1971, p. 143)
- "The [House Appropriations] Committee considered a budget estimate of $511,000,000 for programs of the [NSF] and recommends an appropriation of $495,000,000. This is a reduction of $16,000,000 below the budget request, but an increase of $57,000,000 over the appropriation provided for the current year. Some of the programs supported by the Foundation are the cutting-edge for new knowledge in our society... The Committee is advised that excellent facilities and extreme competence presently exist at the Oak Ridge National Laboratory for research into the problems of the environment. The Committee recommends and directs that these existing facilities be utilized wherever possible, rather than providing new and possibly duplicating facilities. The Committee recommends a specific limitation of $19,500,000 for program development and management expenses of the Foundation. These administrative costs are presently in excess of $19,000,000 annually and the Committee suggests that they be more carefully managed." (H. Rpt. 91-1060, May 7, 1970, pp. 10-11)
- "You are keenly aware, I am sure, of the increasing concern on the part of many of our citizens, young and old, rich and poor, that both the prime products and the by-products of our technology-based society may irreversibly disrupt the social and biological systems that support life, and thereby threaten the very existence of life as we know it on this planet. There is also an expressed desire for the Nation's scientific, academic, and industrial enterprise to mount an appropriate response to the challenge posed by the continuing deterioration in the quality of our environment, the air we breathe, the water we drink, the education our children receive and so on. We welcome the concern being shown by Congress, the President, and the people, and we intend to respond to that concern. In our testimony today, we would like to discuss the broad-scale effort, and some of the specific programs of NSF which are designed to provide the mission agencies, industry, and the academic community itself, with the tools and fundamental knowledge required to meet this challenge. Second, there is a growing shift away from the support of fundamental research by the mission agencies of the Federal Government due to severe budget pressures and Congressional mandate.

This is placing greater pressure on the limited resources of the Foundation, and is making it increasingly difficult for the Foundation to ensure viable programs of scientific research at U.S. academic institutions and other parts of the fundamental research community. I am deeply concerned that budgetary pressures if continued further into the future, will see a dissipation of this basic National strength. Therefore, I urge this committee to support the full budget amount requested." Dr. William D. McElroy, NSF Director, May 14, 1970 (Hearings Before the Senate Appropriations Committee on HUD-Independent Offices Appropriations, FY1971, p. 505)

- "Restoration of $16 million is recommended by the [Senate Appropriations] committee to provide the full amount of the budget estimate of $511 million for salaries and expenses of the [NSF]... The committee has received several requests to earmark specific programs, which the committee is reluctant to do, preferring instead to leave the funding of programs to the better judgment of the Director and his assistants... The program for Sea Grants is also funded by the [NSF], and is budgeted at $13,000,000, which is approved by the committee." (S. Rpt. 91-949, June 24, 1970, p. 11)
- "Also accepted on [Senate floor] voice votes were amendments by Edward M. Kennedy (D-MA) to increase by $9.5 million funds for the [NSF] to provide... first-year graduate traineeships" ("Compromise HUD, NASA, Offices Bill Passed after Veto," *CQ Almanac 1970*, 26th ed., 02-742-02-752. Washington, DC: Congressional Quarterly, 1971)

NSF R&D Appropriations for FY1972

Bill: Department of Housing and Urban Development; Space, Science, Veterans, and Certain Other Independent Agencies Appropriation Act, 1972

Public Law: 92-78 **Enacted:** August 10, 1971 **Effective:** August 10, 1971

Nominal change		Real change		Classification
Millions ($)	YOY%	Millions ($2012)	YOY%	
$115.0	22.8%	$339.7	17.9%	Endogenous

Congress again significantly increased both nominal and real NSF R&D appropriations for FY1972, but with inflation subsiding and the budgetary stance turning expansionary, this increase was partly motivated by concerns about slowing productivity growth and high unemployment rates in science and engineering fields. President Nixon's budget message declared that "excessive demand was eliminated as a source of inflationary pressure" in the previous two years, and the budget pivoted from anti-inflationary fiscal restraint to an "economy-spurring deficit policy"; see "NASA R&D Appropriations for FY1972" for more details. But OMB director George Shultz, an economist, was concerned that more federal R&D funding was needed to address both a slowdown in U.S. productivity growth and high unemployment rates for scientists and engineers. The administration proposed a $116 million (22.9%) increase in NSF funding relative to actual FY1971 appropriations. Similar to the previous year, the House Appropriations Committee pared the request back by $38.2 million, but the Senate committee approved the entire top-line budget request and another $25 million was amended onto to the Senate bill during floor debate; conferees settled on $622 million, roughly splitting the House-Senate difference by approving the full budget request. The net increase in the NSF's budget appears to have been in part motivated by short-run concerns about productivity growth and unemployment of scientific manpower. As such, we classify this policy event as endogenous. Most pertinent narrative evidence:

- "The lean years for science—the drop in research caused by tight federal science allotments of the past five years—may be bottoming out. The Nixon administration's fiscal 1972 budget, due within days, will contain increases in research funds, especially funds for colleges, regarded as 'impossible' by many federal science officials only weeks ago. The increase in all federally financed [R&D], including everything from basic laboratory work to weapons to medical electronics, will be about 8 percent. The increase in research at colleges and universities will be 9 percent by one prediction, 12 percent by one prediction, and 12 percent by another. In either case, one informed scientist said, it will be 'considerable,' more than compensating for the years' inflation. All these increases may be attributed in large part, it is reported, to the feeling of presidential aide George P. Shultz that the country badly needs more [R&D] to help revive its sagging industrial productivity. Economist Shultz, director of the [OMB], is said to believe that productivity and prosperity are linked closely in a technologically advanced society to job-creating advances like the transistor and computers. Concern over some 50,000 unemployed scientists and engineers and successful salesmanship by the science community are also involved. For at least three years many scientists have been saying that research and training funds were failing to keep up with inflation and, in the words of Dr. Philip Handler, president of the National Academy of Sciences, that the country's research apparatus was 'falling into shambles.' The increases are made possible of course by the administration's new economy-spurring deficit policy. In one official's words, "a lot of money is going to be available.'" ("Nixon to Increase Budget for Science," by Victor Cohn, *The Washington Post*, January 25, 1971)
- "Science and technology can make major contributions to the public by developing creative solutions to a wide range of national problems that will help us all enjoy a better life. I am proposing in this budget a substantial expansion in outlays for federally supported [R&D]. While a large portion of this increase is needed to strengthen our defense capabilities I am also recommending substantial increases in civilian areas to: make greater use of our scientific and engineering capabilities and resources to cope with major national problems such as pollution, crime, health, transportation, and other environmental and social problems; strengthen research essential to the advancement of our technology and economic productivity; and increase our investment in fundamental science which leads to the long-term progress of our society. As an example of the concern of this administration for the use of science and technology in the public service, I am recommending that the budget for the [NSF] be increased from $506 million in 1971 to $622 million in 1972. A significant portion of these added funds will be directed to research on pressing national problems." (Budget Message of the President, FY1972, January 29, 1971, pp. 26-27)
- "Budget authority for the [NSF] programs will be increased by approximately 23% in 1972, from $506 million to $622 million. In addition to the $116 million increase in total funding, the budget reflects a shift in program emphasis toward greater support of research on specific problems and away from programs to expand general training and research capacity. This increase and program redirection will provide an increase of $170 million, or 56%, in budget authority for research programs. It will permit the Foundation to: Strengthen research efforts to help solve major problems such as pollution, health, transportation, and other urban, social, and environmental problems; Initiate and expand basic and applied research essential to the advancement of our technology and economic productivity; Increase support for fundamental research, including important research which previously received support from other Federal

agencies; and Improve the utilization of current scientific and engineering capabilities" (Budget of the United States, FY1972, pp. 142-143)

- "The [House Appropriations] bill contains $582,000,000 for the [NSF]. Although this amount is $38,150,000 below the budget estimate, it is $71,000,000 over the appropriation for 1971. The Committee will expect the Foundation to utilize the funds included for science education support and institutional support for science as recommended, instead of the diversion of additional funds to basic or applied research. The Committee feels that the limitation on program development and management is not being prudently administered. A limitation of $23,000,000 is recommended in the bill to cover administrative costs in 1972... It is suggested that the Foundation follow sound financial management practices in utilizing these funds" (H. Rpt. 92-305, June 23, 1971, p. 18)
- "For Salaries and Expenses of the [NSF], the [Senate] Committee recommends the appropriation of the full budget estimate of $620,150,000 for fiscal year 1972. This amount is $38,150,000 more than the sum recommended by the House. While the Committee has concurred in the budget estimate, it does not agree with the allocation of the funds to the various programs as proposed by the Administration. Consequently, the Committee has earmarked in the bill not less than $28,800,000 for the programs funded under "Institutional Support for Science" and not less than $99,300,000 for the programs for "Science Education Support"... the Committee concurs with the House and will expect the Foundation to utilize the funds included for Science Education Support and Institutional Support for Science as proposed instead of diverting additional funds to basic and applied research." (S. Rpt. 92-264, July 15, 1971, p. 19)
- "Three amendments were accepted during [Senate] floor debate. One added $25-million to the $623,150,000 recommended by the Appropriations Committee for the [NSF]... Conferees recommended $622-million for the [NSF], instead of the $585-million passed by the House and the $648,150,000 approved by the Senate. Conferees placed a $40-million ceiling on funds that could be used to take over basic research projects dropped by other agencies. (In 1970 Congress had included a provision in certain appropriations bills barring the [DOD], [AEC], and NASA from performing basic research unconnected with their missions.) Conferees earmarked $26.8 million for summer institutes and other training programs for secondary school science and mathematics teachers, as added by the Senate, instead of the $23.3 million approved by the House; $28.8 million for institutional support of science as approved by the Senate, and the Senate figure of $99.3-million for science education support." ("HUD, VA, NASA, Other Agencies: $18.3-Billion for 1972," *CQ Almanac 1971*, 27th ed., 07-238-07-244. Washington, DC: Congressional Quarterly, 1972)

NSF R&D Appropriations for FY1974

Bill: Department of Housing and Urban Development; Space, Science, Veterans, and Certain Other Independent Agencies Appropriation Act, 1974

Public Law: 93-137 **Enacted:** October 26, 1973 **Effective:** October 26, 1973

Nominal change		Real change		Classification
Millions ($)	YOY%	Millions ($2012)	YOY%	
-$74.1	-11.6%	-$403.1	-18.1%	Endogenous

Congress appropriated a significant decrease in both nominal and real NSF R&D funding for FY1974, largely driven by concerns about the inflationary influence of the federal budget and an effort to cap spending as a "guard against inflation"; see "NASA R&D Appropriations for FY1974" for more details. The Nixon administration requested $582.6 million for the NSF, down from $619 million in the regular order appropriation for FY1973 and a total of $638.7 million including supplemental appropriations. Due to "general budget constraints," the House Appropriations Committee denied $10 million for the construction of a large radio telescope that had been approved the previous year, deciding the project could be deferred; they approved $561 million for the agency, $21.6 million less than the budget request. The Senate committee restored $10 million in funding for the radio telescope, approving $571 million for the NSF, with remaining budget cuts largely coming from the Experimental Research and Development Incentives program, which was cut by $8 million. The conferees split the difference between the House and Senate allowances, resulting in $569.6 million being appropriated for FY1974, $13 million below the budget request, and $69 million below enacted FY1973 appropriations. As with NASA's budget cuts in the FY1974 Independent Agencies appropriations bill, the reductions in the NSF's budget appear to have been motivated by short-run concerns about the federal budget exacerbating inflationary pressure, part of a broader effort to reduce inflation and the deficit. As such, we classify this policy event as endogenously motivated. Most pertinent narrative evidence:

- "Next week, President Nixon will move the job of directing science and technology from an axed White House office to the [NSF], until now a minor government agency. The White House hopes this will guide science toward more practical goals, the leading one being the fostering of technologies to create new industries and new jobs... It is the greatest change in the federal science establishment since President Eisenhower created the Presidential Science Advisory Office to help catch up with the Soviet Union in rockets and space and keep ahead in all science. In recent years science outlays have declined, and scientists have been warning that the country may be falling behind such nations as Japan and Germany in new, employment-building civilian technologies... Scientists critical of the Nixon administration have recently been pointing out that so-called assistant secretaries for [R&D] have been shunted aside more and more in several agencies, rather than helping develop the new technological initiatives that President Nixon was promising only a year ago." ("Leading role in Science Will Shift to NSF," by Victor Cohn and Stuart Auerbach, *The Washington Post*, January 20, 1973)
- "The restructuring of his personal staff will enable the President to place more reliance on departments and agencies to carry out programs effectively without the proliferation of staff and operating units now in the Executive Office. In some cases, changed conditions have made the need less acute for particular offices... The Office of Science and Technology will be abolished and its functions transferred to the Director of the [NSF]" (Budget of the United States, FY1974, p. 28)
- "Outlays by the [NSF] will increase from $572 million in 1973 to $586 million in 1974. The program level, however, as measured by obligations, will grow at a greater rate. A $10 million increase for the program, Research Applied to National Needs, gives priority to research on energy and natural hazards, particularly fire and earthquakes. An increase of $23 million is provided for project grants and for national research centers. Greater emphasis is being placed on strengthening research related to industrial progress, including research on materials and engineering processes, as well as on strengthening fundamental research. Also included in the 1974 budget is the provi-

sion of funds for the continued construction of an advanced radio astronomy facility to study the nature of the universe and to understand its evolution. The Foundation will, in addition, assume certain functions and responsibilities formerly assigned to the Office of Science and Technology" (Budget of the United States, FY1974, pp. 128-129)

- "The [House Appropriations] Committee recommends an appropriation of $561,600,000 in support of [NSF] programs in 1974. The bill also provides that unobligated balances as of June 30, 1973, shall be merged with this appropriation. When taken together with the $60,400,000 not used in 1973, this appropriation will provide a total amount of $622,000,000 for obligation next year. This is a net decrease of $14,700,000 from the budget plan... Although the appropriation recommended is a modest decrease from the budget request, the amount provided is sufficient to continue most program activities at the same or higher levels than the 1973 budget plan. The individual actions taken in the bill and report reflect many of the same concerns expressed by the Committee in past years. These actions are designed to ensure that applied research is not pursued at the expense of basic research and that both applied and basic research are not pursued at the expense of the science education responsibilities of the Foundation. In the area of applied versus basic research, the Committee continues to be concerned over the increased tendency towards mission-oriented or applied research. Government support of some of this research is justified, but its growth threatens to weaken and perhaps swamp the vital basic research effort which is the backbone of all science. The Committee hopes that attempts to solve specific problems will not lead to a neglect of the basic research needed... The Committee recommends that the $10,000,000 requested to initiate construction of the Very Large Array radio telescope be denied. Although the Committee approved the initial funding for this project in 1973, it now feels that in view of general budget constraints and other earthbound [NSF] priorities, the VLA can be deferred" (H. Rpt. 93-296, June 19, 1973, pp. 17-18)
- "This appropriation is to fund what the [NSF] considers its major program goals— an increase of the Nation's base of scientific knowledge and maintaining the health and vigor of the economy and welfare of the public through science; encouragement and support of research in areas that can lead to improvements in economic growth, productivity, and environmental quality, and that can enhance the ability of government and private institutions to use science and technology effectively in problem-solving; promotion of cooperation with other nations through the exchange of scientific knowledge and collaboration in research on a global basis; development and implementation of science education programs that will better prepare students, instructors, institutions, and the general public to deal effectively with economic, social, technological, and environmental problems of the decade. The [Senate Appropriations] Committee believes that in order to accomplish the basic mission of the [NSF]... vigorous efforts in science education are vital, including underpinning of scientific efforts with technician training programs; particularly in those fields where there is a lack thereof. The Committee was told that to accomplish these goals, NSF activities planned for FY 1974 include increased support for basic research in the science disciplines, especially in those areas that take advantage of unique research opportunities such as industrial process engineering, materials, gravitation physics, wind engineering, and chemical catalysis; expanded research on energy, environment, and other problems of national concern; effective programs in Polar Research, Ocean-Sediment Coring, International Decade of Ocean Exploration, Global Atmospheric Research, and the National Research Centers; and continued emphasis on International Cooperative Science efforts. The Committee

recommends an appropriation of $571,600,000 estimate and $10 million above the sum recommended in the House. The Committee directs that the $8 million reduction made by it be applied to the Experimental Research and Development Incentives program. The budget estimate for this item was $18 million, and the Committee feels that $10 million should be sufficient for this program until they can see some results from the program's implementation... " (S. Rpt. 93-272, June 24, 1970, pp. 21-22)

- "The House also included language in its report denying the use of the $10 million requested to initiate the construction of the Very Large Array radio telescope. Initial funding for this project occurred in fiscal year 1973, and the Committee felt that this high-priority project in the [NSF] program should be continued. The Committee recommends that out of funds provided herein steps be taken to commence construction on the Very Large Array radio telescope. In this connection, the Committee was told in an appeal by Dr. H. Guyford Stever that radio astronomy is now producing a great deal of scientific information on the basic nature and behavior of matter and energy. Dr. Stever also pointed out that no new radio astronomy facility has been undertaken by the United States in more than 13 years, and our present facilities are incapable of producing the degree of resolution needed to capitalize on recent discoveries. He also stated that without the VLA, U.S. international leadership would be seriously impaired in a very important area..." (Ibid, p. 24)
- "Conferees evenly split the $10,000,000 difference between the smaller House amount and the larger Senate version for the [NSF] by recommending a $569,600,000 appropriation. The administration had requested $582,600,000." ("Congress Votes $19-Billion For HUD, VA, NASA Programs," *CQ Almanac 1973*, 29th ed., 193-200. Washington, DC: Congressional Quarterly, 1974)
- "The United States maintains a commanding position in world science, but that leadership is declining in several important indicators of scientific activity, according to a report sent to Congress today by President Nixon. The report represents the first results of an effort by the National Science Board to develop indicators of the state of the nation's science enterprise. The board, the policy-making unit of the [NSF], said such indicators were needed to provide early warning of trends and events that might reduce the capacity of American science and technology to meet the nation's needs... Recent increases in unemployment among scientists and engineers are viewed by many observers as evidence that such guidance is seriously lacking today. The Administration and the Congress are at odds over several aspects of Federal support for [R&D] efforts... The science board's report said the United States has been declining for several years in the percentage of gross national product spent on [R&D]. In the United States, there has been a steady decline in this proportion since 1967, when an estimated 3 percent of GNP was devoted to [R&D] efforts. By 1971 this had dropped to 2.6 percent, the report said... In the United States, there has also been a decline, relative to total population, in the number of scientists and engineers engaged in [R&D] work. In that respect, the Soviet Union passed the United States in 1967 and now leads this country by a substantial margin. In 1971, the latest year for which comparable figures are available, the figure for the Soviet Union was 37 scientists and engineers in [R&D] for every 10,000 persons in the population. The United States figure is 25, about equal to the current figure for Japan... The report said United States spending for basic research peaked in 1968 and has never since returned to the level of that year in terms of 'constant' 1958 dollars stripped of later inflation effects." ("U.S. is

Cautioned on Science Role," by Harold M. Schmeck, Jr., *New York Times*, September 6, 1973)

NSF R&D Appropriations for FY1975

Primary Bill: Department of Housing and Urban Development; Space, Science, Veterans, and Certain Other Independent Agencies Appropriation Act, 1975

Public Law: 93-414 **Enacted:** September 6, 1974 **Effective:** September 6, 1974

Secondary: Special Energy Research and Development Appropriation Act, 1975

Public Law: 93-322 **Enacted:** June 30, 1974 **Effective:** July 1, 1974

Nominal change		Real change		Classification
Millions ($)	YOY%	Millions ($2012)	YOY%	
$145.1	25.6%	$270.5	14.8%	Endogenous

Congress appropriated significant increases in both nominal and real funding for NSF R&D, motivated by the "energy crisis"—President Nixon's top policy priority; see "Energy R&D Appropriations for FY1975" for more details. The administration proposed $1.8 billion in funding for energy R&D programs, nearly twice the level appropriated for FY1974, and the appropriators bundled together a single high-priority bill providing $2.2 billion to "significantly accelerate" energy R&D programs across seven agencies, including the full $102 million requested for energy R&D funded by the NSF; the NSF's energy R&D program saw a $32 million (45%) increase over FY1974 funding levels, with solar energy and geothermal energy R&D prioritized. In addition to their funding from the Special Energy Research and Development Appropriation Act, 1975, which was enacted in July, the NSF received $666.4 million in the FY1975 Space, Science, Veterans, and Independent Agencies appropriations bill. For that bill, the Nixon administration requested $681.4 million for the agency—a whopping $136.7 million (25%) increase over comparable FY1974 appropriations—excluding the supplemental $102 million request for certain NSF energy R&D programs; the House Appropriations Committee modestly pared back the request for non-energy R&D programs, the Senate restored some of that funding, and the conference bill split the difference, still resulting in a significant net increase in the agency's budget. The increases in NSF R&D funding appear to have been in part motivated by concerns about energy production, energy inflation, and short-run macroeconomic conditions. As such, we classify this policy change as endogenous. Most pertinent narrative evidence:

- "Early in 1973 President Nixon abolished the post of presidential science adviser at the White House and disbanded the Office of Science and Technology. The task of advising the president about science and technology went to H. Guyford Stever, director of the [NSF]... Now in the face of the energy crisis and the distractions of the Watergate scandals, there is an increasing clamor among the nation's scientific leadership for a presidential science adviser of greater rank and voice. Some scientists are concerned there is insufficient high-level coordination of the federal government's vast expenditures on [R&D]. There also is concern Stever is being ignored in important decisions that require technical expertise not now available in the White House... Concern became more visible last fall when a committee of 23 presidents of scientific societies with a combined membership of 300,000 scientists called for a cabinet rank science advisor... "Without more top-level coordination of federal efforts in science and technology, it

warned, "solving problems such as energy and food shortages would be more difficult"" ("Lack of Science Adviser to Nixon Hit," by William Stockton, *The Washington Post*, January 27, 1974)

- "The [NSF] will increase its outlays from $598 million in 1974 to $630 million in 1975. Further emphasis on energy research programs, under the President's accelerated 5-year commitment to such [R&D], will provide additional outlays in 1975... As reflected by obligations... research programs will increase substantially. A $34 million increase, to a total of $325 million, will be distributed over a wide spectrum of research fields with emphasis given to strengthening research related to industrial progress—particularly in engineering and materials research—and to providing basic knowledge on the Nation's varied energy problems. Another $8 million increase, to a total of $13 million, will be used to accelerate the construction of an advanced radio astronomy facility designed for the study of the universe and its evolution. Obligations for the program of Research Applied to National Needs will rise to $84 million. This increase of $9 million over 1974 will be used to accelerate energy research, primarily in solar and geothermal energy, and research on socio-economic and environmental problems." (Budget of the United States, FY1975, p. 113)
- "The [NSF] has an important role in determining the allocation of the Nation's resources for science. It has a primary responsibility for maintaining a strong basic research capability while, at the same time, seeking to accelerate the process of bringing the results of basic research into practical application to help solve such national problems as the achievement of energy self-sufficiency... The Foundation's responsibility for solar energy includes support through proof-of-concept experiments for heating and cooling of buildings; advancing the technology base of wind generator systems; and studying solar thermal, ocean thermal, photovoltaic, and other energy conversion possibilities. Geothermal experiments will attempt to determine whether geothermal resources can be utilized economically and without adverse environmental effects... While the [House Appropriations] Committee is recommending full support of the Foundation's pursuit of a broad range of energy research as necessary and useful, it continues to be concerned that the resources provided are not duplicative of energy research being conducted under the aegis of other mission agencies." (H. Rpt. 93-1010, April 25, 1974, p. 14)
- "While the [Senate Appropriations] Committee has taken cognizance of the energy crisis, by making available the entire budget estimate for the direct energy research program of the [NSF], it also concurs with the House, and admonishes the Foundation, to exert its administrative capacity to the fullest extent to ensure that dollars are not wasted in duplicative energy research." (S. Rpt. 93-903, June 5, 1974, p. 14)
- "Congress June 24 cleared for the President HR 14434 (PL 93-322) providing fiscal 1975 appropriations for federal energy [R&D] programs. As cleared, HR 14434 appropriated $2,236,089,000 for energy [R&D] programs for fiscal 1975. President Nixon Feb. 4 requested $2,203,728,000... HR 14434 carried appropriations for federal energy [R&D] programs that in the past had been considered as part of seven separate appropriations bills. The House and Senate Appropriations Committees moved quickly on the measure because of the energy crisis... [for the NSF, the bill included] $101,800,000—identical to the budget request and $70,200,000 more than the fiscal 1974 appropriation. The [House] committee said it would consider a request of $150,800,000 for supporting programs as part of the foundation's regular appropriations. The recommendation

included $50,000,000 for solar energy research and $22,300,000 for research in the use of underground heat, the committee said." ("Congress Clears Energy Research Funds." In CQ Almanac 1974, 30th ed., 54-58. Washington, DC: Congressional Quarterly, 1975)

- "The purposes of the [NSF] are to increase the Nation's base of scientific knowledge; encourage research in areas that can lead to improvements in economic growth, productivity, and environmental quality; promote international cooperation through science; and develop and help implement science education programs that can better prepare the Nation for meeting the challenges of the decades ahead... Increased funding for fiscal year 1975 will be used to support a special program in international cooperation in the field of energy [R&D]" (S. Rpt. 93-1056, August 1, 1974, p. 25)
- "[For the NSF, the House committee recommended] $671,800,000—$14,600,000 less than the budget request, but $124,140,000 more than the fiscal 1974 appropriation. The amounts excluded a request of $101.8-million which was considered in the federal energy [R&D] appropriation bill (HR 14434) for fiscal 1975. The net reduction was the result of a $16-million increase above the requests for science education and information activities balanced against unspecified general reductions and a $15.5-million cut in the request for applied research not related to energy. The proposed increases in funding for science education generally conformed with House and Senate actions on the fiscal 1975 NSF authorization bill" ("HUD-NASA-VA Appropriations: $21.2 Billion," *CQ Almanac 1974*, 30th ed., 90-97. Washington, DC: Congressional Quarterly, 1975)
- "The [Senate] committee recommended a total of $680-million for the NSF, $8.2-million more than the House-passed amount but $6.4-million below the budget request. The total did not include $101.8 million appropriated for the NSF in the energy [R&D] appropriations bill. The committee restored $10 million of a $15.5 million House-approved cut in the budget request for applied research not related to energy. Other adjustments in House-passed amounts included a $3-million cut in an $8-million appropriation for science information activities; the budget request was $5 million... In general, conferees split the difference between most House- and Senate-passed amounts" (Ibid)

NSF R&D Appropriations for FY1976

Bill: Department of Housing and Urban Development–Independent Agencies Appropriation Act, 1976

Public Law: 94-116 **Enacted:** October 17, 1975 **Effective:** October 17, 1975

Nominal change		Real change		Classification
Millions ($)	YOY%	Millions ($2012)	YOY%	
-$0.3	0.0%	-$132.9	-6.4%	Endogenous

Congress held flat the nominal appropriations for NSF R&D in FY1976, resulting in a significant decline in real funding for the agency in the highly inflationary environment. The Ford administration also transferred the existing energy R&D functions of the NSF—roughly $52 million for FY1976—to ERDA, the recently created agency consolidating energy R&D efforts and trying to address the energy crisis. President Ford's FY1976 budget broadly reined in federal spending growth to curb inflationary pressures and the only new budget initiatives included were for energy R&D programs, which saw very significant increases in funding; see "Energy R&D Appropriations for FY1976" for more details. The FY1976 budget requested $755.4 million for the NSF, but Congress only appropriated $714 million

for the year. The House Appropriations Committee report explained that they faced quite the "budget priority dilemma and difficult decisions" with their bill given the "potential $67 billion budget deficit and unmet needs in areas of critical concern to our Nation," and asserted that the resulting FY1976 Space, Science, Veterans, and Independent Agencies appropriations bill would have a minimal inflationary impact. The House committee cut $44.3 million from the administration's NSF budget request, approving only $711.1 million, $5.3 million less than appropriated for FY1975 (adjusted for the transfer of NSF energy programs to ERDA). The Senate appropriators added back $6 million in their allowance for the NSF, and the conferees roughly split the House- and Senate-approved funding levels, to the effect of slightly reducing nominal NSF R&D funding relative to FY1975. A bit on the nose given their own budget situation, an NSF report released during this appropriations cycle warned that inflation was driving down the real dollar value of R&D spending, particularly for basic research, and warned that R&D spending as a share of GDP was continuing to fall from its peak in 1964. The nominal freeze in NSF R&D funding and reduction in real appropriations appears to have been partly motivated by concerns about inflation and related anti-inflationary federal spending restraint, while the transfer of the NSF's energy R&D programs to ERDA was a policy response to the energy crisis. As such, we classify these policy changes as endogenous. Most pertinent narrative evidence:

- "The economy is now in a recession. Unemployment is far too high, and productivity has declined. At the same time, inflation, a serious and growing problem for nearly a decade, continues to distort our economy in major ways. Underlying these problems is the fact that we are far from self-sufficient in energy production, and even with the measures I have proposed, regaining the capacity for self-sufficiency will take years to achieve... While recommending temporary measures to help the economy and to provide greater assistance to the unemployed, I have sought, on an item-by-item basis, to eliminate nonessential spending and avoid commitment to excessive growth of Federal spending in the long run. I am proposing no new spending initiatives in this budget other than those for energy." (Budget Message of the President, FY1976, February 3, 1975, pp. 5, 7)
- "The [NSF] will increase its outlays by 11% from $649 million in 1975 to $720 million in 1976. Obligations for fundamental research will increase by 11%, $39 million above the 1975 level of $341. A significant portion of this increase will be used to add to the scientific knowledge needed for the solution of long-term national problems in such areas as energy and the environment. National research programs and centers will receive a $36 million increase to a total of $173 million for 1976... These programs and centers include a wide range of activities primarily in research related to the physical environment of the Earth, such as the: Deep sea drilling project, the International Decade of Ocean Exploration, and the National Center for Atmospheric Research. They also include support for the major radio and optical astronomy centers of the Nation. The role of the Foundation in energy research will change with the transfer of solar and geothermal research to [ERDA]. The Foundation will continue to support basic and exploratory research related to the long-term development of the Nation's energy resources." (Budget of the United States, FY1976, pp. 90-91)
- "witnesses appearing before the [House Appropriations] Committee representing a broad spectrum of interest groups appealed for more than one billion dollars above the budget request for the programs contained in the bill. This dramatically illustrates the budget priority dilemma and difficult decisions confronting the Committee and

Congress when faced with a potential $67 billion budget deficit and unmet needs in areas of critical concern to our Nation. ... Pursuant to clause 2(1) (4), rule XTI, of the House of Representatives, the Committee estimates that enactment of this bill would have minimal overall inflationary impact on prices and costs in the operation of the national economy." (H. Rpt. 94-313, June 19, 1975, pp. 2-3)

- "The [NSF] recently commemorated its first quarter century of operations... The primary purpose for its creation was to develop a national policy in science and to support and promote basic research and education in the sciences to fill a void left after World War II. The principal addition to the initial charter has been to target more effectively the basic scientific information developed to meet national needs and problems. The amount of Federal support has grown from the initial $225,000 to $763,300,000 last year, before the transfer of $51,730,000 to the newly created [ERDA]. The Committee recommends an appropriation of $707,100,000, plus the carryover of $20,000,000 deferred by the Administration in 1975. This provides for a total program level of $727,100,000 in 1976. Including the transfer to ERDA and adjusting for the deferrals in 1975, this will provide a program increase of $35,530,000 in 1976 and $44,300,000 less than the budget estimate... (Ibid, p. 32)
- "In recent months particular activities of the Foundation have been questioned. Members of Congress, representatives of the press, and countless American taxpayers have been openly critical of the use of tax revenues to finance seemingly frivolous and irrelevant scientific research projects. A number of specific examples have been cited, and responsibility for some has been attributed to the Foundation. Investigation has shown that in most cases the responsibility for these grants rests with agencies other than NSF, and some charges of frivolity have stemmed from an inadequate understanding of the scope, purpose, and intent of the research. Nevertheless, the Committee is aware of a responsibility to ensure that the quality and value of scientific research undertaken is commensurate with the tax dollars provided." (Ibid, p. 33)
- "[For the NSF, the House Committee recommended] $711,100,000—$44,300,000 less than the budget request and $5,320,000 less than the fiscal 1975 appropriation... The committee also made it clear that it was aware of charges that the foundation was conducting "frivolous" research, but cautioned against hasty action to change research grant procedures. The House had approved an amendment to the foundation's fiscal 1976 authorization bill (HR 4723) that would require the agency to submit proposed research awards to Congress for review. For specific programs, the committee recommended a $35-million reduction in the $380-million requested for basic research programs, an $11.5-million cut in the $71.5-million requested for applied research and a $10-million increase in the $50-million request for science education programs." ("$49.3-Billion Approved for Housing and Urban Development, NASA, Veterans, Funding Community Development, Selective Service, and Research," *CQ Almanac 1975*, 31st ed., 809-17. Washington, DC: Congressional Quarterly, 1976)
- "The [Senate Appropriations] committee added a total of $6-million to the $711.1-million approved by the House for the [NSF]. The amount approved by the committee was $38.3 million less than the budget request. In specific actions, the committee increased House-passed funding for research programs and intergovernmental research efforts by $25 million, while reducing House-passed appropriations for science education programs by $19 million... Commenting on complaints that the agency had funded frivolous research and conducted its grant approval proceedings in secret, the commit-

tee argued that the foundation should work harder to make its research objectives understandable to the general public. At the same time, the committee said it was encouraged by steps announced by the foundation on June 20 that would help open grant approval proceedings to the public. The committee added that Congress should not have the authority to review and veto research project applications. The House approved an amendment to the fiscal 1976 authorization bill (HR 4723) that would give Congress this authority. The Senate version did not contain the amendment, and conferees refused to include it in the final version of the bill... In general, conferees split the difference between the conflicting appropriations approved by the House and Senate for a number of independent agencies, including [the NSF]" (Ibid)

- "Because of the effects of inflation, there will be an 8 percent drop in real spending for basic scientific research in the United States this year as compared with spending in 1974, according to an estimate just published by the [NSF]... A specialist at the foundation said that the drop was the sharpest on record. The next most severe drop was one of about 5 percent between 1973 and 1974. Basic research is widely considered a vital long-range asset to an industrial society, ultimately affecting industry, agriculture, and health. The trend noted in the report is a reflection of the powerful impact of inflation on scientific activity of inflation on scientific activity. It shows that private as well as Government spending has been affected... The report also shows a national decline in emphasis on overall [R&D] as reflected in spending for these purposes as a fraction of the Gross National Product. This decline has now persisted for more than a decade, primarily because of the slowdown in the growth of Federal [R&D] spending since 1964." ("Science Research Hurt By Inflation," by Harold M. Schmeck Jr., *New York Times*, July 2, 1975)

NSF R&D Appropriations for FY1977

Bill: Department of Housing and Urban Development–Independent Agencies Appropriation Act, 1977

Public Law: 94-378 **Enacted:** August 9, 1976 **Effective:** October 1, 1976

Nominal change		Real change		Classification
Millions ($)	YOY%	Millions ($2012)	YOY%	
$1.1	0.1%	-$90.4	-4.6%	Endogenous

Congress again held nominal appropriations for NSF R&D in FY1977 virtually unchanged from FY1976 funding levels, again resulting in a significant decline in real funding for the agency given the persistently elevated rates of inflation. The FY1976 budget requested $805 million for the NSF, which would have represented an $87 million (12.1%) increase for the agency; research funds were to be prioritized for work on the environment and natural resources as well as international scientific programs. The NSF's budget justification for the appropriators stressed that investments in basic research could help address "the major perplexing problems confronting the Nation," notably unemployment, inflation, and energy supplies; the budget specifically proposed a $1.1 million (57%) increase in its Economics program for research on unemployment and inflation. The administration had proposed a big tax cut to stimulate the economy and prioritized funding increases for energy and defense functions, but was trying to restrain other domestic spending growth; the House and Senate budget committees, on the other hand, were intent on funding jobs programs

and increasing domestic spending to tackle high unemployment. While Congress was keen to stimulate the economy with spending and transfers, the House Appropriations Committee was less keen on maintaining the NSF's budget growth in recent years. Accusations that the NSF was funding "frivolous" research had surfaced during the FY1976 budget cycle; appropriators criticized the agency for failing to adequately communicate the value of its research program to taxpayers and upped their oversight of how grants were being awarded during the FY1977 cycle. Indirect costs to universities were a perennial concern to some members, and the Senate committee wanted audits of expensive research equipment bought by universities with NSF funds. The House committee also noted that rapid growth in the NSF's budget in recent years "has been necessary to keep pace with inflation." The House Appropriations Committee cut $60 million off the requested research budget of the agency; the Senate committee restored some of this funding, and the conferees negotiated $710 million in research funding, up $28.6 million from the House bill but $31 million below the FY1977 budget request. The conference bill provided the NSF with $773.6 million in total, below the $802 million budget request but slightly above FY1976 funding. While the appropriators were working on the FY1977 Space, Science, Veterans, and Independent Agencies appropriations bill, Congress passed a late FY1976 emergency supplemental appropriations bill on April 7 with $2.1 billion for jobs programs and a swine flu immunization campaign (Pub. L. 94-266). While public backlash to NSF funding and congressional ire over the agency's internal management influenced the decline in real NSF R&D funding, the recent acceleration in inflation also appears to have influenced the NSF's FY1977 budget, and the agency's research program was unusually focused on trying to address short-run macroeconomic concerns following the oil shock. Moreover, fiscal stimulus programs were prioritized over increased NSF funding in the HUD-Independent Agencies appropriations bill. As such, we classify this policy change as endogenous. Most pertinent narrative evidence:

- "As an important step toward reversing the long-term trend, my budget for 1977 proposes to cut the rate of Federal spending growth, year to year, to 5.5%—less than half the average growth rate we have experienced in the last 10 years. At the same time, I am proposing further, permanent income tax reductions so that individuals and businesses can spend and invest these dollars instead of having the Federal Government collect and spend them." (Budget Message of the President, FY1977, January 21, 1976, p. M4)
- "Proposed budget authority for the [NSF] will increase by $87 million to $805 million from 1976 to 1977. There will be an increase of almost 20% in obligations for the conduct of basic research, from $523 million to $625 million. This increase will apply to all fields of basic research, but particularly to the physical and life sciences. Growth will continue in international scientific programs such as the international decade of ocean exploration and in national programs such as the climate dynamics program. Funds for the U.S. Antarctic research program will also increase due primarily to additional costs of logistic support. The program of research applied to national needs (RANN) will continue with a focus on environment, productivity, and natural resources." (Budget of the United States, FY1977, p. 84)
- "Ford, in his Jan. 21 budget message, had called for restraint in the growth of federal spending, particularly for social programs, consolidation of a number of those programs, and, in return for holding down outlays, a tax-cut package for business and individuals to stimulate the economy. The Senate committee, on the other hand, chose government spending as a better stimulus than returning money to the private sector

through new tax reductions. In its report it stressed the need for a fiscal 1977 budget that continued economic recovery at a steady pace; avoided actions, such as increases in payroll taxes, that could increase the rate of inflation; maintained anti-recession and social programs at or near their fiscal 1976 levels; provided for real growth in defense spending, and accelerated research on new sources of energy and conservation programs. The differences from Ford were reflected in the targets it set for spending in the 17 functional categories... The [House] Budget Committee reported its version of the budget resolution [on] April 9... "The committee is convinced that the President's fiscal policy proposals would arrest the strong economic recovery underway and result in a continuation of the nation's high levels of unemployment, without significantly altering an already declining inflation rate," the report stated. "The committee believes that high unemployment remains the nation's number one problem and that Congress' fiscal policy must be directed at more rapid progress toward full employment"... The anticipated growth rate and reduction in unemployment could be accomplished without setting off "unchecked" inflation, the report continued, because of the slack still in the economy... Reflecting its majority's beliefs that continued economic stimulus was necessary to keep the recovery on track, and that unemployment was the major problem facing the country, the committee's recommendations focused on spending for various jobs programs. Those stimulative proposals, the report estimated, would create about 1.1 million more jobs in fiscal 1977 than would Ford's budget, at an added total cost of $6.3-billion." ("Budget and Appropriations 1976: Overview," *CQ Almanac 1976*, 32nd ed., 673-86. Washington, DC: Congressional Quarterly, 1977)

- "Science and technology alone cannot solve many of the major perplexing problems confronting the Nation, such as unemployment, inflation, energy, transportation, stagnating productivity, and the increasing cost of government at all levels. But these and other problems have a significant science and technology component, and it is essential that U.S. scientific resources be applied to national efforts to help resolve them. The ability to make significant progress is increasingly dependent upon a broadening base of scientific understanding that can be provided only through a stronger national basic research effort. The NSF program for FY 1977 was developed with this central goal. The [NSF's] proposed program for FY 1977 represents a major effort on the part of the Administration to bolster science and to ensure the United States has a strong basic research program in all major fields of science and engineering. A specific aim of this program is to counteract the gradual decrease of Federal support for basic research which has declined about 23 percent in terms of constant dollars since 1968." NSF FY1977 Budget Justifications (Hearings Before the House Appropriations Committee on HUD—Independent Agencies Appropriations, FY1977, p. 268)
- "A large and growing volume of research, which now absorbs approximately one-quarter of the Economics program budget, is focused on the problems of inflation and unemployment. The persistence of these problems and the cumulation of research results that promise a reasonably early pay-off, again mark this as a high-priority area. The research for FY 1977 will total $3.0 million, an increase of $1,100,000 over the FY 1976 total." (Ibid, p. 567)
- "The [NSF] suffered a major cut in requested funding for its research programs in the wake of criticism of some of the agency's grant awards and operating procedures. The committee said it could not support any large expansion of the agency's research until it saw whether management changes instituted by the foundation would work. "To the

credit of the director, Dr. [H. Guyford] Stever, he and some of the National Science Board members have taken forthright steps to respond to these concerns," the committee said, "but this has been done only after the fact and in response to vigorous prodding by the Congress and strong public objections to certain grant awards and program thrusts." Reflecting its concern, the committee chopped $59.6 million from a request of $741 million for research. The resulting $681.4-million level, however, did increase fiscal 1976 appropriations by about $20-million" ("Housing, Independent Agencies: $43-Billion," *CQ Almanac 1976*, 32nd ed., 739-46. Washington, DC: Congressional Quarterly, 1977)

- "Undoing a House funding cut opposed by the scientific community, the [Senate Appropriations] committee recommended $738-million for research programs run by the [NSF]. The House had chopped a $741-million request for research by $59.6-million. The Senate committee applied its more modest $3-million reduction to science planning programs and productivity studies, while keeping support for basic research at the requested level. While backing the science agency's requests, the committee urged the foundation to improve its efforts to help the average taxpayer understand the results of research he had supported... Conferees restored part of a deep House cut in research funding for the science agency. They settled on $710 million for research, $31 million below the request, but $28.6 million above the House-passed appropriation." (Ibid)
- "The last quarter century has seen the support of science in programs of the [NSF] grow from the initial $225,000 in 1951 to $715,250,000 in the current fiscal year. An increase to $750,000,000 is recommended for fiscal year 1977. This is $34,750,000 above the current year. The [NSF]'s total support for basic research has grown steadily over the past several years, with a 12 percent increase in obligations in fiscal year 1975 above the level of obligations reported for fiscal year 1974, and an expected 11.5 percent increase in obligations for fiscal year 1976 over the amount obligated in 1975. These increases have been necessary to keep pace with inflation and are reasonable in the context of competing financial needs in the economy and the lack of growth of science faculties in colleges and universities." (H. Rpt. 94-1220, June 8, 1976, pp. 27-28)
- "After carefully considering all factors relating to NSF's research support programs, the Committee feels that the Foundation should be given the budgetary resources needed to continue its current level of research support. In some instances, the Committee has recommended funds above the budget for specific science initiatives in other agencies. These include high energy accelerator programs in ERDA, solar and energy technology research in NASA, and critical [R&D] requirements in EPA." (Ibid, p. 28)
- "One of the major criticisms of the [NSF] over the past two years has been its lack of responsiveness to the average American taxpayer who pays for Federal research, who wants to know where his tax dollars are going, and who wants to see what has resulted from his investment. The Committee feels that the Foundation has been remiss in communicating final research results to the public." (S. Rpt. 94-974, June 23, 1976, p. 56)
- "The Committee is concerned that the [NSF] is not carefully monitoring applications for expensive research-related equipment that may duplicate equipment currently available on a university campus. Although the Committee understands that the primary auditing function for NSF rests with the Audit Agency of the Department of Health, Education, and Welfare (HEW), the Foundation should initiate spot audit checks on applications for equipment involving large sums of money to make sure the equipment

is not already readily available... In the opinion of the Committee, the [NSF] is remiss in not having examined its policies and practices regarding the support of faculty salaries in light of the income levels of those whose research it supports." (Ibid, p. 57)

- "Two months after giving the [NSF] its fiscal 1977 appropriations, Congress Sept. 29 cleared the authorization bill (PL 94-471) telling the agency how to use its funds. A summer-long dispute over a "science for citizens" program delayed final action until three days before adjournment. The final version of the bill authorized $1.2 million in fiscal 1977 for this program in an attempt to aid public understanding of scientific issues. Among other things, the science agency could help national professional societies or groups "serving important public purposes" conduct conferences and workshops to explore public policy issues with scientific aspects. This proposal, a compromise between the House and Senate provisions, was acceptable to most House and Senate conferees. But House conferee Mike McCormack (D Wash.) objected, arguing that the program could embroil the science foundation in politics. "The [NSF] is already in enough political hot water," argued an aide to McCormack... In general, the bill gave the science agency about all it wanted for basic scientific research while increasing funding for science education and applied research." ("Science Authorization," *CQ Almanac 1976*, 32nd ed., 596-99. Washington, DC: Congressional Quarterly, 1977)

NSF R&D Appropriations for FY1981

Bill: Department of Housing and Urban Development–Independent Agencies Appropriation Act, 1981

Public Law: 96-526 **Enacted:** December 15, 1980 **Effective:** December 15, 1980

Nominal change		Real change		Classification
Millions ($)	YOY%	Millions ($2012)	YOY%	
$48.0	5.3%	-$66.7	-3.4%	Endogenous

Congress appropriated a substantial nominal increase for NSF R&D funding in FY1981, but in the highly inflationary environment at hand, it nonetheless resulted in a significant decrease in real appropriations for the year. "Despite overall budget constraints" and fiscal efforts to "contain inflation," President Carter's initial FY1981 budget request proposed a significant $88.8 million (9.8%) increase for the NSF's research programs. But those initial budget plans were soon revised as the economic situation rapidly deteriorated early that year. In mid-March, the administration announced a new anti-inflationary program, the focal point being reducing government spending, and promised to send Congress a smaller revised FY1981 budget eliminating the deficit; see "NASA R&D Appropriations for FY1981" for more details. In the March budget revision, the NSF saw its budget cut by $64 million, nixing most of the initial requested increase for the agency. However, the updated underlying economic forecasts proved wildly overoptimistic, sending the budget office back to the drawing board; see "NIH R&D Appropriations for FY1981" for more details. In June, the House Appropriations Committee approved most of the administration's downwardly revised budget request for NSF research programs, only trimming an additional $10 million; the remaining increase in funding over FY1980 levels was explicitly intended to "offset the effects of inflation in the past year." The Senate committee restored those research funds, allowing slightly more NSF funding than the revised request. But as with NASA, the NSF's budget was further pared back in conference by a 2% across-the-board cut affecting

all agencies funded by the FY1981 HUD-Independent Agencies appropriations bill save the Veterans Administration (VA). On net, Congress appropriated $1.076 billion for the NSF, slightly more than the $1.074 billion revised budget request, nonetheless resulting in a significant decline in real funding, despite the appropriators' intent to offset the recent effects of inflation on the NSF's budget. The reduction in the administration's nominal budget request for the NSF and the ensuing decline in real appropriations for the agency appears to have been largely influenced by concerns about inflation, reflecting a broader anti-inflationary program. As such, we classify this policy event as endogenous. Most pertinent narrative evidence:

- "The budget also provides support, through the programs of the NSF, for: Initiation of a 10-year ocean drilling program on the seaward slope of the Continental Shelf to provide scientific data about the Earth's crust and basic information that can provide a framework for subsequent resource assessment. This program would be financed and conducted in collaboration with industry; Expansion of international science and technology activities, including increased scientific cooperation with the Peoples Republic of China; Creation of a new program to upgrade research facilities at the Nation's most productive research universities." (Budget of the United States, FY1981, p. 121)
- "Scientific [R&D], which have been given a high priority by President Carter, appear to have survived well the budget cutting that has undermined many Government programs in recent weeks. Last January, Mr. Carter proposed a 13 percent increase in Federal support for science in the next fiscal year, calling it a 'critical area' that needed strengthening. Later, his proposed revisions to balance the budget still called for an 11 percent increase over the outlay for science in the current budget... One reason [R&D] have fared so well in the proposed budget is that much of the new money being sought by the Administration is to be channeled through [DOD], one of the few agencies that are to receive sizable budget increases... Overall, the revised budget proposed for the fiscal year 1981 contains 2.8 percent less money for [R&D] than the original version that was issued in January. This contrasts with an 8.4 percent slice taken out of the entire 'controllable' budget—that is, that portion that the President can alter without having to seek new legislation... The [NSF] would continue to build up research in computer science, physics and other areas neglected in recent years. But it would lose $64 million that it had expected to receive for industrial innovation, ocean margin drilling, upgrading of research facilities and other projects." ("Science Projects Spared in Carter Budget Cutting," by Robert Reinhold, *New York Times*, April 6, 1980)
- "During his 1976 Presidential campaign, Jimmy Carter made an issue of his promise to balance the budget by 1981. For his re-election campaign, he decided against cutting social programs. Instead, on Jan. 28, he began the 1981 budget process by sending Congress a proposed $615.8 billion budget with a $15.8 billion deficit. Large increases were proposed for the military ($13 billion) and energy ($1 billion)... The following month, Congressional Democrats facing re-election panicked when the prime interest rate reached an annual rate of 18 percent... On March 31, President Carter sent Congress a revised budget, calling for $611.5 billion in spending and a $16.5 billion surplus. The new budget was based on a 12.8 percent inflation rate that accounted for a $28 billion increase in projected revenues. Unemployment was at 7.3 percent... By the middle of last summer, it became obvious that spending had been seriously underestimated, and revenues overestimated, and that 1981 would be seriously in the red... On Jan. 15, President Carter sent a budget for 1982 to the Congress. Con-

tained within it was his last version of the budget for 1981, on which 1982 projections were based. Total 1981 spending was $662.7 billion; the deficit was $55.2 billion, and the inflation and unemployment rates were projected at 9.8 percent and 7.8 percent respectively. Interest rates were calculated at 13.5 percent." ("Carter Budget Casts a Long Shadow," by Martin Tolchin, *New York Times*, May 24, 1981)

- "Foundation appropriations have increased at an average annual growth rate of approximately 8.5 percent in the period from fiscal year 1970 to fiscal year 1980, reaching a total of $996,250,000 in 1980. The [House Appropriations] Committee recommends appropriations of $1,074,000,000 for the Foundation in fiscal year 1981. This is an increase of $77,750,000 above the current fiscal year and is identical to the budget request. The [NSF] bears a unique responsibility among Federal agencies for the health and well-being of the Nation's basic scientific research activities. There can be no question that its programs serve a vital function. It is clear that the commercial vitality and military security of the United States are directly dependent upon the Nation's command of fundamental scientific knowledge... The Committee recommends an appropriation of $982,800,000 for research and related activities in 1981. This is an increase of $76,750,000 above the 1980 appropriation and $10,000,000 below the budget estimate for fiscal year 1981. The level recommended for research and related activities is designed to provide sufficient funds to offset the effects of inflation in the past year" (H. Rpt. 96-114, June 19, 1980, p. 37)
- "The [Senate] Committee recommends an appropriation of $1,078,600,000 for the activities of the [NSF] in fiscal year 1981. This amount is $4,600,000 above the budget estimate and the amount recommended by the House... NSF also provides support for applied research in selected areas where there is good potential for the research results to contribute over the long term to improved technology and productivity, in our national effort to deal with inflation and provide more and better jobs for U.S. workers. A significant portion of NSF applied research deals with fundamental research aimed at expanding our understanding of phenomena and processes. The Committee recommends a total of $992,900,000 for research and related activities, which is $100,000 above the budget estimate and $10,100,000 more than the level of funding recommended by the House... In fiscal year 1981, the Foundation will continue to place special emphasis on its primary mission of funding basic research at a pace that will help the United States maintain its competitive edge among the nations of the world" (S. Rpt. 96-926, June 12, 1980, pp. 75-76)

NSF R&D Appropriations for FY1982

Bill: Department of Housing and Urban Development–Independent Agencies Appropriation Act, 1982

Public Law: 97-101 **Enacted:** December 23, 1981 **Effective:** December 23, 1981

Nominal change		Real change		Classification
Millions ($)	YOY%	Millions ($2012)	YOY%	
$19.8	2.1%	-$95.6	-5.1%	Endogenous

Congress appropriated a modest nominal increase for NSF R&D funding in FY1982, but in the highly inflationary environment at hand, it resulted in a significant decrease in real

appropriations for the year. The outgoing Carter administration had requested a significant increase in NSF budget authority in their final budget request, proposing $1.4 billion, up from $1.1 billion in FY1981. But the incoming Reagan administration, grappling with stagflation and campaign promises, had markedly different budget priorities and produced major revisions to the FY1982 budget shortly after President Reagan was inaugurated; the NSF budget request was substantially revised down, nixing almost all of the increase proposed by Carter. Beyond the executive, the 1980 election led to a significant shift and realignment in congressional leadership over science policy, notably the defeat of Senate Appropriations Committee Chairman Warren Magnuson (D-WA); see "NIH R&D Appropriations for FY1982" for more details. The Senate Appropriations Committee proposed an additional $14 million above and beyond President Reagan's revised budget request for the NSF, $56 million less than their House counterparts had provided—a significant swing in dynamics from a few years earlier when the Senate was the greater champion of NSF funding. The House committee had rejected the administration's proposed elimination of the NSF's science education program in its entirety, in addition to proposing $41 million more for the NSF's research programs than the Senate approved. In its statutorily required inflation impact statement, the House committee also asserted that funding in the bill supporting "advanced technology and science that directly and indirectly increase productivity" would not be inflationary. In an unusual twist, the conferees agreed to an even lower NSF funding level than approved by either appropriations committee, likely reflecting the deteriorating inflation situation and pressure from the White House. The Reagan administration's sizable reduction in the nominal budget request for the NSF and the ensuing decline in real appropriations for the agency appears to have been partly influenced by concerns about inflation; the agency's double-digit requests had also been motivated by elevated rates of inflation. As such, we classify this policy event as endogenous. Most pertinent narrative evidence:

- "The primary mission of the [NSF] is support of basic research, which accounts for about 78% of its budget in 1982. The Foundation also funds selected programs in applied research and science education at all levels. Outlays for the NSF are estimated to increase from $1.0 billion in 1981 to $1.2 billion in 1982. Budget authority is proposed to increase from $1.1 billion in 1981 to $1.4 billion in 1982. Particular emphasis in 1982 is placed on: significant growth in funding for engineering research, because of the particular importance of such research to growth in industrial productivity; increased support for basic research in the mathematical and physical sciences, because these disciplines have not shared as fully in previous increases for Federal basic research support as their importance would warrant; and initiation of a project to construct a new radio telescope capable of providing fundamental information about intense energy sources in outer space not now observable from Earth." (Budget of the United States, FY1982, p. 126)
- "President Reagan promised the nation that his economic "recovery" plan of tax-rate cuts and federal spending-restaurant will lead to "less inflation, more growth and a brighter future for all of our citizens. The program Mr. Reagan outlined to Congress in a televised State of the Union address last night and in a separate printed message reflects his determination to slow the growth of government... Administration officials emphasize that Mr. Reagan's budget proposals, if adopted, would alter drastically the "mix" of federal spending over the next five years. Military spending, for instance, is seen accounting for 36.8% of the fiscal 1986 budget, up from 24.1% in the current budget... Mr. Carter's science officials had been especially proud of a $75 million

request for fiscal 1982 to modernize laboratory equipment in the nation's universities. This item in the [NSF]'s budget will be "deferred for future construction," the Reagan White House said. The [NSF]'s original plans for awarding research grants in the hard physical sciences would be preserved, but there would be a cutback or elimination in grants for behavioral, social and economic sciences, and science education. The foundation's revised budget outlays for fiscal 1982 are pegged at just over $1 billion, a relatively modest net cut of $15 million from Carter projections." ("Reagan Promises His Tax, Spending Cuts Will reduce Inflation and Increase Growth," by Kenneth H. Bacon and Timothy D. Schellhardt, *The Wall Street Journal*, February 19, 1981)

- "Foundation appropriations have increased at an average annual growth rate of approximately 8.5 percent in the period from fiscal year 1970 to fiscal year 1981, reaching a total of $1,022,359,000 in 1981. The [House Appropriations] Committee recommends appropriations of $1,103,500,000 for the Foundation in fiscal year 1982. This is an increase of $70,000,000 above the budget request. The [NSF] bears a unique responsibility among Federal agencies for the health and well-being of the Nation's basic scientific research activities. There can be no question that its programs serve a vital function. It is clear that the commercial vitality and military security of the United States are directly dependent upon the Nation's command of fundamental scientific knowledge." (H. Rpt. 97-162, June 25, 1981, p. 31)
- "The Committee recommends an appropriation of $1,065,000,000 for research and related activities in 1982. This is an increase of $44,900,000 above the budget estimate. The Committee directs that the $44,900,000 shall be applied to the highest priority activities at the discretion of the Foundation within the Biological, Behavioral and Social Sciences; Scientific, Technological and International Affairs; and Cross-Directorate Programs... The Committee believes that the Administration's decision to eliminate entirely the science education program is short-sighted. While it is true that various activities within this directorate have become fractured and too often driven by specialized programs that fail to focus research dollars on the critical problem of educating young Americans in science, the Committee still believes that evidence supports the need for a comprehensive science education program in the United States." (Ibid, p. 32)
- "Clause 2(l) (4) of Rule XI of the House of Representatives requires that each committee report on a bill or resolution shall contain a statement whether enactment of such bill or resolution may have an inflationary impact on prices and costs in the operation of the national economy. Critics of government spending suggest that practically any spending by government is inflationary. If that were true, then the funds proposed in this bill would be inflationary. However, all Federal spending is not inherently inflationary... Other funds will support advanced technology and science that directly and indirectly increase productivity. It is the considered opinion of the Committee that enactment of this bill will not have an inflationary impact on prices and costs in the operation of the national economy." (Ibid, pp. 51-52)
- "The impact of inflation on NSF's fiscal year 1982 budget is best seen by looking at increases we planned for the major areas of basic research. We have included in the fiscal year 1982 budget increases in physical and natural sciences, 18 percent in chemistry, 17.6 percent in physics, and 25.6 percent in computer engineering. In the biological sciences, the increases are somewhat less than the inflationary rate, 6.7 percent. In the geophysical sciences, the proposed increases are about 12 to 13 percent

in most cases, just keeping up with inflation. It is important to realize that much of the activity required to support experimental research today calls for investments in equipment and supplies, the costs of which outstrip the inflation rate in this country. Science is suffering seriously because exceedingly high costs are associated with the conduct of scientific experiments and research." Dr. John B. Slaughter, NSF Director, April 30, 1981 (Hearings Before the Senate Appropriations Committee on the HUD—Independent Agencies Appropriation Act, FY1982, p. 1091)

- "The Committee recommends an appropriation of $1,047,500,000 for the activities of the [NSF]. This amount is $14,000,000 more than the budget estimate and $56,000,000 less than the House allowance... The Committee recommends an appropriation of $1,024,100,000 for research and related activities. This amount is $4,000,000 more than the budget estimate and $40,900,000 less than the House allowance..." (S. Rpt. 97-163, July 8, 1981, pp. 65-66)
- "The program for fiscal year 1982 will expand basic and applied engineering research and improve the possibilities for converting research concepts and results into practical use. It will also strengthen the underpinnings needed for further progress in all engineering fields and will increase U.S. capabilities to exploit new discoveries in science. Special emphasis in fiscal year 1982 will include research in automation, including robotics and other technology innovations that have good potential to contribute to improved productivity and to advance engineering generally. The biological, behavioral, and social sciences activity will place particular emphasis on the following areas in fiscal year 1982: Studies on gene structure, function, and regulation and research in plant sciences, including plant response to stress with its implications for potential advancement on agricultural, pharmaceutical, and health-related problems; the maintenance of research resources in the social and economic sciences, and innovation and productivity research; biogeochemical cycling, especially where related to acid rain; tropical forest systems and global carbon dynamics, and ecological response to stress; improved technology for information transfer; research on nerve membranes and mapping of brain pathways; and anthropological research focused upon early man. In the astronomical, atmospheric, earth, and ocean sciences program activity, NSF intends to give priority to astronomy instrumentation, particularly to detectors and image processing equipment, and to the continued operation of the very large array for radio astronomy; to basic atmospheric research on weather and climate change; to earth sciences related to earthquakes, volcanoes, and the origin and evolution of ore deposits; and to ocean research related to weather and resources..." (Ibid, p. 67)
- "Congress Dec. 10 cleared a $60.38 billion appropriations bill for fiscal 1982 for the Department of Housing and Urban Development and 20 independent agencies... The final agreement was $1.7 billion in budget authority over the president's revised September budget request of $58.68 billion. But the bill included a provision allowing the administration to cut up to 5 percent from accounts that were over the corresponding amounts in the September request... The final total was considerably less than originally passed by either chamber. The president originally had requested $63.23 billion. The House July 21 approved $62.60 billion, while the Senate July 30 approved $60.51 billion." ("HUD, Agencies Funds," *CQ Almanac 1981*, 37th ed., 334-39. Washington, DC: Congressional Quarterly, 1982)
- "The [Senate] committee recommended $1.05 billion for the [NSF], $14 million more than the budget request and $56 million less than the House... For research and

related activities, conferees appropriated $1.04 billion. The House had proposed $1.06 billion while the Senate had provided $1.02 billion. Conferees accepted Senate language limiting money for biological, behavioral and social sciences to $184.6 million." (Ibid)

NSF R&D Appropriations for FY1984

Bill: Department of Housing and Urban Development–Independent Agencies Appropriation Act, 1984

Public Law: 98-45 **Enacted:** July 12, 1983 **Effective:** October 1, 1983

Nominal change		Real change		Classification
Millions ($)	YOY%	Millions ($2012)	YOY%	
$183.4	17.3%	$234.3	12.6%	Exogenous

Congress significantly increased both nominal and real NSF R&D appropriations for FY1984, an increase largely motivated by new concerns about national security and the "long-term competitiveness of U.S. high technology dependent industries," notably maintaining science and technological leadership over Japan and Germany. In a sharp reversal from earlier budget requests, President Reagan's FY1984 budget proposed $1.29 billion in budget authority for the NSF, an 18% increase over enacted appropriations for FY1983. The NSF funding request accompanied President Reagan's defense buildup and a significant requested increase in defense R&D appropriations for FY1984; see "Defense R&D Appropriations for FY1984" for more details. In another unusual development, the administration got even more for the agency than requested: The House Appropriations Committee approved $1.32 billion, their Senate counterparts tried to cut this down to $1.29 billion, but conferees settled on the House-approved $1.32 billion for the final appropriation bill. The House committee agreed with the administration's assessment that NSF funding was important for national security, declaring that the "commercial vitality and military security of the United States are directly dependent on the Nation's command of fundamental scientific knowledge" in their committee report. The Senate Committee did not disagree but was primarily quibbling about the NSF's programmatic management and grant oversight. The increase in NSF research funding appears to have been motivated by national security concerns and long-run scientific competitiveness objectives, and does not appear to have been influenced by unemployment, inflation, or any other short-run macroeconomic prerogatives. As such, we classify this policy event as exogenous. Most pertinent narrative evidence:

- "We Americans are still the technological leaders in most fields. We must keep that edge, and to do so we need to begin renewing the basics—starting with our educational system. While we grew complacent, others have acted. Japan, with a population only about half the size of ours, graduates from its universities more engineers than we do." Ronald Reagan, State of the Union Address, January 25, 1983 (*The American Presidency Project*, by Gerhard Peters and John T. Woolley, https://www.presidency.ucsb.edu/node/263103)
- "The continued growth of scientific knowledge, the development of new technology, and the training of future scientists and engineers are critically important to sustained economic growth, enhanced national security, and improved quality of life... In 1984 basic research under this function will increase by more than 16%, a somewhat higher rate than for overall Federal support of basic research. This reflects an emphasis on research having the potential to contribute to the long-term competitiveness of U.S. high technology dependent industries." (Budget of the United States, FY1984, p. 5-27)

- "The 1984 budget includes $1.3 billion in proposed budget authority for NSF, 18% above 1983. This increase will enhance the support of basic research in all disciplines, particularly in the physical sciences and engineering, at academic institutions. Such investments will help to ensure adequate numbers of high-quality scientists and engineers who are essential to continued U.S. leadership, particularly in defense and in high technology-dependent industries. The proposed increase places special emphasis on upgrading research instrumentation at universities to ensure that research will be of the highest quality and that future scientists and engineers will be trained using the latest equipment." (Ibid, p. 5-29)
- "The budget request for fiscal year 1984 includes a significant increase of funds to a new level of $1,292,300,000. The [House Appropriations] committee has recommended $1,315,300,000 in 1984. This is an increase of $23,000,000 above the budget estimate and $223,100,000 above 1983. The [NSF] bears a unique responsibility among Federal agencies for the health and well-being of the Nation's basic scientific research activities. There can be no question that its programs serve a vital function. It is clear that the commercial vitality and military security of the United States are directly dependent on the Nation's command of fundamental scientific knowledge... The committee recommends an appropriation of $1,242,400,000 for research and related activities in fiscal year 1984. This is a decrease of $8,300,000 below the budget estimate. The increases and decreases within this account are detailed as follows: +$15,000,000 for high technology instrumentation to be allocated for new research initiatives laboratory development and technology instruction delivery... -$10,000,000 from Mathematical and Physical Sciences, Engineering, and Astronomical, Atmospheric, Earth and Ocean Sciences to be applied against these activities at the agency's discretion... -$15,300,000 from the ocean drilling activities under the Astronomical, Atmospheric, Earth and Ocean Sciences Directorate." (H. Rpt. 98-223, May 24, 1983, pp. 37-38)
- "The [Senate Appropriations] Committee recommends $1,214,700,000 for research and related activities. This is $36,000,000 less than the budget request and $27,700,000 less than the House allowance. The Committee's recommendation for fiscal year 1984 is $154,700,000, or 14.6 percent over the fiscal year 1983 level. The entire reduction of $36,000,000 in this account has been reallocated by the Committee to the Foundation's science and engineering education activities account—thus providing the same aggregate amount for these two accounts as the request. The Committee takes exception to the numerous program-specific adjustments and earmarkings made by the House. The Committee believes that the Foundation, through its science advisory boards and peer review process, is in the best position to make these program-level decisions. Consequently, the Committee has deleted these House provisions. The Committee is concerned that while the administration proposes to increase the amount of funds available for grants by approximately 19 percent, it only proposes to increase the number of grants awarded by less than 1 percent. The Committee questions the wisdom of this resource allocation model. The history of science does not lend support to the notion that increasing the amount of money available to a basic research project increases the quality or significance of the scientific findings. In fact, given the inherent unreliability in the peer review process, a large number of highly promising research proposals that would have been recommended by a different panel of reviewers are often rejected. The Committee believes that the scientific community and the Nation would be better served if the number of grants were increased, as well as the size of the average grant." (S. Rpt. 98-152, June 13, 1983, pp. 70-71)

- "The Committee continues to be concerned about the Foundation's reluctance to assert its leadership position as the Government's premier science agency. The Committee believes that the Foundation has construed its role too narrowly, as that of a grant selection agency. The issues — improving scientific communications, technology transfer, improving the peer review process, coordinating science activities within the Government and the private sector, and articulating issues of science policy— have been largely ignored... The Committee feels that increased oversight and strong management are required" (Ibid, pp. 71-72)

NSF R&D Appropriations for FY1985

Bill: Department of Housing and Urban Development–Independent Agencies Appropriation Act, 1985

Public Law: 98-371 **Enacted:** July 18, 1984 **Effective:** October 1, 1984

Nominal change		Real change		Classification
Millions ($)	YOY%	Millions ($2012)	YOY%	
$172.1	13.8%	$222.6	10.7%	Exogenous

Congress again significantly increased both nominal and real NSF R&D appropriations for FY1985, an increase largely motivated by new concerns about national security and maintaining science and technological leadership over Japan and Germany. The president's budget request declared that "basic research lays the foundation for a strong defense in the years to come and for new technologies and industries that will maintain U.S. industrial leadership." Similar to the previous year's request, President Reagan's FY1985 budget proposed a $181 million (14%) increase in NSF funding, asking for $1.502 billion in BA for the agency to bolster investments in basic research and the science and technology base. The NSF funding request again mirrored an accompanying double-digit requested increase for defense R&D appropriations; see "Defense R&D Appropriations for FY1985" for more details. The House Appropriations Committee pared a mere $15 million from the NSF budget request but also shuffled money around between budget functions, notably approving far more funding for work on supercomputers; the House committee also worried that the agency was spending too little supporting science education, and shuffled some funds from research to education programs. The Senate committee restored $14.3 million in research funds cut by the House, approving all but $700,000 from the budget request. The conferees approved the top-line budget request but reshuffled funding across NSF budget accounts, notably approving the extra $20 million for supercomputers that the House had recommended—funds with clear defense applications. The increase in NSF research funding appears to have been motivated by national security concerns and long-run scientific competitiveness objectives, and does not appear to have been influenced by unemployment, inflation, or any other short-run macroeconomic prerogatives. As such, we classify this policy event as exogenous. Most pertinent narrative evidence:

- "Recognizing the Federal responsibility to maintain and strengthen U.S. leadership in science and technology, the budget proposes further increases of more than 10% in Government-wide funding for basic research. The $8 billion planned for support of such research represents a relatively small share of the budget, but it is a critical investment in the Nation's future. Basic research lays the foundation for a strong defense in the years to come and for new technologies and industries that will maintain U.S. industrial

leadership, create new jobs, and improve our quality of life." (Budget Message of the President, FY1985, February 1, 1984, p. M10)

- "The 1985 budget includes $1.5 billion in proposed budget authority for NSF, $181 million or 14% above 1984. Within this amount, the support of basic research will increase by 13%. The principal increase, $112 million in 1985, will be for additional support of basic research at academic institutions through project grants. Within this increase, further emphasis will be given to strengthening support for the physical and engineering sciences and to the improvement of university research instrumentation across all disciplines. The proposed budget for NSF places special emphasis on increasing the access of academic scientists in all scientific fields to the most advanced computers as research tools. As part of this effort, the Foundation plans to extend and expand in 1985 its effort begun in 1984 to provide blocks of time on supercomputers located at existing centers and to increase funding for networks and local user support." (Budget of the United States, FY1985, p. 5-34)
- "For four years private industry has paid a larger share of the cost of [R&D] in the United States than the Federal Government, according to a Government analysis. Although the Federal Government had been the chief source of [R&D] funds for two decades, the analysis said, that trend ended in 1980, when industrial expenditures climbed above Government expenditures. Since then, industrial [R&D] spending has continued to climb faster than Government spending. In 1983, according to estimates in the report, industry spent $44.3 billion, and the Federal Government spent $39.6 billion... The trend was noted in a report called "Scientific Indicators—1982," a quantitative assessment of American science and technology prepared by the [NSF]... the report warned that other industrial nations might be catching up or forging ahead in a few fields, and it cited "evidence that the United States is losing some of the overwhelming pre-eminence in the sciences, engineering, and technology that it enjoyed during the past several decades." The report said that the United States was "certainly lagging" in science and mathematics instruction in the secondary schools and that its share of world trade in research-intensive products had declined from 23 percent in 1970 to 20 percent in 1980, a period when Japan's share increased from 10 percent to almost 15 percent." ("Private Spending on Research Rises," by Philip M. Boffey, *New York Times*, February 12, 1984)
- "A committee of House Republicans yesterday called for a stronger government commitment to basic research and education, and new incentives for investors, entrepreneurs, and inventors, to help American industry become more competitive. The task force, headed by Rep. Edwin V. W. Zschau of California, argued against government attempts to target key technologies or industries for federal support. "We believe the proper role of government in promoting U.S. technological leadership and industrial competitiveness is to target the process by which new ideas and products are developed—the process of innovation," the report said... A broader approach to this issue was proposed yesterday by the President's Commission on International Competitiveness, a committee of business and labor leaders appointed... The commission members, meeting in Detroit, recommended that the [NSF] and other government research agencies award grants for graduate students in engineering and provide incentives to those who join academic faculties instead of industry. The commission also endorsed the [NSF]'s new program to develop engineer research center on campuses and urged a marked expansion after fiscal 1985." ("GOP Task Force Urges New US Role to Help Industries

Compete," by Peter Behr, *The Washington Post*, May 2, 1984)

- "The budget request for fiscal year 1985 includes another significant increase of funds to a new level of $1,501,792,000. The [House Appropriations] committee has recommended $1,499,792,000 in 1985. This is a decrease of $2,000,000 below the budget estimate and is $179,492,000 above 1984... The committee recommends an appropriation of $1,293,212,000 for research and related activities in fiscal year 1985. This is a decrease of $15,000,000 below the budget estimate. The increases and decreases within this account are detailed as follows: +$20,000,000 for advanced scientific computing (supercomputers). This will provide for a total of $40,000,000 for this activity in fiscal year 1985... +$5,000,000 for the biological, behavioral, and social sciences directorate. These funds may be distributed at the Foundation's discretion, but the committee urges that special emphasis be placed on the social and economic sciences which have absorbed the largest reductions in past years... -$43,500,000 from the mathematical and physical sciences; engineering; astronomical, atmospheric, earth and ocean sciences; and program development and management areas to be allocated at the Foundation's discretion" (H. Rpt. 98-803, May 23, 1984, pp. 39-40)
- "For too long, the funding of science education programs has received a disproportionately small share of the Foundation's budget. The 1985 request for science education represents only 5 percent of the total requested for the Foundation, and that level is down from approximately 5.7 percent in fiscal year 1984. In fact, it is important to point out that the total amount requested and appropriated for science education for the past ten fiscal years is less than $625,000,000. During roughly the same period, NASA and NSF astronomy projects either completed or currently underway have totaled $2,900,000,000... The committee, therefore, does not believe that the astrophysical or astronomy sciences have been underfunded. It does believe, however, that science education, which is vital to ensuring the future science capability of this nation, must receive an appropriate share of the Foundation's budget." (Ibid, p. 40)
- "The [Senate Appropriations] Committee recommends $1,307,512,000 for research and related activities. This is $700,000 less than the budget request and $14,300,000 more than the House allowance. This represents an increase of $167,212,000, or 14.7 percent, over the fiscal year 1984 level. For fiscal year 1985, the Committee recommends increases totaling $17,500,000 and a general reduction of $18,200,000. This compares to a House reduction of $42,500,000. The Committee added $10,000,000 to the $20,000,000 requested by NSF for supercomputer centers. The Committee believes that $30,000,000 is the highest level that can be utilized in fiscal year 1985... The Committee also incremented several small programs by about 50 percent in keeping with the Committee's automation initiative." (S. Rpt. 98-506, June 6, 1984, p. 76)
- "In keeping with last year's Senate action, this bill contains a legislative provision that sets the number of NSF grants at no fewer than 13,000. This is about 500 grants more than assumed by NSF and would permit a 4.4 percent growth in grants rather than the less than 1 percent increase proposed by NSF in their fiscal year 1985 request." (Ibid, p. 76)
- "The [conference] bill met the budget request of $1.5 billion for the [NSF], but conferees adjusted items within the total. The largest increase was $20 million for additional work on so-called "supercomputers." ("$56.5 Billion Approved for Housing and Urban Development," *CQ Almanac 1984*, 40th ed., 415-21. Washington, DC: Congressional Quarterly, 1985)

NSF R&D Appropriations for FY1987

Bill: Continuing Appropriations Act, 1987

Public Law: 99-591 **Enacted:** October 30, 1986 **Effective:** October 30, 1986

Nominal change		Real change		Classification
Millions ($)	YOY%	Millions ($2012)	YOY%	
$118.9	8.5%	$162.2	7.2%	Exogenous

Congress significantly increased both nominal and real NSF R&D appropriations for FY1987, an increase largely motivated by concerns about national security and maintaining long-run science and technological leadership over advanced economy peers. The president's budget request explained that basic research and fundamental scientific knowledge "provides the basis for a healthy long-term economy, a strong defense, and a better quality of life for all our citizens," and proposed broad increases in basic research funding, with a particularly large increase budgeted for the NSF. The Reagan administration proposed $1.7 billion in budget authority for the NSF, an increase of $228 million (15.9%) over enacted FY1986 funding levels, including $1.4 billion for the agency's research programs, an increase of $167 million. In the context of broader efforts to reduce spending and rein in the budget deficit, the significant increases requested for R&D activities in the FY1987 budget were said to reflect "the Administration's long-held belief that scientific advance is critical to both the military and economic strength of the nation." Top policy priorities for NSF funding included helping research universities upgrade to "state-of-the-art instrumentation," expand access to advanced computers, and invest in computational science and engineering programs. The House Appropriations Committee pared back the administration's request for the NSF, but their Senate counterparts restored some of that reduced funding. The regular order appropriations process broke down, and NSF funding was moved in an FY1987 continuing resolution bill, which appropriated $1.6 billion for the agency, a $165 million (11%) increase over FY1986 funding—the largest increase for any agency in the HUD-Independent agencies division of the bill. The increase in NSF research funding appears to have been motivated by national security concerns and long-run scientific competitiveness objectives, and does not appear to have been influenced by unemployment, inflation, or any other short-run macroeconomic prerogatives. As such, we classify this policy event as exogenous. Most pertinent narrative evidence:

- "The budget reflects the high priority that this administration continues to give support for basic research. Government-wide support for basic research is proposed to increase by more than 3% in real terms in 1987. Fundamental knowledge in scientific fields such as mathematics, physics, and materials science, and in the various engineering disciplines provides the basis for a healthy long-term economy, a strong defense, and a better quality of life for all our citizens. The administration's commitment to basic research is exemplified in the proposed 1987 budget of the [NSF], which provides over $1.4 billion in support of basic research in science and engineering, an increase of $167 million over 1986." (Budget of the United States, FY1987, 3-6)
- "The principal mission of NSF is to promote basic research in all fields of science and engineering. The NSF's broad-based research programs complement [NASA], DOD, and the [NIH], thereby helping to ensure balanced Federal support across all scientific disciplines. The budget includes $1.7 billion in proposed budget authority for the NSF, an increase of $228 million over the 1986 level. Within this amount, the support of basic research will increase from $1.3 billion in 1986 to $1.4 billion in 1987...

Areas to receive increased support in 1987 include advanced materials research, global geosciences, advanced research in computational science and engineering, and state-of-the-art instrumentation. Emphasis will also continue on providing access to the most advanced computers for academic researchers. The budget proposal will also enhance support for university-based engineering research centers. This program encourages interdisciplinary efforts in such fundamental research areas as microelectronics, materials, and biotechnology, where an interdisciplinary focus appears key to the advancement of scientific knowledge." (Ibid, pp. 5-25-26)

- "[R&D], long a favored activity under the Reagan Administration, would continue to grow significantly under the President's proposed budget for the fiscal year 1987. But the major factor in the growth would be military research... The budget proposes a start on several important new programs, including the development of a new hypersonic aircraft capable of flying into space, new high-energy physics facilities in Newport News, Va., and Berkeley, Calif., and new emphasis on research in biotechnology, computational science, and global geoscience at the [NSF]... The proposed 1987 budget calls for increasing total Federal financing for [R&D] from the 1986 estimated level of $53.8 billion to about $62.5 billion for 1987, an increase of about 16 percent, far above the 4.1 percent inflation rate that is projected in the budget documents. Of the $62.5 billion, roughly $21 billion would support civilian [R&D]. The sizable increase in research spending proposed for a year in which both the Reagan Administration and Congress are trying to curb expenditures to reduce the budget deficit reflects the Administration's long-held belief that scientific advance is critical to both the military and economic strength of the nation..." ("Military is Chief Factor in Rise for Research and Development," by Philip M. Boffey, *New York Times*, February 6, 1986)
- "Mr. Chairman, there are three basic reasons why the Federal Government supports research and education in the sciences and engineering. They are: for its intrinsic intellectual value; because government needs the results; and for economic competitiveness. The Foundation has long been dedicated to the first reason—intrinsic intellectual value. And the Congress has long supported this quest to do the best possible science in every field... I will concentrate my remarks this morning on the third goal, that of economic competitiveness. This is the area in which the Nation is most in need. It is an area in which the [NSF] has much to offer, and it is the rationale behind our major budget thrusts of this year. It is no secret that the world has become a much more competitive place in recent years... the proportion of our R&D that goes for military purposes has been both high and rising. When we consider only civilian-oriented R&D, which is the part that is most economically relevant, we find that our level of effort is behind that of West Germany and Japan." Erich Bloch, Director, NSF, March 5, 1986 (Hearings Before the Senate Appropriations Committee on the HUD-Independent Agencies Appropriations, FY1958, pp. 532-536)
- "The House approved an estimated $576 billion omnibus appropriations bill funding the government through fiscal year 1987 and revamping the priorities in the budget presented by President Reagan in February... Science and research programs would command increasing dollars, even in a time of budget pressure. The [NIH] would receive $6.18 billion, an increase of more than 17%. The [NSF], which has won increasing support from the administration in recent years, would receive $1.29 billion—an 8.6% increase..." ("House Votes $576 Billion Spending Bill To Fund U.S. for the Rest of Fiscal 1987," by David Rogers, *New York Times*, October 16, 1986)

- "The [NSF] received $1.6 billion—$165 million or 11 percent more than fiscal 1986. That was the largest increase in fiscal 1987 for any major category contained in the HUD/Independent Agencies portion of the legislation... " ("$56 Billion in Funding Set Aside for Department of Housing and Urban Development (HUD), Assorted Agencies," *CQ Almanac 1986*, 42nd ed., 171-76. Washington, DC: Congressional Quarterly, 1987)

NSF R&D Appropriations for FY1989

Bill: Department of Housing and Urban Development–Independent Agencies Appropriations Act, 1989

Public Law: 100-404 **Enacted:** August 19, 1988 **Effective:** October 1, 1988

Nominal change		Real change		Classification
Millions ($)	YOY%	Millions ($2012)	YOY%	
$173.7	11.0%	$175.9	7.3%	Exogenous

Congress significantly increased both nominal and real NSF R&D appropriations for FY1989, an increase largely motivated by concerns about national security and maintaining long-run science and technological leadership over advanced economy peers. Policymakers were increasingly concerned about the ascendant scientific and technological prowess of Japan and bolstering the long-term international competitiveness of U.S. industries, and the president's FY1989 budget request explained that basic research "has the potential to contribute significantly to America's long-term economic competitiveness" and increased funding would help "ensure, over the long-term, the ability of the U.S. to compete in increasingly competitive global markets." The Reagan administration proposed a total of $2.1 billion in FY1989 budget authority for the NSF, an increase of $333 million (19.2%) over FY1988 funding levels. The budget proposed doubling NSF's support of basic research at universities and continued to provide funds for upgrading university research laboratories and equipment; another top NSF policy priority was improving technological transfers from federal agencies and universities to the private sector. The House Appropriations Committee cut $25 million from the administration's request for the NSF's research activities, but their Senate counterparts restored $15 million of that reduced funding; the Senate committee was particularly supportive of recent NSF-funded supercomputing centers and provided the full $54 million requested for that program. The conferees settled on the House-approved $1.9 billion in total for the agency, $165 million below the administration's request and $5 million more than the Senate allowance, but significantly more than the $1.7 billion funding level for FY1988. The increase in NSF research funding appears to have been motivated by national security concerns and long-run scientific competitiveness objectives, and does not appear to have been influenced by unemployment, inflation, or any other short-run macroeconomic prerogatives. As such, we classify this policy event as exogenous. Most pertinent narrative evidence:

- "I am proposing funds to strengthen U.S. technology and make America more competitive. For example: I propose a continued increase in federally supported basic research aimed at longer-term improvements in the Nation's productivity and global competitiveness. This budget would double [NSF] support for academic basic research, increase support for training future scientists and engineers, and expedite technology transfer of Government-funded research to industry." (Budget Message of the President, FY1989, February 18, 1988, p. 1-7)

- "Basic research generates new knowledge which helps ensure continued technological innovation. It represents an essential investment in the Nation's future. Real outlays for science have risen from $1.7 billion in 1980 to $1.9 billion in 1987. This budget proposes a further increase to $2.3 billion in 1989... Federal policy has placed a special emphasis on basic research that has the potential to contribute significantly to America's long-term economic competitiveness, such as research in the physical sciences, mathematics and engineering. About one-half of the Federal funds for basic research go to the Nation's universities and colleges. These funds support not only fundamental research but also the training of future generations of scientists and engineers." (Budget of the United States, FY1989, 2a-13)
- "The President's budget proposes to increase funding for the [NSF] to $2.1 billion in budget authority for 1989, an increase of 19 percent from the 1988 enacted level. NSF would emphasize the support for basic research and for science and engineering education. Continued U.S. leadership in science and technology depends on the future availability of high-quality scientists and engineers. NSF would also fully fund 10 to 15 interdisciplinary Science and Technology Centers for five years, encouraging substantial participation by industry and the States to speed the transfer of knowledge from the laboratory to the marketplace. Support for basic research is a key element in helping to ensure, over the long term, the ability of the U.S. to compete in increasingly competitive global markets. University-based research not only generates the "intellectual capital" of new knowledge but also, through the training of future scientists and engineers, the essential "human capital" necessary for continued economic growth." (Ibid, 2a-13)
- "Investors are dramatically increasing their reliance on basic scientific research to compete in the international race for commercial innovations... Today, the delay between science and technology, between understanding nature and using that knowledge to reorder the natural world, can be as short as years and sometimes months. Recently, the rush of investors to make use of basic science has been statistically detailed for the first time in studies of patents, which are key expressions of technical innovation. New studies show that American patents awarded in the last decade are citing scientific papers with rapidly increasing frequency and that these science-intensive patents are drawing on ever more recent discoveries... The fusion of science and technology is viewed as crucial by Federal officials who help shape the nation's [R&D] effort, which this year will cost about $132 billion. For instance, President Reagan in his weekly radio address on Saturday urged not only greater Federal support for basic research but closer cooperation with industry so discoveries "can quickly lead to new and better and internationally competitive products." To date, the [NSF], a Federal agency, has created 14 special centers where university scientists and industry engineers rapidly exchange ideas and insights, collaborating on specific innovation goals in the hope of generating more competition for the rush of high-technology consumer goods from Japan. "The pace of development is accelerating very rapidly," said Erich Bloch, director of science foundation. "We need to transfer knowledge between universities and industries much faster and better than we usually do." ("Science and Technology: The Gap is Shrinking Fast," by William J. Broad, *New York Times*, April 5, 1988)
- "At least ten major new scientific initiatives—"megascience" projects, as some call them—are clamoring for billions of dollars of government money at a time when the federal budget is tighter than ever and unlikely to loosen up much in the next few years. Some are well-known: the space station, the Strategic Defense Initiative, the de-

velopment of high-temperature superconductors, the Superconducting Super Collider, a manned mission to Mars, and an expanded assault on acquired immune deficiency syndrome. Others, although less familiar to the public, have impassioned advocates in the scientific and engineering communities: the Human Genome Project, the "national aerospace plane," a budget doubling the [NSF], and a $10 billion renovation of deteriorating laboratories at the nation's universities. "The reality for science is that there is more to do than the country is willing, some would say able, to pay for right now," said Robert M. Rosenzweig, president of the Association of American Universities" ("Clash of Titans: Science Projects vs The Budget," by Boyce Rensberger, *The Washington Post*, April 25, 1988)

- "The [House] Committee recommends an appropriation of $1,578,000,000 for research and related activities in fiscal year 1989. This is a decrease of $25,000,000 below the budget estimate. The recommendation includes the following increases, decreases, and changes to the program areas described below: -$20,000,000 to be applied equally across all disciplines except ocean sciences and astronomical sciences, which shall be maintained at the 1989 requested level... " (H. Rpt. 100-701, June 24, 1988, p. 48)
- "The [Senate Appropriations] Committee recommends $1,593,000,000 for research and related activities. This is $10,000,000 less than the budget request and $15,000,000 more than the House allowance. Although the amount provided represents an increase of $140,000,000, or almost 10 percent, above the current appropriation, the Committee has not recommended support for a $150,000,000 science and technology centers program that was proposed for funding under a separate account. In view of the budget strictures facing the Congress, the Committee concludes that it is inappropriate to initiate a program of this magnitude in fiscal year 1989. The funds provided should be used first and foremost to support the Foundation's basic research programs... The Committee does not concur with House report language earmarking funds for specific activities and programs. The Committee believes that specific earmarks interfere with the merit-based review process and expects this process to continue to be the basis for all awards made by the Foundation. The Committee concurs with the House directive that ocean and astronomical sciences are to be maintained at the level requested in the President's budget... The Committee continues to be impressed with the results achieved by the five national supercomputing centers and expects the NSF to provide the full $54,000,000 requested in the administration's budget for the continued operation of the centers" (S. Rpt. 100-401, June 24, 1988, pp. 76-77)
- "Compared with what the agencies received in fiscal 1988, the $59.4 billion bill allowed slightly less for HUD, significantly more for NASA and NSF, and only modest increases for most other agencies." ("Space Station Survives in Bill Granting $59.4 Billion to the Department of Housing and Urban Development (HUD)," *CQ Almanac 1988*, 44th ed., 728-33. Washington, DC: Congressional Quarterly, 1989)
- "The House Appropriations Committee May 25 approved a $60.1 billion FY1989 spending plan (H. Rpt. 100-701) for HUD, NASA and 15 other agencies... "If the bill were presented to the president in its present form, I would recommend that he veto it," White House budget director James C. Miller III said in a May 24 letter to Appropriations leaders. He said money from housing, veterans' and environmental programs, which he called "low priority," should be shifted to NASA and the NSF." (Ibid)

NSF R&D Appropriations for FY1994

Bill: Departments of Veterans Affairs and Housing and Urban Development, and Independent Agencies Appropriations Act, 1994

Public Law: 103-124 **Enacted:** October 28, 1993 **Effective:** October 28, 1993

Nominal change		Real change		Classification
Millions ($)	YOY%	Millions ($2012)	YOY%	
$189.3	8.9%	$194.0	6.7%	Exogenous

Congress significantly increased both nominal and real NSF R&D appropriations for FY1994, an increase largely motivated by the Clinton administration's new emphasis on civilian R&D and greater public-private collaboration in developing new technologies. The administration was also keen to maintain U.S. global leadership in science and technology fields and, relatedly, the preeminence of American universities and research facilities. President Clinton requested a total of $3.2 billion in FY1994 budget authority for the NSF, an increase of $447 million (16.3%) over FY1993 funding levels. This push for increased nondefense basic research funding came in spite of countervailing efforts to restrain federal spending and reduce the budget deficit; see "Department of Defense R&D Appropriations for FY1994" for more details. The House Appropriations Committee cut $160 million from the administration's request for the NSF's research activities, nonetheless approving a net increase of $186 million above FY1993 funding; the House committee was primarily concerned that indirect costs for universities and other entities were spiraling out of control, and ordered GAO to study the issue. The Senate Appropriations Committee, on the other hand, had deeper concerns that the NSF was overly fixated on basic research and wanted the agency to pivot toward funding more applied research work better integrated with the administration's science, technology, and competitiveness objectives; the committee prioritized funding for revitalizing university research laboratories and science education programs but restrained growth in basic research programs, and ordered the agency to revise its strategic plans for the FY1995 budget cycle. Despite the Senate's newfound skepticism of the NSF's emphasis on basic research, the conferees settled on $3.0 billion for the agency, $152 million below the administration's request but $294 million above FY1993 funding levels and more than approved in either the House or Senate committee bills. The increase in NSF research funding appears to have been motivated by long-run scientific competitiveness objectives, and does not appear to have been influenced by unemployment, inflation, or any other short-run macroeconomic prerogatives. As such, we classify this policy event as exogenous. Most pertinent narrative evidence:

- "The [FY1994 budget] plan has three key elements: economic stimulus to create jobs now and lay the foundation for long-term economic growth; long-term public investments to increase the productivity of American workers and businesses; and fair, balanced, and equitable deficit reduction measures to stop government deficits from preempting the private investments needed to create jobs and raise living standards" (Budget Message of the President, FY1994, April 8, 1993)
- "On February 22, 1993, the Administration released a report entitled "Technology for America's Economic Growth, A New Direction to Build Economic Strength." The report's central premise is that investing in technology is investing in America's future. The report establishes three principal technology goals: 1) Long-term economic growth that creates jobs and protects the environment; 2) A Government that is more productive and more responsive to the needs of its citizens; and 3) World leadership in basic science, mathematics, and engineering." (Budget of the United States, FY1994, p. 43)

- "Our Nation's research universities are the best in the world and attract scientists and engineers from around the globe. In almost every field, U.S. researchers continue to lead their foreign colleagues in scientific citation and most other measures of scientific excellence. [NSF, NIH, DOE, DOD, and NASA] provide over 93 percent of Federal funding for university research. The Administration proposes to spend over $11 billion for these activities in 1994. Since universities play dual roles in research and training, the long-term scientific and technological vitality of the U.S. depends upon adequate and sustained funding for university research programs at these agencies" (Ibid, p. 44-45)
- "The Clinton Administration announced today a broad new technology initiative that enthusiastically embraces Government and industry cooperation to create new technologies and nurture innovative small companies... the plan calls for spending $598 million on high technology this year and restoring $207 million of cuts in the budget of the [NSF]. It would also increase spending for the national laboratories by $47 million this year and $146 million in the next four years to focus on civilian instead of military projects... The plan stresses building the national high-speed computer network to link businesses, schools, and governments, a project Vice President Gore has long championed. He said its construction would lead to a blossoming of new businesses and economic productivity." (Clinton Proposes Changes in Policy to Aid Technology," by John Markoff, *New York Times*, February 23, 1993)
- "The [House Appropriations] Committee's fiscal year 1994 recommendation for the VA, HUD, and Independent Agencies Appropriations Bill is the product of some very difficult choices. The problem is primarily driven by the lack of sufficient outlays necessary to support a number of critical programs. For fiscal year 1994, the President's budget proposed "core" both a funding level for most programs and an "investment" package that selectively enhanced various activities. For example, the National Science Foundation's "core" request included $2,753,000,000 while the "investment" package enhanced that amount by $427,200,000..." (H. Rpt. 103-150, June 22, 1993, p. 3)
- "The [House] Committee recommends an appropriation $2,045,000,000 for research and related activities in fiscal year 1994. This is a decrease of $159,800,000 below the budget request and an increase of $186,000,000 above 1993. The reduction may be taken at the agency's discretion, subject to the normal reprogramming procedures. The Committee is concerned with the extraordinary variation in overhead costs among different academic institutions receiving federal research funding. Federal funding for indirect costs to institutions averages 46 percent of the direct expense of federal research. However, select institutions claim and are being compensated for indirect costs as high as 69.5 percent of the direct costs of federal research. The Committee believes these wide variations in the level of direct costs require further study to determine whether such variations are both reasonable and in the national interest; what factors contribute to such wide variations; and whether a standard formula might be developed to establish a maximum allowance for indirect costs... [GAO] is directed to undertake such an analysis and submit a report by February 1, 1994." (Ibid, pp. 79-80)
- "The [Senate Appropriations] Committee has recommended funds for a number of priority activities that are consistent with its goal of trying to foster economic competitiveness, as well as maintain commitments to key programs despite budget constraints. The specific highlights include: The bill includes funds for key science and technology programs funded through NASA and the NSF, including the space station, a mix of

space science missions, the space shuttle, math, and science education, academic research infrastructure, and basic research grants. The NASA budget increases by more than $300,000,000 over the 1993 appropriation, and the NSF budget increases by nearly $250,000,000 over the 1993 level." (S. Rpt. 103-137, September 7, 1993, pp. 6-7)

- "The Committee recommends an appropriation of $2,981,997,000 for the [NSF] for fiscal year 1994. This amount reflects an increase of $248,449,000, or 9 percent, above the fiscal year 1993 level. The Committee notes that its investment in the [NSF] for fiscal year 1994, by providing an appropriation of nearly $3,000,000,000, is significant given that the VA, HUD, and Independent Agencies Subcommittee 602(b) allocation increased by just over 2 percent in new budget authority available for all agencies it funds. Given the uncertainty over the Foundation's future direction, the Committee has emphasized funding for math and science education, and revitalizing the Nation's academic infrastructure. Basic research activities will grow slightly better than the expected rate of inflation." (Ibid, p. 166)
- "The Committee believes that the [NSF] is at a crossroads in its future. Either the Foundation will evolve as envisioned by the Commission on the Future of the NSF, commonly known as the Massey Commission, or it will drift in a direction that moves it further and further from broad national interests in science and technology. In short, the Foundation can be at the heart of helping to shape the administration's science and technology policy in pursuit of specific national goals, or it can diminish into becoming nothing more than a national endowment for science. The conference report accompanying last year's NSF appropriations (H. Rept. 102-902) made clear the Committee's concern about the future direction of the Nation's science and technology policy. Its concern was based upon a report of the National Science Board... [which] outlined a sober assessment of the condition of the U.S. competitive position. It found that our Nation spends too few dollars on [R&D] in industrial science and technology; does not allocate R&D expenditures well; and does not utilize the R&D investments that are made well... the Committee directs the Foundation to revise its strategic plan, for submission by the time the President's fiscal year 1995 budget is submitted to the Congress..." (Ibid, pp. 166-168)
- "After an early-year funding scare that had NSF officials worried that basic research would be gored by the new Clinton administration and Congress, appropriators agreed to give the NSF more than a 10 percent increase to $3 billion. There was a renewed push, however, by Senate appropriators to get the NSF to focus more on joining forces with industry for more "applied" research that had a specific, presumably commercial, goal in mind... In their report, Senate appropriators warned the NSF to set specific performance goals by the time Clinton's fiscal 1995 budget was submitted, or risk losing much of its funding to agencies such as the National Institute of Standards and Technology, NASA, the National Energy Labs or the [NIH]. The agency also was told to ensure that no less than 60 percent of its research was "strategic," rather than "of a generic nature"... Within the NSF budget, conferees agreed to spend $2 billion on research and related activities and $569.6 million on education programs, which included science instruction programs for precollege students and fellowships and equipment for college-level students. The agency, whose advocates had long complained that big-science projects such as NASA's space station drained funding from traditional science coffers, won an extra $22.5 million when Congress killed NASA's Advanced Solid Rocket Motor..." ('Veterans Affairs, Housing and Urban Development Appropri-

ations Cover Diverse Needs, From Space Stations to Public Housing," *CQ Almanac 1993*, 49th ed., 691-97. Washington, DC: Congressional Quarterly, 1994.)

- "Reading the headlines, one might get the impression that these are dire days for science. Congress, after all, has killed the Superconducting Super Collider, and support for NASA's Space Station Freedom has been unsteady. Although the most visible science programs have taken a beating, federal research funding in other areas has risen: Budgets are up at key science programs from [NIH to DOE]. One example of that congressional generosity can be found at the [NSF], which funds research and education in science, mathematics, and engineering nationwide. In a notoriously tight budget year, the agency was appropriated two-thirds of the 1994 budget increase the Clinton administration requested, for a total 1994 appropriation of more than $3 billion. That amounted to an 11 percent jump over fiscal 1993. Of that amount, about $2 billion will go to research funds, an 8 percent increase over the previous year... The biggest jump in NSF's budget—a 120 percent leap—will go toward expanding facilities at research institutions. A 1990 NSF study said as much as $12 billion was needed for renovation and new facilities to bring America's "academic infrastructure" up to snuff... It also might not have hurt NSF's fortunes that Congress's habit of earmarking appropriations for specific institutions has come under fire this year... NSF infrastructure grants are decided by merit." ("Science Foundation Bucks the Budget Squeeze," by John Schwartz, *The Washington Post*, December 01, 1993)

NSF R&D Appropriations for FY1999

Bill: Departments of Veterans Affairs and Housing and Urban Development, and Independent Agencies Appropriations Act, 1999

Public Law: 105–276 **Enacted:** October 21, 1998 **Effective:** October 21, 1998

Nominal change		Real change		Classification
Millions ($)	YOY%	Millions ($2012)	YOY%	
$207.0	7.8%	$203.0	6.2%	Exogenous

Congress significantly increased both nominal and real NSF R&D appropriations for FY1999, an increase largely motivated by the Clinton administration's push for a 21st Century Research Fund for America prioritizing basic and applied research of the NIH and NSF; see "NIH R&D Appropriations for FY1999" for more details. President Clinton viewed these public investments as key to maintaining a strong defense posture and promoting innovation in new jobs and industries. The FY1999 budget requested a total of $3.8 billion in budget authority for the NSF, an increase of $344 million (10.0%) over FY1998 appropriations. In taking their budget request to the Senate Appropriations Committee, NSB Chairman Richard Zane argued that the 10% requested increase would "help maintain U.S. world leadership in all aspects of science, mathematics, and engineering" and "keep America at the cutting edge of science." The House Appropriations Committee cut $102 million from the administration's request for the NSF's research activities, nonetheless approving a net increase of $199 million above the level appropriated for FY1998; concerned with climate change, the House committee was particularly keen to see increased funding support for the NSF's atmospheric, earth, and oceanographic science programs. Their Senate counterparts cut an additional $20 million below the House allowance for the NSF's research programs, scolding the NSF for its management practices, the lack of performance-based metrics, and

failure to adhere to the Government Performance and Results Act (Pub. L. 103-62). In the end, the conferees settled on $3.7 billion in total for the agency, $102 million below the administration's request but $242 million (7.0%) above FY1998 funding levels and more than approved in either the House or Senate committee bills. The increase in NSF research funding appears to have been motivated by long-run scientific competitiveness objectives and does not appear to have been influenced by short-run macroeconomic concerns such as inflation or unemployment. As such, we classify this policy event as exogenous. Most pertinent narrative evidence:

- "Because I am committed to America's continued leadership in science and technology, I am proposing a Research Fund for America, from which many of our important investments will flow. It includes record increases for the [NIH], higher funding for the [NSF], new resources to address global climate change, and a wide variety of investments in basic and applied research. These investments are vital; they help to create new knowledge, train more workers, spur new jobs and industries, address our health care challenges, strengthen our understanding of environmental problems, better educate our children, and maintain a strong national defense." (Budget Message of the President, FY1999, February 2, 1998, p. 6)
- "The Fund provides $3.7 billion, 10 percent more than in 1998, for NSF, whose broad mission is to promote science and engineering research and education across all fields and disciplines. NSF supports nearly half of the non-medical basic research conducted at academic institutions and provides 30 percent of Federal support for mathematics and science education. Because most NSF awards go to colleges and universities, they not only generate knowledge, they also train the next generation of scientists and engineers." (Budget of the United States, FY1999, pp. 96-97)
- "The examples of NSF's leadership in R&D are almost endless, and I will note only a few: NSF's investment in nanotechnology and thin films are expected to generate a thousand-fold reduction in size for semiconductor devices, which will make computers, telecommunications, and other advanced technologies even more powerful, more portable, more affordable, and more useful. In terms of life in extreme environments, the unique properties of a microbe found in the thermal pools and geysers at Yellowstone Park some 30 years ago have led to the development of the polymerized chain reaction, or PCR, that has led to DNA fingerprinting, enzymes for nonpolluting detergents, and a variety of other state-of-the-art applications. And I am very proud that the new plant genome initiative is already bearing fruit. This is a very important new thrust of research at NSF which I believe could lead to a revolution in how we develop new and better sources of food and food-related products... The tough news is that this is another difficult year for funding decisions for the subcommittee. The President has submitted a budget that raises expectations by not structuring spending decisions according to fiscal requirements and program needs. In particular, the President's budget proposes a Research Fund for America, which is intended to reflect the President's commitment to nondefense research programs. The Research Fund for America is essentially a title for existing [R&D] programs which proposes a total of $31 billion for all programs in the fund in fiscal year 1999, an increase of 8 percent over the fiscal year 1998 level... This includes a 10-percent increase for NSF in fiscal year 1999," Senator Christopher S. Bond, Subcommittee Chairman, May 7, 1998 (Hearings Before the Senate Appropriations Committee on the HUD-VA-Independent Agencies Appropriations Act, FY1958, p. 560)

- "Mr. Chairman, the budget before you has the wholehearted approval of the Board. In the face of very tight constraints on Federal discretionary spending, President Clinton has stepped forward to champion a 10 percent increase in NSF's 1999 budget. This important commitment to the strength of our national scientific infrastructure—which I hope will be shared by Congress-would enable NSF to help maintain U.S. world leadership in all aspects of science, mathematics, and engineering. NSF funding is a vital investment in the Nation's future. The budget you are considering today will provide the means to fund thousands of worthwhile projects across the exciting frontiers of all fields of research, and it will fund important efforts to improve the Nation's education in science, mathematics, engineering, and technology... This proposed NSF budget would help keep America at the cutting edge of science. It would enable new discoveries and educate the world's best scientists and engineers—setting the stage for the next millennium. It Is good for the country good for science, and good for economic growth. But most important, it is also good for the American people." Prepared Statement of Dr. Richard Zane, NSB Chairman, May 7, 1998 (Ibid, pp. 565-566)
- "The [House Appropriations] Committee recommends $2,745,000,000 for Research and Related Activities in fiscal year 1999, an increase of $199,300,000 above last year's funding level and $101,800,000 below the budget request. An additional appropriation of $70,000,000 is included in Title IV–General Provisions of this bill. The funding increase over the 1998 level is intended to be spread proportionally throughout NSF's Research and Related Activities as outlined in the budget request and accompanying justification, except as specifically noted below. It is the Committee's intention that within the increased funding level provided for fiscal year 1999, Atmospheric Sciences will receive the budget request of no less than $170,000,000, Earth Sciences the budget request of no less than $106,000,000, and Ocean Sciences the budget request of no less than $230,000,000... " (H. Rpt. 105-610, July 8, 1998, p. 100)
- "The [Senate] Committee recommends an appropriation of $2,725,000,000 for research and related activities. This amount is $179,300,000 above the fiscal year 1998 level and $121,800,000 less than the budget request. While the Committee strongly supports the goals of the [NSF] and recognizes the importance that the Foundation places in the primary initiatives of knowledge and distributed intelligence, life and Earth's environment, and educating for the future, the Committee remains concerned over the [NSF]'s failure to provide a budget justification for fiscal year 1999 that meets the requirements of the Government Performance and Results Act. It is important that all initiatives and programs of NSF be identified with specific funding as well as quantifiable goals and milestones. The Committee expects NSF's fiscal year 2000 budget to establish quantifiable goals and milestones and, absent compliance, the Committee may have to consider appropriating program-specific funding." (S. Rpt. 105-216, June 12, 1998, p. 112)
- "Narrowly avoiding being absorbed into the catchall omnibus appropriations bill, the $93.4 billion [VA-HUD-Independent Agencies appropriations bill] ended up as one of just five separately enacted fiscal 1999 spending measures... The final agreement included... $3.7 billion for [NSF] activities, a 7 percent increase" ("Housing Policy Overhaul Gets Ride to Enactment On Spending Bill For Veterans Affairs, Housing and Urban Development," *CQ Almanac 1998*, 54th ed., 2-101-2-111. Washington, DC: Congressional Quarterly, 1999)

NSF R&D Appropriations for FY2001

Bill: Departments of Veterans Affairs and Housing and Urban Development, and Independent Agencies Appropriations Act, 2001

Public Law: 106-377 **Enacted:** October 27, 2000 **Effective:** October 27, 2000

Nominal change		Real change		Classification
Millions ($)	YOY%	Millions ($2012)	YOY%	
$411.0	13.4%	$421.9	11.6%	Exogenous

Congress significantly increased both nominal and real NSF R&D appropriations for FY2001, an increase again largely motivated by the Clinton administration's push for the 21st Century Research Fund for America prioritizing basic and applied research funded by the NIH and NSF; see "NIH R&D Appropriations for FY2001" for more details. President Clinton requested $4.6 billion for the NSF in FY2001, a 17% increase over FY2000 appropriations—which would have been the largest ever percentage increase. The administration was still keen to use the NSF and NIH to help advance research at American universities, and genomics, super-computing, and nanotechnology were among the administration's top science policy priorities in the FY2001 budget request. The House Appropriations Committee cut $405 million from the administration's request for the NSF's research activities, nonetheless approving a net increase of $170 million above FY2001 appropriations; the House committee was particularly keen to see increased funding support for the NSF's oceanographic science programs. The House Republican majority was operating under tighter spending limits than their Senate counterparties, and President Clinton threatened to veto the first version of the VA-HUD-Independent Agencies appropriation bill, in part because it provided inadequate funding for the NSF. The Senate Appropriations Committee was much more supportive of the administration's request and restored $110 million of research funds cut by the House in the Senate allowance. The Senate was keen on the NSF's new nanotechnology program but worried that the full budget request for that program exceeded the NSF's administrative capacity for the time being, and cut $217 million from the request for that budget account specifically. The increase in NSF research funding appears to have been motivated by long-run scientific competitiveness objectives and concerns about climate change, and does not appear to have been influenced by unemployment, inflation, or any other short-run macroeconomic prerogatives. As such, we classify this policy event as exogenous. Most pertinent narrative evidence:

- "President Clinton this week will ask Congress to approve a nearly $3 billion spending increase to boost science and technology research—money he says is essential for the US to maintain its technological edge... Mr. Clinton said the $2.8 billion in new spending would include a $1 billion increase in biomedical research for the [NIH] and a $675 million increase for the [NSF]. Additional funding also would go to expand research in areas ranging from information technology to space exploration to the development of cleaner sources of energy... Neal Lane, President Clinton's top science adviser, said the additional funding would go a long way towards pushing the nation toward the administration's goal of having government and private enterprise together invest 3% of the country's gross domestic product on [R&D]. He said that number is approaching 2.9%, up from 2.6% when the president was elected... The [NSF] would see the largest increase in its history, up 17% from its current $3.9 billion budget." ("Clinton to Propose More Funding for Research," by Glenn Burkins, *The Wall Street Journal*, January 24, 2000)

- "During the past seven years, I have sought to strengthen science and technology investments in order to serve many of our broader goals for the Nation in the economy, education, health care, the environment, and national defense. Building on the balanced portfolio of basic and applied research in the 21st Century Research Fund, my budget includes a Science and Technology Initiative that places special emphasis on high-priority, long-term basic research, including nanotechnology, the manipulation of matter at the atomic and molecular level, which offers the promise that medical science may one day be able to detect cancerous tumors when they are comprised of only a few cells... The budget provides strong support for the Nation's two largest sources of civilian basic research funding for universities: the [NSF] and the [NIH]." (Budget Message of the President, FY2001, February 7, 2000, p. 7)
- "Over the last several years, private industry has expanded its support for [R&D], but most of these efforts focus on bringing new products to market rather than funding the basic research that can lead to breakthrough applications in a wide range of fields. By supporting basic research that can provide the foundation for tomorrow's technologies, the Federal Government can act as a catalyst for these breakthroughs. Federal investment in basic research increased by nearly 45 percent from 1993 to 2000, with emphasis on health research. The budget proposes $20.3 billion to advance a balanced portfolio in basic research, an increase of $1.3 million, or seven percent, over 2000. This initiative builds upon recent gains for the NIH and furthers the President's commitment to sustained increases in NIH funding. It provides double the largest annual dollar increase ever for NSF, to increase support for Administration research priorities and university-based research. With this initiative, NIH will have grown 82 percent since 1993 and NSF by 66 percent..." (Budget of the United States, FY2001, p. 98)
- "The budget provides $4.57 billion—17 percent more than in 2000—for NSF, whose broad mission is to promote science and engineering research and education across all fields and disciplines. In 1999, NSF-funded scientists reported the first complete DNA sequence of a plant chromosome, which will provide new information about chromosome structure, evolution, intracellular signaling and disease resistance in plants. The budget provides $740 million for NSF's lead role in IT R&D, focusing on long-term computer science research and providing scientists access to world-class supercomputers. The budget also provides $217 million for the National Nanotechnology Initiative. The budget increases funding for biocomplexity research by $86 million, or 173 percent, over 2000 to promote understanding of the complex biological, physical, chemical, and social interactions within and among the Earth's ecosystems. The budget also increases funding for the agency's 21st Century Work Force initiative by $83 million or 115 percent over 2000, focusing on the science of learning and enhancing educational performance and broadening participation in the science, mathematics, engineering, and technology enterprise" (Ibid, p. 103)
- "The [House Appropriations] Committee recommends a total of $3,135,690,000 for Research and Related Activities in fiscal year 2001, an increase of $169,690,000 above last year's funding level and a decrease of $404,990,000 below the budget request... The Committee's recommendation has been developed using the same percentage increase for each directorate as that proposed in the budget submission. In its distribution of funds within each directorate, the Foundation is directed to provide each program, project, and activity the same percentage as that proposed in the budget request... The Committee is concerned with the lack of research addressing linkages between

human health and the world's oceans. Marine systems and processes impact public health in a variety of ways including natural disasters, waterbone diseases, and toxic algal blooms." (H. Rpt. 106-674, June 12, 2000, p. 80)

- "For the [NSF], the [Senate] Committee recommendation totals $4,297,184,000, an increase of $400,000,000 above the fiscal year 2000 enacted level. The Committee views NSF as a key investment in the future, and this funding is intended to reaffirm the strong and longstanding leadership of this Committee in support of scientific research and education." (S. Rpt. 106-410, September 13, 2000, pp. 3-4)
- "The Committee recommends an appropriation of $3,245,562,000 for research and related activities. This amount is $287,100,000 above the fiscal year 2000 enacted level and $295,118,000 below the budget request. The Committee fully supports the Foundation's efforts to push the boundaries of science and technology issues, especially in the areas of information technology, biotechnology, and the administration's new focus on nanotechnology. The Committee also applauds the Foundation's efforts to address the problem of science and mathematics education among K–12, undergraduate, and graduate students... To improve planning and priority-setting for the Foundation and improve the Committee's efforts to understand NSF's long-term budgeting, the Committee directs NSF to provide multi-year budgets for all of its multi-disciplinary activities beginning in fiscal year 2002... The Committee recommends $75,000,000 for the Foundation's biocomplexity initiative, an increase of $25,000,000 over last year's level. The Committee supports this multi-disciplinary initiative. This program should also complement the highly successful Plant Genome Research Program... The Committee recommends $125,000,000 for the new multiagency nanotechnology initiative. The Committee believes that the recommended level of funding will be adequate for the Foundation to begin this initiative in a field that is still regarded to be in its infancy. The recommended level is less than the $216,700,000 requested level due to concerns about the Foundation taking on another major interagency initiative when its administrative resources have remained relatively flat..." (Ibid, pp. 129-131)
- "The Committee recognizes the significant infrastructure needs of our nation's research institutions, especially for smaller research institutions that have not traditionally benefited from Federal programs. The Committee is especially concerned about the larger schools receiving a disproportionate share of scarce Federal resources from indirect cost reimbursements to fund infrastructure needs. As a result, the Committee recommends $75,000,000 to the Foundation's Major Research Instrumentation (MRI) account to address the infrastructure needs of research institutions. NSF is encouraged to target these funds in assisting smaller research institutions." (Ibid. p. 131)
- "The [VA-HUD-Independent Agencies bill] was enacted only after negotiators from the White House and Congress blunted several House Republican policy proposals and agreed to a substantial spending increase, giving President Clinton almost all of what he sought. At $107.3 billion, the bill was the third most expensive of the fiscal 2001 appropriations measures. It increased spending 8 percent above the fiscal 2000 level overall, with a 12 percent increase in discretionary spending, to $82.6 billion... The bill was not nearly so generous at the outset when Republican leaders were hewing to self-imposed discretionary spending caps. The version the House passed in June would have increased spending by 2 percent over fiscal 2000 levels. Clinton threatened a veto on the grounds that the bill... provided too little for housing, environmental protection, space and [NSF] accounts" ("More Than 1,000 Earmarks Adorn Bill for Veterans Affairs,

Housing and Urban Development; Housing Gets Big Boost," *CQ Almanac 2000*, 56th ed., 2-148-2-161. Washington, DC: Congressional Quarterly, 2001)

- "Signaling their eagerness to bring this year's spending battle to an end, Senate appropriators have written a package that would give in to President Clinton on almost all the major sticking points in the appropriations bill for veterans, housing, space and environmental programs. To make that happen, the Senate Appropriations Committee will spend $4.4 billion more on the VA-HUD bill for fiscal 2001 than would the House... The [NSF], which conducts basic science research, would receive $4.3 billion, a 10 percent increase but 6 percent below Clinton's request." (Ibid)

NSF R&D Appropriations for FY2002

Bill: Departments of Veterans Affairs and Housing and Urban Development, and Independent Agencies Appropriations Act, 2002

Public Law: 107-73 **Enacted:** November 26, 2001 **Effective:** November 26, 2001

Nominal change		Real change		Classification
Millions ($)	YOY%	Millions ($2012)	YOY%	
$274.0	7.9%	$307.0	7.6%	Exogenous

Congress again significantly increased both nominal and real NSF R&D appropriations for FY2002, largely motivated by bipartisan congressional support for maintaining rapid real growth in federal support for basic research, particularly in the fields of nanotechnology, supercomputing, and biological sciences. President George W. Bush's first budget touted a large increase in NSF funding over FY2000-2002, but that increase had almost entirely been realized by FY2001; the $4.5 billion proposed for the NSF in FY2002 represented an increase of just $46 million (1.0%) over FY2001 levels, and the agency's Research and Related Activities budget account was slated for a slight decrease in nominal budget authority. However, appropriators on both sides of the aisle were keen to maintain the Clinton administration's recent push for basic research funding growth for the NSF and NIH; see "NIH R&D Appropriations for FY2002" for more details. The administration's budget proposal also drew fire from the scientific community, and Rep. Sherwood Boehlert (R-NY), Chairman of the House Science Committee, criticized the president's planned cuts to the NSF in particular. Senate Appropriations Subcommittee Chairman Barbara Mikulski (D-MD) and ranking member Senator Christopher Bond (R-MO) had struck a bipartisan pledge to double the NSF's budget over the next five years, with Mikulski declaring they both believed that "science is about ideas, not about ideology" and that "new ideas that lead to new products, that lead to new jobs." The Senate Appropriations Committee reported their bill first, proposing $4.7 billion for the agency, $200 million above and beyond the budget request, with particular emphasis on increasing federal support for nanotechnology research, which the committee report called "the next frontier in science and engineering with the possibility of revolutionizing nearly every aspect of society." The House committee in turn proposed $4.8 billion for the agency, $168 million above the Senate allowance, and the conferees settled just under $4.8 billion, closer to the House-approved level. A budget score-keeping change from rescinding $1.2 billion in unspent HUD funds facilitated the substantial increase in NSF funding, shuffling funds across agencies in the same appropriations bill. The increase in NSF research funding appears to have been motivated by bipartisan science policy objectives and promoting long-run innovation and growth, and does not appear to have been influenced by unemployment, inflation, or other short-run macroeconomic

prerogatives. As such, we classify this policy event as exogenous. Most pertinent narrative evidence:

- "More than half of the Nation's economic productivity growth in the last 50 years is attributable to technological innovation and the science that supported it. Appropriately, the private sector makes the largest investments in technology development. The Federal Government, however, also plays a role. Total Federal [R&D] would be at an all-time high in inflation-adjusted terms if the President's proposal is approved..." (Budget of the United States, FY2002, p. 29)
- "Under the President's plan, between 2000–2002, NSF's budget will grow by 15 percent to $4.5 billion. This significant increase is consistent with the President's support for increasing the Federal investment in basic R&D, and funding NSF as the primary agency for supporting peer-reviewed, competitively awarded, long-term, high-risk research conducted through our Nation's university systems. For 2003, the Administration will undertake a budgetary review to determine how best to support the NSF's budget in a sustained manner over time. While NSF represents just three percent of Federal R&D spending, it supports nearly half of the non-medical basic research conducted at academic institutions, and provides 30 percent of Federal support for mathematics and science education..." (Ibid, p. 33)
- "The administration's proposed spending on science for next year has far more decreases than increases, key leadership positions are unfilled, and grumbling has reached new heights. Even Republican leaders are criticizing some of the budget cuts as dangerous for the nation's well-being... In President Bush's budget proposal for the fiscal year beginning Oct. 1, research spending, after inflation, is down at Agriculture, Commerce, Interior, Energy, Education, the [NSF], the Environmental Projection Agency and [NASA]. The main winners are health and defense... To be sure, scientists regularly grumble that the government is not spending enough on research, and many of the administration's sharpest critics would stand to benefit from increased support for research. Also, previous administrations have occasionally left major science posts unfilled in their early months. But perhaps because science research budgets enjoyed robust expansion in the Clinton years, scientific leaders are now expressing an unusual sense of dismay. They have also criticized the administration's early actions on climate, the environment, antimissile defense and toxic chemicals, saying good science advice could have averted missteps... Representative Sherwood Boehlert, a Republican of New York, who is chairman of the House Science Committee, said recently that the administration's overall science budgets were too low and that some proposed cuts left him "very disturbed." He singled out those planned for the Energy Department (4.5 percent) and the [NSF] (1.6 percent), which is the main conduit of government support for civilian basic research in the physical sciences" ("Bush Actions, And Inaction, Set Scientists Grumbling," by William J. Broad, *New York Times*, May 15, 2001)
- "Before I welcome our witnesses, I would like to say a few words about this auspicious moment. I would like to say to my colleague, Senator Bond, that I assume this chairmanship in the spirit of bipartisanship that has always characterized this subcommittee... In the area of science and technology, we have really again focused on a bipartisan basis. [Ranking Member] Senator Bond and I believe that science is about ideas, not about ideology. We have supported our space program where we have taken it to the stars and seen untold discoveries. And in the area of the [NSF], on which we are holding today's hearing, we have an agreed-upon plan in which we want to double

the [NSF] budget over the next 5 years. We believe that science is about new ideas that lead to new products, that lead to new jobs." Senator Barbara A. Mikulski, Subcommittee Chair, June 6, 2001 (Hearings Before the Senate Appropriations Committee on VA-HUD-Independent Agencies Appropriations for FY2002, pp. 275-276)

- "The [Senate Appropriations] Committee recommends $3,514,481,000 for research and related activities. This amount is $171,851,000 more than the fiscal year 2001 enacted level and $187,500,000 above the budget request. The Committee's recommendation makes the following changes to the budget request: +$75,000,000 for disciplinary research; +$25,000,000 for nanoscience and engineering research; +$25,000,000 for information technology research; +$10,000,000 for plant genome research; +$5,000,000 for mathematics; +$25,000,000 for major research instrumentation; +$10,000,000 for regional innovation clusters; and +$12,500,000 for increased energy and fuel costs for polar activities, the academic fleet, the Ocean Drilling Program, and other national NSF user facilities facing significantly increased energy costs... The Committee has provided an additional $25,000,000 to the request for nanoscience and engineering. Nanotechnology represents the next frontier in science and engineering with the possibility of revolutionizing nearly every aspect of society—from manufacturing to disease diagnosis and treatment, and computing and communications. These funds will allow the Foundation to expand research at the molecular and atomic scales and develop new techniques to aid in the application of nanotechnology research results." (S. Rpt. 107-43, July 20, 2001, p. 114)
- "The [House Appropriations] Committee recommends a total of $3,642,340,000 for Research and Related Activities in fiscal year 2002, an increase of $292,340,000 above last year's funding level and an increase of $315,359,000 above the budget request... Within the additional funds made available for Computer and Information Science and Engineering, up to $10,000,000 may be used by NSF for ongoing operational support of the two funded terascale computing systems... the Foundation is expected to aggressively continue its program, begun last year, of upgrading on a priority basis its astronomical facilities and equipment... The Committee commends the NSF leadership for their recognition of the needs of the mathematical sciences, and their efforts to provide the support that is required to meet those needs. Within the general Nanotechnology Science and Engineering program area, the Committee urges NSF to consider a stronger emphasis on research that explores biological mechanisms at the molecular force level and then translates these findings up through hierarchical scales of structure and organization to provide unique designs for engineered devices." (H. Rpt. 107-159, July 25, 2001, pp. 92-93)
- "In several cases, the [House appropriations] subcommittee decided to spend more than Bush had requested for space and science programs. The panel rejected the modest $47 million increase proposed for the NSF, approving $4.8 billion in new budget authority, a $414 million increase over fiscal 2001." ("VA-HUD Funds Grow $4.4 Billion," *CQ Almanac 2001*, 57th ed., 2-51-2-54. Washington, DC: Congressional Quarterly, 2002)
- "The [VA-HUD-Independent Agencies] bill's final spending total was $609 million less than the Senate version and roughly equal to the House-passed level. On a programmatic basis, however, lawmakers actually brought spending close to Senate levels by rescinding $1.2 billion of unspent HUD money, mostly from Section 8 rental assistance funds... The bookkeeping changes allowed appropriators to provide an 8 percent increase to the [NSF], raising its funding to $4.8 billion—its highest level ever." (Ibid)

NSF R&D Appropriations for FY2003

Bill: Consolidated Appropriations Resolution, 2003; Division K—Veterans Affairs and Housing and Urban Development, and Independent Agencies Appropriations, 2003

Public Law: 108-7 **Enacted:** February 20, 2003 **Effective:** February 20, 2003

Nominal change		Real change		Classification
Millions ($)	YOY%	Millions ($2012)	YOY%	
$466.0	12.4%	$504.1	11.5%	Exogenous

Congress again significantly increased both nominal and real NSF R&D appropriations for FY2003, largely motivated by bipartisan congressional support for maintaining rapid real growth in federal support for basic research as well as newfound concerns related to the 9/11 terrorist attacks, anthrax attacks, and cybersecurity vulnerabilities. The Bush administration proposed $5.0 billion in FY2003 budget authority for the NSF, a $239 million (5.0%) increase over enacted funding levels for FY2002; the administration had started scoring federal agencies by efficiency, and the NSF was in their good graces, being the only agency to receive top marks for financial management. Newfound national security concerns about the war on terror, chemical and biological terrorism, and domestic terrorism also benefited the research budgets of the NIH, NSF, and several other nondefense agencies; see "NIH R&D Appropriations for FY2003" for more details. Still committed to doubling the NSF's budget over five years, the Senate Appropriations Committee proposed $5.4 billion for the NSF, an increase of $325 million over the budget request, largely compelled by concerns about national security and maintaining U.S. competitiveness in a global economy; the committee was particularly concerned that both the public and private sector had underinvested in cybersecurity research and allowed an additional $25 million for computer and network security in their allowance. The House committee added $70 million in their allowance for the NSF above and beyond the Senate's proposed funding level, approving a net increase of $551 million (15.3%) for the NSF's research programs relative to FY2002 funding levels. The increase in NSF research funding appears to have been motivated by national security concerns, bipartisan science policy objectives, and promoting long-run innovation and economic growth, and does not appear to have been influenced by unemployment, inflation, or any other short-run macroeconomic prerogatives. As such, we classify this policy event as exogenous. Most pertinent narrative evidence:

- "By curtailing unsuccessful programs and moderating the growth of spending in the rest of government, we can well afford to fight terrorism, take action to restore economic growth, and offer substantial increases in spending for improved performance at low-income schools, key environmental programs, health care, science and technology research, and many other areas." (Budget Message of the President, FY2003, February 4, 2002)
- "The [NSF] received the only "green" [efficiency] score. NSF did so in financial management because it has embraced advanced information technologies, and operates in a paperless environment. Its grant workload more than doubled from $2.1 billion in 1990 to $4.4 billion in 2000, yet the number of employees actually decreased." (Budget of the United States, FY2003, p. 48)
- "NSF is the leading performer among federal agencies funding basic research. For example, of the nearly 10,000 awards NSF makes annually, 94 percent of the research awards are made through competition, based on merit review. A competitive merit

review process ensures that high-quality research is funded... One of NSF's many strengths is its flexibility to redirect resources to emerging science and engineering opportunities. Unlike other agencies that own and operate numerous laboratories, NSF owns facilities related to only a few programs, such as the U.S. Antarctic Program. NSF is largely free from ongoing institutional obligations. In addition, NSF awards do not last indefinitely. The average NSF grant is typically for three years. This minimizes research stagnation or funding research that ceases to be important or cutting-edge." (Ibid, pp. 338-339)

- "The [Senate] Committee recommends an appropriation of $5,353,360,000 for the [NSF] in fiscal year 2003. This represents an increase of $564,120,000 over the fiscal year 2002 level and $325,140,000 more than the budget request. The Committee was guided in its allocation of resources for the Foundation by two central considerations. First, productivity growth, powered by new knowledge and technological innovation, makes the economic benefits of a comprehensive fundamental research and education enterprise abundantly clear. New products, processes, entire new industries, and the employment opportunities that result, depend upon rapid advances in research and their equally rapid movement into the marketplace. In today's global economy, continued progress in science and engineering and the transfer of the knowledge developed is vital if the United States is to maintain its competitiveness. In addition, the events of September 11 and subsequent anthrax attacks demonstrate that a nation strong in science and technology can respond rapidly and effectively to crises and changing national circumstances. Fundamental research across the full spectrum of science and engineering disciplines in an appropriately balanced manner, together with the highly skilled workforce that makes research and innovation possible, provides the intellectual capital for the nation to draw upon in times of need. A growing stock of knowledge focused on the frontiers of research increases the options available for response. A diverse, internationally competitive, and globally engaged science and engineering workforce accelerates the development of new technologies to meet unexpected needs." (S. Rpt. 107-222, July 25, 2002, p. 122)
- "The [Senate] Committee recommends $4,131,630,000 for research and related activities. This amount is $532,990,000 or 15 percent more than the fiscal year 2002 level and $348,420,000 more than the budget request. This funding level is consistent with proposals to double the NSF research budget over five years... The Nation has become vulnerable to cyber-attacks, in part, because critical aspects of daily life rely on computer systems, networks, and the internet (e.g., water systems and electricity grids). Currently-available technologies provide inadequate protection, yet relatively little research is being conducted to develop new approaches to protecting computer systems and networks. The private sector has had little incentive to invest in cyber security because the market emphasizes only speed and convenience. The Federal Government has not filled the gap, but instead has chronically underinvested in cyber security. As a result, what little research has been done on cyber security has been incremental, leaving the basic approaches to cyber security unchanged for decades. As a field with relatively modest support, few researchers, and minimal attention, cyber security fails to attract the interest of students, perpetuating the problems of a lack of trained personnel. Therefore, the Committee is providing $25,000,000 to be used to strengthen support for research in computer and network security. The Committee expects these funds will be used to support both individual investigators and a number of interdisciplinary research centers in computer and network security research." (Ibid,

p. 123)

- "The [House Appropriations] Committee recommends a total of $5,422,942,000 for fiscal year 2003. This recommendation is an increase of $614,402,000, or 13 percent, above last year's appropriation and an increase of $394,732,000 above the President's budget request. The Committee is strongly supportive of the [NSF] and committed to its mission of providing national leadership and federal financial support of research as the basis for scientific and social advancement for the nation and for the entire world. This commitment is reflected in the substantial 13 percent increase provided in this bill for the NSF for FY 2003... The Committee recommends a total of $4,150,000,000 for Research and Related Activities in fiscal year 2003, an increase of $551,660,000 above last year's funding level and an increase of $366,800,000 above the budget request. This represents a 15.3 percent increase over the fiscal year 2002 appropriated level for this entire account and provides an increase of at least 15 percent over the fiscal 2002 funding level for seven of the nine Research and Related Activities' directorates" (H. Rpt. 107-740, October 10, 2002, pp. 155-157)
- "The [NSF] would have received $5.4 billion under the House bill, a 13 percent increase over fiscal 2002. The Senate bill included $5.35 billion for the foundation. Bush had requested $5 billion... The Senate committee rejected a Bush plan to transfer other science programs, such as the National Oceanic and Atmospheric Administration's Sea Grant program and the EPA environmental education program, to the NSF. Mikulski said she thought her committee would not get an increase in funding if all those programs were included under the NSF." ("Lean Times for VA-HUD Bill," *CQ Almanac 2002*, 58th ed., 2-38-2-39. Washington, DC: Congressional Quarterly, 2003)

NSF R&D Appropriations for FY2007

Bill: Revised Continuing Appropriations Resolution, 2007; Departments of Commerce and Justice, Science, and Related Agencies Appropriations Act, 2007

Public Law: 110-5 **Enacted:** February 15, 2007 **Effective:** February 15, 2007

Nominal change		Real change		Classification
Millions ($)	YOY%	Millions ($2012)	YOY%	
$332.0	7.3%	$281.8	5.6%	Exogenous

Congress significantly increased both nominal and real NSF R&D appropriations for FY2007, largely motivated by the Bush administration's new American Competitiveness Initiative, of which NSF funding was a cornerstone. In his State of the Union Address, President Bush pledged to double funding for basic research in the physical sciences over the next decade, with particular emphasis on "nanotechnology, supercomputing, and alternative energy sources." Accordingly, the FY2007 budget request proposed $6.0 billion for the agency, an increase of $439 million (7.9%) over FY2006 funding levels, one intended to "keep America at the forefront of world discovery and innovation." The House Appropriations Committee approved the full requested increase for the NSF, expressing support for the administration's desire to double the NSF's budget over the next decade and commending the agency's work in nanotechnology. Their Senate counterparts modestly reduced the budget request, cutting $28 million from NSF funding, but the conference committee settled on a very significant increase for the agency nonetheless. The net increase in NSF research funding appears to have been motivated by bipartisan science policy objectives and

promoting long-run innovation and growth, and does not appear to have been influenced by unemployment, inflation, or any other short-run macroeconomic prerogatives. As such, we classify this policy event as exogenous. Most pertinent narrative evidence:

- "Tonight I announce an American Competitiveness Initiative to encourage innovation throughout our economy and to give our Nation's children a firm grounding in math and science. First, I propose to double the Federal commitment to the most critical basic research programs in the physical sciences over the next ten years. This funding will support the work of America's most creative minds as they explore promising areas such as nanotechnology, supercomputing, and alternative energy sources..." George W. Bush, State of the Union Address, January 31, 2006 (*The American Presidency Project*, by Gerhard Peters and John T. Woolley, https://www.presidency.ucsb.edu/node/214381)
- "My fellow Cabinet colleagues and I are thrilled to have the opportunity to talk with you all this morning about the American Competitiveness Initiative that the President laid out last night. It is a bold plan that speaks to the needs of Americans throughout their lifetimes... The [NSF] is a major player in this program, the American Competitiveness Initiative. The [NSF] is the lead agency for two of the major physical science research programs in the nation, the National Nanotechnology Initiative, and the Networking and Information Technology R&D Initiative, both of which are interagency programs that are vital to the economic competitiveness of the future." Margaret Spellings, Press Briefing by Administration Officials on American Competitiveness Initiative, February 1, 2006 (*The American Presidency Project*, by Gerhard Peters and John T. Woolley, https://www.presidency.ucsb.edu/node/272718)
- "As part of the President's American Competitiveness Initiative, the 2007 Budget provides an increase of 7.9 percent for the [NSF], initiating a 10-year commitment to double NSF's investments in science and engineering. NSF research builds the foundations for innovative technologies that drive economic growth and enhance America's quality of life. A broad portfolio of research—from physics, chemistry, mathematics, engineering, and computer science, to the geological, biological, behavioral, and social sciences—will energize science broadly, sustain the productivity of the Nation's science and engineering enterprise, and keep America at the forefront of world discovery and innovation." (Budget of the United States, FY2007, pp. 274)
- "NSF is a leading agency in the National Nanotechnology Initiative, funding nanotechnology investments at $373 million in 2007, an increase of 8.6 percent from 2006 and of nearly 150 percent since 2001. Nanotechnology research will continue to advance the fundamental understanding of materials at the subatomic, atomic, and molecular levels and will enable the development of capabilities to design, manipulate, and construct revolutionary devices and materials with unprecedented properties. A broad range of developing technologies is likely to emerge from this field, including high-performance materials; more efficient manufacturing processes; increased computer storage capacity; and biomedical applications ranging from efficient drug delivery systems to cancer therapies. The 2007 Budget funds approximately 50 new nanotechnology interdisciplinary research teams." (Ibid, p. 274)
- "The 2007 Budget supports research tools critical to scientists and engineers, such as instruments, equipment, facilities, databases, and large surveys. Development of state-of-the-art infrastructure and facilities substantially enhances research efforts throughout a wide range of fields, including astronomy, earthquake research, and environmental research. Computing and advanced networking tools that broadly benefit the Nation's

entire science and engineering community, collectively known as "cyberinfrastructure," have become essential to advancing the frontiers of knowledge through science and engineering. The Budget provides $600 million for NSF's targeted investments in these tools." (Ibid, p. 275)

- "The [House Appropriations] Committee recommends a total of $4,665,950,000 for Research and Related Activities. The recommendation is $334,467,000 above the fiscal year 2006 level and the same as the request. The Committee strongly supports the increased funding for basic scientific research proposed in the President's American Competitiveness Initiative for fiscal year 2007. The increase provided for fiscal year 2007 is intended as the first year of a ten-year doubling of the Federal investment in innovation-enabling research supporting high-leverage fields of physical science and engineering... The Committee commends NSF for its Silicon Nanoelectronics and Beyond program and its partnership with the Nanoelectronics Research Initiative, which involves the sponsorship of research in the areas of information technology and electronics. The Committee encourages NSF to continue its support for such research in fiscal year 2007." (H. Rpt. 109-520, June 22, 2006, pp. 101-102)
- "The [Senate] Committee recommendation provides $5,991,690,000. The recommendation is $410,524,000 above the fiscal year 2006 enacted level and $28,322,000 below the budget request... The Committee has had to make difficult funding choices within the amount provided to the Foundation for the coming fiscal year. NSF plays a critical role in supporting fundamental research, education, and infrastructure at colleges, universities, and other institutions throughout the country. Through these efforts, NSF provides funds for discovery in many fields, but also holds the unique stewardship within the Federal [R&D] enterprise of developing the next generation of scientists and engineers. In order to preserve NSF's intrinsic nature of providing basic research grants across many scientific disciplines, the Committee has chosen to concentrate the available funds on areas that will preserve the Nation's ability to lead the world in the areas of basic research." (S. Rpt. 109-280, July 13, 2006, p. 125)

NSF R&D Appropriations for FY2009

Primary Bill: American Recovery and Reinvestment Act of 2009

Public Law: 111-5 **Enacted:** February 17, 2009 **Effective:** February 17, 2009

Secondary: Omnibus Appropriations Act, 2009; Commerce, Justice, Science, and Related Agencies Appropriations Act, 2009

Public Law: 111-8 **Enacted:** March 11, 2009 **Effective:** March 11, 2009

Nominal change		Real change		Classification
Millions ($)	YOY%	Millions ($2012)	YOY%	
$3,204.0	63.7%	$3,323.7	62.4%	Endogenous

Congress appropriated a significant increase in both nominal and real NSF R&D appropriations for FY2009, both through the regular appropriations process and through ARRA, the largest fiscal stimulus bill enacted in response to the Great Recession. In its last budget request, the outgoing Bush administration again proposed significant increases in the NSF's science programs as part of its American Competitiveness Initiative, policies aimed at long-run economic competitiveness; the budget request proposed $6.9 billion for the

NSF, an increase of $789 million (13.0%) over enacted funding levels for FY2008. Both the House and Senate Appropriations Committees approved the full budget request for the NSF, but the appropriations process broke down during the lame-duck period of the Bush administration, and the VA-HUD-Independent Agencies appropriations bill was bundled into an omnibus bill enacted shortly after President Obama was inaugurated; see "Energy R&D Appropriations for FY2009" for more details. Shortly before enactment of the omnibus, ARRA appropriated an additional $2.5 billion for the NSF's Research and Related Activities budget account and another $400 million for major research equipment and facilities construction as part of the effort to stimulate economic activity during the Great Recession. The accompanying Senate Appropriations Committee report stated that their (smaller-than-enacted) proposed increase in NSF funding was "expected to create an estimated 25,000 jobs," and the House committee was similarly focused on the number of grant awards and positions supported by the emergency stimulus spending for the NSF. Because the increases in NSF's funding levels for FY2009 appear to have been intended as a form of fiscal stimulus to combat the economic downturn and boost employment, we classify this policy event as endogenous. Most pertinent narrative evidence:

- "The President's 2009 Budget will: Support aggressive funding for key research agencies to advance basic science through the President's American Competitiveness Initiative; Invest in the foundations for innovative technologies that drive future economic growth; Provide research facilities needed to keep America at the forefront of science and engineering; and Enhance fellowship and early-career opportunities for beginning researchers... [The NSF budget] Increases 14 percent over the 2008 enacted level, including a 16-percent increase for NSF's primary research activities." (Budget of the United States, FY2009, p. 125)
- "Under President Bush's proposed federal budget announced on Monday, research in the physical sciences would receive a hefty boost. That is welcome news to physicists in a broad swath of fields, from those who study the tiniest of fundamental particles to those trying to understand basic science that could lead to future energy sources. It is especially welcome after two years of tight financial constrictions resulting from money wrangling between Congress and the White House that have turned off some experiments, delayed others, and left some scientists unemployed... The [NSF] would receive $6.85 billion, an increase of $822 million, or 14 percent over this year... Any optimism about the proposed budget is tempered by experience. In the past two years, Mr. Bush also proposed significant increases for the physical sciences budget, but the increases largely vanished by the time Congress finished the final spending bills... Last year, Mr. Bush again sought sizable increases for physical sciences research as part of his 2008 spending plan, in line with a promise to double financing by 2016. The increases for physical sciences research were offset by cuts elsewhere, including a cut for the [NIH]... Further complicating the process is the presidential election. There is widespread speculation that the Democratic-controlled Congress will delay passage of the budget bills in hopes that the next president will be a Democrat and more amenable to its priorities" ("Physicists Hope U.S. Budget Will Mean an End to Research Cuts," by Kenneth Chang, *New York Times*, February 05, 2008)
- "The [Senate Appropriations] Committee recommendation provides $5,593,990,000. The recommendation is $772,516,000 above the fiscal year 2008 enacted level and the same as the budget request... The recommendation provides a nearly 14 percent increase over the fiscal year 2008 enacted level. The Congress conveyed its clear deter-

mination to build on America's success as a world leader in discovery and innovation through the passage of the America COMPETES Act last year. The Committee's fiscal year 2008 recommendation for NSF was to have been the first phase of delivering on the promises and policies outlined by this landmark legislation. Unfortunately, as the fiscal year 2008 appropriation cycle progressed, it was clear that the administration was unwilling to compromise with Congress. This intransigence forced Congress to reluctantly reduce the proposed increases for NSF in order to avoid devastating consequences to other domestic programs. The Committee's fiscal year 2009 recommendation renews its commitment to Federal long-term basic research that has the potential to be transformative to our economy and our way of life." (S. Rpt. 110-397, June 23, 2008, pp. 102-103)

- "Sustained, targeted investment by NSF in basic research in fundamental science and engineering advances discovery and spurs innovation. Such transformational work holds promise for meeting the social, economic, and environmental challenges facing the Nation, and for competing in an increasingly intense global economy. To meet these challenges, the America COMPETES Act proposed to double funding for the NSF in seven years. The funding provided in the recovery will return and exceed appropriated levels to the levels assumed in the COMPETES Act. The $2.5 billion proposed for research and related activities (R&RA) is estimated to support an additional 3,000 highly-rated, new awards and would immediately engage 12,750 senior personnel, postdoc, graduate and undergraduates." (H. Rpt. 111-4, January 26, 2009, p. 23)
- "The [Senate] Committee recommends a total of $1,402,000,000 for the [NSF]. This funding is critical to support valuable investments for America's competitiveness in research and technology, and is expected to create an estimated 25,000 jobs. NSF is directed to provide a spending plan no later than 60 days after enactment of this act detailing the proposed use of these funds... The Committee recommends $1,200,000,000 for Research and Related Activities which is intended to directly impact the research community and engage a workforce of scientists, technicians, engineers, and mathematicians, which will enhance and support the Nation's scientific innovation and economic competitiveness. NSF shall use these funds to support activities within all research disciplines. The Foundation is encouraged to renovate and maintain existing NSF facilities, including the University-National Oceanographic Laboratory System vessels and associated property. NSF shall also include $50,000,000 for supporting advancements in supercomputer technology." (S. Rpt. 111-3, January 27, 2009, pp. 21-22)
- "After being traumatized when Congress suddenly slashed research budgets for science agencies last year, scientists were pleasantly surprised to find that they did not lose out again in the last round of negotiations on the stimulus plan. The plan largely restores [R&D] money for the basic sciences in the House version of the bill, while keeping $10 billion for the [NIH], championed by Senator Arlen Specter of Pennsylvania, a cancer survivor and one of three Republican votes for the plan. The bill includes $3 billion for the [NSF], $1 billion for [NASA], and $1.6 billion for the Energy Department's Office of Science. The science foundation money includes $100 million for laboratory equipment at universities and $400 million for speeding construction of projects like a neutrino detector in Antarctica, a radio telescope in Chile, and advanced gravity wave detectors in Louisiana and Washington State." ("Research and Development Aid Restored," by Kenneth Chang, *New York Times*, February 14, 2009, February 14, 2009)

NSF R&D Appropriations for FY2010

Primary Bill: Consolidated Appropriations Act, 2010; Commerce, Justice, Science, and Related Agencies Appropriations Act, 2010

Public Law: 111-117 **Enacted:** December 16, 2009 **Effective:** December 16, 2009

Nominal change		Real change		Classification
Millions ($)	YOY%	Millions ($2012)	YOY%	
-$2,554.0	-31.0%	-$2,781.6	-32.2%	Endogenous

Congress appropriated significant decreases in both nominal and real NSF R&D funding for FY2010, entirely driven by the reversal of a surge in emergency ARRA stimulus funding provided for the NSF in FY2009. The Obama administration requested $7.0 billion for the NSF in FY2010, a $436 million (6.6%) increase over regular order appropriations from the previous year, but $2.4 billion less than total NSF appropriations for FY2009 when factoring in ARRA stimulus spending for the agency. The House and Senate appropriations committees both slightly pared back the administration's request, cutting $109 million and $128 million, respectively; the conference committee roughly split the difference between the House and Senate allowances, settling on $6.9 billion for the agency. In addition to influencing a sizable annual decrease in NSF appropriations, ARRA was also motivating increases in the NSF's regular order budget; the House Appropriations Committee noted that it was important to maintain support for the NSF following the sizable increases in FY2009 from ARRA and the FY2009 Omnibus Appropriations Act "so as to avoid a boom-bust cycle in science, engineering, and mathematics employment." Because the decrease in NSF R&D funding for FY2010 was driven by the reversal of a one-off fiscal stimulus appropriated for FY2009 to combat the recession and related knock-on effects, we classify this policy event as endogenous. Most pertinent narrative evidence:

- "Investments in science and technology foster economic growth, create millions of high-tech, high-wage jobs that allow American workers to lead the global economy, improve the quality of life for all Americans, and strengthen our national security. For these reasons, the Budget doubles funding for basic research over ten years, beginning with $3 billion for the [NSF] in [ARRA] and a 2010 Budget that increases NSF funding by $950 million over 2008." (Budget of the United States, FY2010, p. 105)
- "In a speech on Monday at the National Academy of Sciences in Washington, President Obama presented a vision of a new era in research financing comparable to the Sputnik-period space race, in which intensified scientific inquiry, and development of the intellectual capacity to pursue it, are a top national priority. The president laid out an ambitious plan to invigorate the country's pipeline for innovation, from grade-school classrooms to corporate, government, and academic research laboratories. Mr. Obama's plan includes fulfilling commitments dating from the Bush administration to double the budgets of the [NSF], the science office of [DOE] and the National Institute of Standards and Technology... Overall, he described his initiative as "the largest commitment to scientific research and innovation in American history," receiving hearty applause from the scientists and observers who packed the halls at the National Academy headquarters for the group's annual meeting... He provided fresh detail on an initiative, already included in the economics stimulus bill, creating a $5 billion "Race to the Top" fund available to states doing the most to increase the ranks of trained science and math teachers. Mr. Obama noted that the country faced a

shortfall of more than 280,000 math and science teachers by 2015. He pledged to lift public and private investment in [R&D] in the United States beyond its high point in 1964, at the peak of the space race and Cold War, when such money was 3 percent of the gross domestic product." ("Invoking the Sputnik Era, Obama Vows Record Outlays for Research," by Andrew C. Revkin, *New York Times*, April 28, 2009)

- "[ARRA] included an additional $3,002,000,000 in funding for NSF. Roughly two-thirds of these added funds will support 2-, 3-, 4-, and 5-year research grants, with the overwhelming majority of this amount likely going to fund 3-year grants, consistent with normal NSF practice. These grants will encourage many undergraduate science, engineering, and mathematics majors to go to graduate school in their technical fields and will support a pulse of research positions employing new graduate degree recipients. The budget request projects NSF funding in fiscal year 2012 of $8,490,000,000. This level is only $1,990,000,000 above the base level for fiscal year 2009. The Committee expects future budget requests for NSF at least adequate to sustain the levels of science workforce supported in fiscal year 2009 by the combined Omnibus Appropriations Act, 2009 (Public Law 111–8) and ARRA so as to avoid a boom-bust cycle in science, engineering, and mathematics employment. It is critical that there be sufficient NSF funding in fiscal year 2012 to support opportunities for this pulse of additional graduate students and young researchers to continue their careers when the 3-year grants funded by ARRA expire. The budget request projects NSF funding in fiscal year 2011 of $7,250,000,000, which is less than 3 percent above the fiscal year 2010 request. The Committee finds this level of request inadequate given the critical role played by NSF and the Nation's colleges and universities. A 7 percent increase, as projected for the annual increases in fiscal years 2013–2016, would be more consistent with a 10-year doubling of NSF's budget." (H. Rpt. 111-149, June 12, 2009, p. 154)
- "The Commerce-Justice-Science section of the omnibus provided... $6.9 billion for the [NSF], $436 million more than regular fiscal 2009 appropriations. The NSF got $3 billion in extra fiscal 2009 funds under the stimulus law." ("C-J-S Spending Bill Sets Tone for Year," *CQ Almanac 2009*, 65th ed., edited by Jan Austin, 2-17-2-19. Washington, DC: CQRoll Call Group, 2010)

NSF R&D Appropriations for FY2011

Primary Bill: Department of Defense and Full-Year Continuing Appropriations Act, 2011; Title III—Commerce, Justice, Science, and Related Agencies

Public Law: 112-10 **Enacted:** April 15, 2011 **Effective:** April 15, 2011

Nominal change		Real change		Classification
Millions ($)	YOY%	Millions ($2012)	YOY%	
-$54.0	-1.0%	-$207.7	-3.5%	Exogenous

Congress appropriated a modest decrease in nominal funding for NSF R&D for FY2011, resulting in a more significant decline in real terms, as the regular order budget process broke down in late 2010 and the newly elected House Republican majority demanded sharp cuts to nondefense discretionary spending in early 2011; see "Energy R&D Appropriations for FY2011" for more details. The Obama administration had proposed $7.4 billion for the NSF in FY2011, an increase of $552 million (8.0%) over FY2010 funding levels, but this request was a world away from the eventual appropriations level enacted after the midterm elections.

The House Appropriations Subcommittee approved this request in full, but the full House Committee never moved the bill, and the Senate Appropriations Committee cut just $71 million from the budget request during regular order work on their bill. However, with the collapse of the regular appropriations process and intensified partisan budgetary disputes after the 2010 midterms, FY2011 appropriations for the NSF ended up being cut back rather than increased, as was the case for almost every nondefense agency. House Republicans had campaigned on a platform of cutting nondefense discretionary spending back to FY2008 levels, which would have required cutting the NSF's budget by $1 billion (19%), reversing earlier bipartisan pledges to double the agency's budget within five or ten years. The NSF actually fared better than many other science and technology agencies amidst the budget-cutting fervor; the Commerce-Justice-Science appropriations in the omnibus were cut by $10.9 billion (-17%) relative to FY2010 levels, although some of that reduction reflected a one-off decline in Census Bureau funding after the decennial census. The net decrease in NSF R&D funding appears to have been related to concerns about long-term deficit reduction and partisan disagreement about the appropriate size and role of the federal budget, and appears unrelated to any concerns about unemployment or other short-run macroeconomic prerogatives; see also "NASA R&D Appropriations for FY2011" for more details. As such, we classify the policy changes as exogenous. Most pertinent narrative evidence:

- "Federal financing of science research, which has risen quickly since the Obama administration came to power, could fall back to pre-Obama levels if the incoming Republican leadership in the House of Representatives follows through on its list of campaign promises. In the Republican platform, Pledge to America, the party vows to cut discretionary nonmilitary spending to 2008 levels. Under that plan, [R&D] at nonmilitary agencies—including those that sponsor science and health research—would fall 12.3 percent, to $57.8 billion, from Mr. Obama's request of $65.9 billion for fiscal year 2011. An analysis by the American Association for the Advancement of Science looked at what would happen if all of the agencies were cut to the 2008 amounts. The [NIH] would lose $2.9 billion, or 9 percent, of its research money. The [NSF] would lose more than $1 billion, or almost 19 percent, of its budget, and the National Oceanic and Atmospheric Administration would lose $324 million, or 34 percent." ("Money for Scientific Research May Be Scarce With a Republican-Led House," by Kenneth Chang, *New York Times*, November 10, 2010)
- "Investment in science and basic research is critical to long-term economic growth. That's why the Budget invests $61.6 billion in civilian [R&D], an increase of $3.7 billion, a 6.4 percent increase, and an amount that continues the commitment to double funding for three key basic research agencies—the [NSF], the [DOE's] Office of Science, and the National Institute of Standards and Technology. This funding includes $1.8 billion for research in basic energy sciences to discover novel ways to produce, store, and use energy to address energy independence and climate change and $300 million for the Advanced Research Projects Agency-Energy, to accelerate game-changing energy technologies in need of rapid and flexible experimentation or engineering. The Budget includes increased funding for research to help create the foundation for the industries and jobs of the future, such as nano-manufacturing, advanced robotics, and new tools for the design of biological systems." (Budget of the United States, FY2011, p. 21)
- "NSF is the principal Federal agency charged with promoting science and engineering education from pre-kindergarten through career development. This helps ensure that the United States has world-class scientists, mathematicians, and engineers, and

well-prepared citizens for today and the future. In today's global economy, continued progress in science and engineering and the transfer of the knowledge developed is vital if the United States is to maintain its competitiveness. NSF is at the leading edge of the research and discoveries that will create the jobs and technologies of the future... The [Senate] Committee's recommendation provides $5,967,180,000 [for research and related activities]. The recommendation is $403,260,000 above the fiscal year 2010 enacted level and $51,650,000 below the budget request. The Research and Related Activities appropriation funds scientific discovery, trains a dynamic workforce and supports broadly accessible state-of-the-art tools and facilities. Research activities will contribute to the achievement of these outcomes through the expansion of the knowledge base; integration of research and education; stimulation of knowledge transfer among academia and public and private sectors; and international activities, and will bring the perspectives of many disciplines to bear on complex problems important to the Nation..." (S. Rpt. 111-229, July 22, 2010, pp. 133-134)

- "Congress completed none of the 12 appropriations bills for fiscal 2011, which began on Oct. 1, 2010. To avoid a government shutdown, lawmakers cleared a series of short-term continuing resolutions that froze most government spending at fiscal 2010 levels... Appropriators planned to reduce discretionary spending under the fiscal 2011 Commerce-Justice-Science bill—by $3.9 billion in a House draft and $4.3 billion in the Senate version—compared with the previous year. The cuts were more than covered by a proposed $6.1 billion reduction in both bills for the Census Bureau, which had received a boost in fiscal 2010 to carry out the 2010 census... Versions won approval from the full Senate Appropriations Committee and from the House Commerce-Justice-Science Subcommittee but went no further... Both bills included roughly $9 billion for the Commerce Department, $30 billion for the Justice Department, and $7.4 billion for the [NSF]." ("Action Aborted on all FY 2011 Bills," *CQ Almanac 2010*, 66th ed., edited by Jan Austin, 2-5-2-14. Washington, DC: CQ-Roll Call Group, 2011)
- "SEC. 1317. Notwithstanding section 1101, the level for "National Science Foundation, Research, and Related Activities" shall be $5,575,025,000." (Pub. L. 112-10)

NSF R&D Appropriations for FY2013

Primary Bill: Consolidated and Further Continuing Appropriations Act, 2013; Commerce, Justice, Science, and Related Agencies Appropriations Act, 2013

Public Law: 113-6 **Enacted:** March 26, 2013 **Effective:** March 26, 2013

Nominal change		Real change		Classification
Millions ($)	YOY%	Millions ($2012)	YOY%	
-$146.0	-2.5%	-$186.2	-3.2%	Exogenous

Congress significantly cut both nominal and real appropriations for NSF R&D for FY2013, entirely because the legislative resolution to the 2011 debt ceiling crisis had capped discretionary spending and further automatic "sequestration" spending cuts were unexpectedly triggered in FY2013; see "Department of Defense R&D Appropriations for FY2012-2013" for more details. The Obama administration again proposed $7.4 billion for the NSF in FY2013, including $6.0 billion for research and related activities, an increase of $264 million (4.6%) above FY2012 funding levels. The House Appropriations Committee trimmed just $41 million from the budget request for the NSF's R&D activities during regular order

work on their bill, while the Senate Appropriations Committee cut $100 million from this part of the budget request. Despite the administration pushing for a net increase in NSF funding, the recent pivot to long-term deficit reduction was clearly felt by the agency; both the budget request and the appropriation committee reports emphasized cost savings and budget reductions from a myriad of NSF programs and program management. Despite the BCA's discretionary spending caps, the Commerce-Justice-Science title of the FY2013 consolidated appropriations bill approved the full $6.0 billion from the budget request, but that funding level was then significantly cut back by the across-the-board sequestration spending cuts that were triggered in early 2013. The decrease in NSF R&D funding appears to have been driven by concerns about long-term deficit reduction, a breakdown in the regular appropriations process, and partisan disagreement about the appropriate size and role of the federal budget, and appears unrelated to any concerns about unemployment or other short-run macroeconomic prerogatives. As such, we classify the policy change as exogenous. Most pertinent narrative evidence:

- "For many years, the United States has been a world leader in R&D. In order for the United States to thrive in today's innovation economy, we need to maintain a world-class commitment to science and research. The 2013 Budget does that by providing $140.8 billion for R&D overall, while targeting resources to those areas most likely to directly contribute to the creation of transformational technologies that can create the businesses and jobs of the future. Among the steps taken are... Providing $51 million at NSF for an interdisciplinary program to develop innovative approaches and technologies to enable more flexible and efficient access to the radio spectrum—an investment that reflects the large and growing importance of the wireless communications sector." (Budget of the United States, FY2013, p. 52)
- "Funding Highlights: Provides $7.4 billion for the [NSF], which is $340 million above the 2012 enacted level. Investments are made in research priorities and savings of $66 million are realized through terminations and reductions in lower-priority programs; Maintains the President's commitment to double funding for key basic research agencies, including a robust 5 percent increase over the 2012 enacted level for NSF; Fosters the development of a clean energy economy by providing $203 million for a cross-agency sustainability research effort focused on renewable energy technologies and complex environmental- and climate-system processes; Supports future job creation in advanced manufacturing and emerging technologies with $414 million for multidisciplinary research targeted at new materials, wireless communications, cyberinfrastructure, "smart" infrastructure, and robotics technologies; Protects the Nation's critical information technology infrastructure with $57 million for a coordinated cybersecurity research initiative... Makes tough reductions and terminations to lower-priority education, outreach, and research programs, which will save over $66 million; Cuts administrative expenses, which will save an additional $19 million." (Ibid, p. 187)
- "The [Senate Appropriations] Committee's recommendation provides $7,273,100,000 for the [NSF]. The recommendation is $240,005,000 above the fiscal year 2012 enacted level and $100,000,000 below the budget request... NSF is the principal Federal agency charged with promoting science and engineering education from pre-kindergarten through career development. This helps ensure that the United States has world-class scientists, mathematicians, and engineers, and well-prepared citizens for today and the future. In today's global economy, continued progress in science and engineering and the transfer of the knowledge developed is vital if the United States is to maintain its competitive-

ness. NSF is at the leading edge of the research and discoveries that will create the jobs and technologies of the future... The Committee appreciates the NSF's commitment to terminating programs that are outdated, duplicative, or no longer achieving their goals. The Committee accepts NSF's proposal for 11 cuts and consolidations totaling $67,000,000 in savings from the fiscal year 2012 level, including the elimination of three Computer and Information Science and Engineering Research programs; termination of the Cyber-enabled Discovery and Innovation program; elimination of four Mathematics and Physical Sciences Research programs; reduced funding for Nanoscale Science and Engineering Centers; and elimination of two duplicative public outreach programs." (S. Rpt. 112-158, April 19, 2012, pp. 104-106)

- "The Committee's fiscal year 2013 recommendation renews its support for Federal long-term basic research that has the potential to be transformative to our economy and our way of life in the context of a Federal budget that is shrinking. However, the Foundation has chosen, in its budget request, to prioritize new initiatives while cutting support for core, merit-based science grants and for scientific infrastructure like ships and facilities... While the Committee supports these multi-disciplinary initiatives, it cannot do so by cutting NSF's core programs. The Committee directs that the $100,000,000 reduction below the fiscal year 2013 request level for R&RA be taken from the proposed $290,850,000 increases in OneNSF initiatives and not from core NSF program or infrastructure funding. The Committee urges NSF to reconsider cuts to key scientific infrastructure when delivering its spending plan by further reducing proposed increases for OneNSF initiatives" (Ibid, pp. 106-107)
- "The [House] Committee recommends $5,942,693,000 for Research and Related Activities, which is $223,693,000 above fiscal year 2012 and $40,587,000 below the request... The Committee appreciates the [NSF]'s commitment to reviewing its portfolio of programs and proposing reductions or terminations where appropriate. Such proposals provide a more fiscally sustainable way to support new or expanded programs. Accordingly, the recommendation adopts all of the reduction and termination proposals contained in the R&RA budget request except for the proposed termination of the Communicating Science Broadly (CSB) program. The Committee supports the continuation of CSB activities to ensure taxpayers have access to information about the impact and relevance of NSF's scientific research. The funds made available through reductions and terminations, together with the increase provided by the Committee, will allow NSF to expand or enhance its activities across a range of research areas with significant potential impacts on national security and economic competitiveness. The Committee directs NSF to prioritize these new activities toward cybersecurity and cyberinfrastructure improvements; advanced manufacturing (as further discussed below); materials research; and disciplinary and interdisciplinary research in the natural and physical sciences, math, and engineering." (H. Rpt. 112-463, May 2, 2012, pp. 76-77)
- "The long-term importance of government-supported research may loom small in the current debate over how to reduce the federal deficit. But it is an economic issue worth keeping in mind, and one that points to the kinds of tough choices and tradeoffs facing policymakers. The [BCA], which is scheduled to take effect next January unless Congress shifts course, calls for across-the-board cuts in discretionary spending... A new study by the American Association for the Advancement of Science estimates that federal spending on [R&D] would be trimmed by more than $12 billion in 2013. The [NSF], which finances most government-supported computer science research at

universities, would have its budget cut by more than $450 million. Last week, Senate leaders were trying to negotiate a deficit-reduction deal that would avoid the automatic cuts, but programs like those that finance research are likely to receive rigorous scrutiny from budget-cutters for years into the future. Already, the Advancement of Science report says, government spending on [R&D] has declined by 10 percent since 2010, when adjusted for inflation" ("Seeds that Federal Money Can Plant," by Steve Lohr, *New York Times*, October 7, 2012)

- "The hybrid measure (HR 933 — PL 113-6) was both an omnibus appropriations bill and a continuing resolution, incorporating five regular full-year spending bills and preserving prior-year spending levels for agencies and programs covered by the remaining seven regular bills. The measure, which was cleared a week before spending for most federal departments and agencies was set to expire, financed government activities for the period from enactment through Sept. 30... The year-end 2013 measure followed the enactment of a six-month continuing resolution (PL 112-175) in September 2012 to keep the government operating at fiscal 2012 levels through March 27, 2013... For the Commerce-Justice-Science title, the omnibus provided a total of $59.9 billion, about $100 million less than in 2012. That included $50.2 billion in discretionary appropriations, 5 percent less than fiscal 2012, before the sequester. The measure provided increases for the [NSF, among other independent agencies]." ("Bipartisan Hybrid Bill Finances 2013," *CQ Almanac 2013*, 69th ed., 2-34-2-35, 2014)

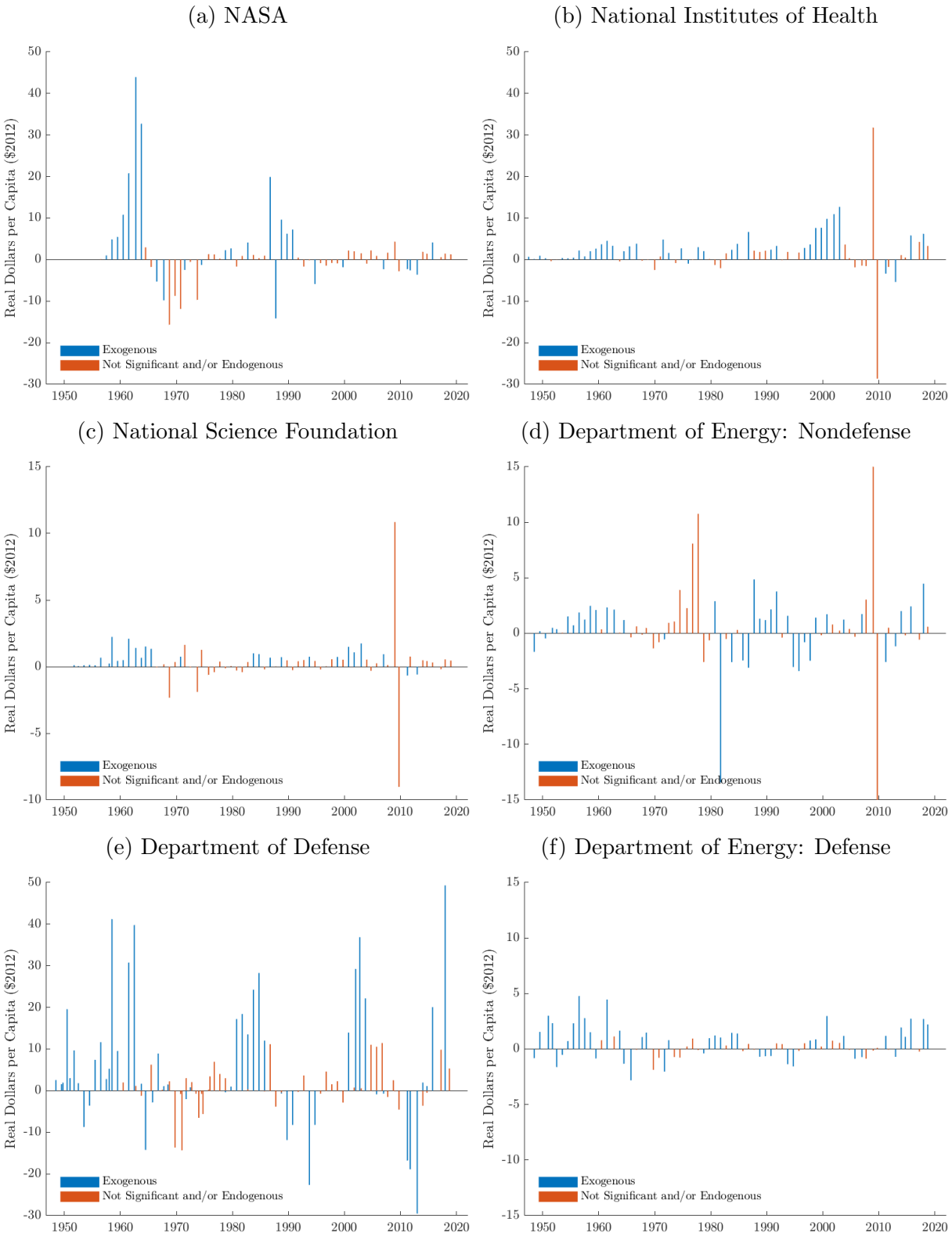
5 The Narrative Measures

Our narrative analysis generates a quarterly time series of significant changes in annual real R&D appropriations for each of the five agencies, distinguishing between the defense and nondefense R&D functions of DOE. Tables 1–6 compile the time series of all significant changes in R&D appropriations analyzed in Section 4, with our narrative classification as either exogenous and endogenous, and with all policy events dated by the effective quarter. Table 1 reports results for defense R&D activities of DOD, Table 2 reports results for the defense R&D functions of DOE, Table 3 reports results for the nondefense R&D functions of DOE, Table 4 reports results for the aerospace R&D activities of NASA, Table 5 reports results for NIH research funding, and Table 6 reports results for NSF research funding.

Figure 2 depicts these narrative R&D appropriations changes separately for each agency, with all changes in R&D appropriations measured in real dollars per capita for ease of visual comparison. The top four panels of Figure 2 depict the nondefense R&D appropriations changes, with NASA in the top left panel, NIH in the top right panel, NSF in the middle left panel, and the nondefense functions of DOE in the middle right panel. The bottom two panels depict the defense R&D appropriations changes, with DOD in the bottom left panel and the defense R&D functions of DOE in the bottom right panel. The narrative R&D appropriations changes classified as exogenous are depicted in blue and those classified as endogenous (or too small to classify) are depicted in red.

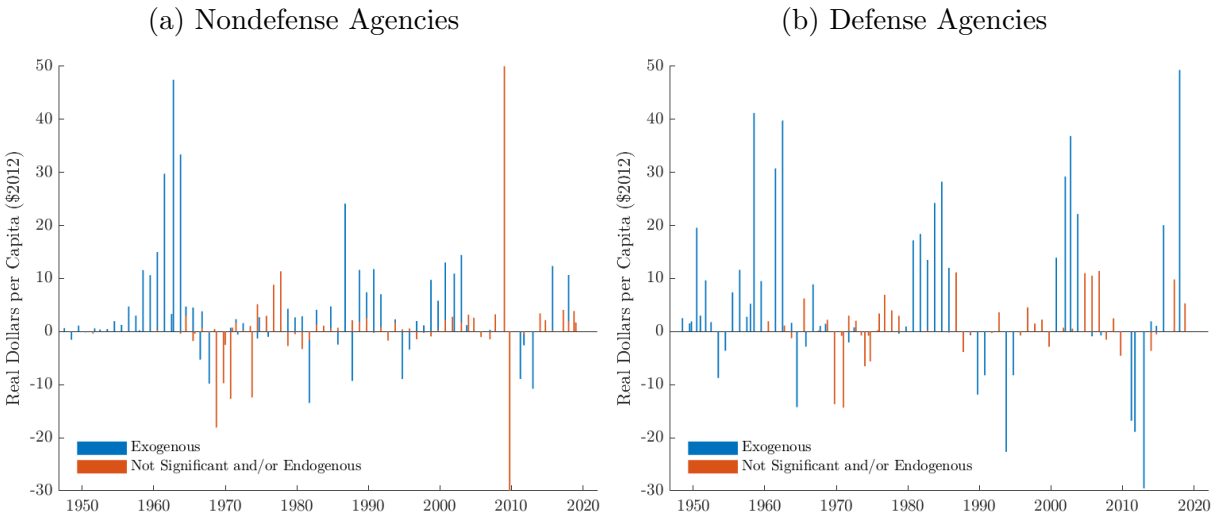
As noted earlier, our analysis—particularly our split treatment of DOE R&D functions—is intended to generate separate instrumental variables for defense versus nondefense government R&D capital or expenditures. The left panel in Figure 3 shows a single nondefense R&D narrative measure, aggregated up from the policy events for NASA, NIH, and NSF, and DOE's nondefense functions. Analogously, the right panel shows a single defense R&D narrative measure, aggregated from the policy events for DOD and DOE's defense functions.

Figure 2: Changes in R&D Appropriations by Federal Agency



Notes: Nominal appropriations are converted to real dollars using NIPA price indices for federal nondefense/defense investment in intellectual property products. *Sample*: 1947Q1–2019Q4.

Figure 3: Changes in Nondefense and Defense R&D Appropriations



Notes: Nondefense agencies include NASA, NIH, NSF, and the nondefense functions of DOE. Defense agencies include DOD and the nuclear weapons and naval reactor functions of DOE. Nominal appropriations are converted to real dollars using NIPA price indices for federal nondefense/defense investment in intellectual property products. *Sample*: 1947Q1–2019Q4.

6 Glossary of Acronyms

ABM Anti-Ballistic Missile Treaty

ADAMHA Alcohol, Drug Abuse, and Mental Health Administration

AEC Atomic Energy Commission

AIDS Acquired immunodeficiency syndrome

ARPA Advanced Research Projects Agency

ARPA-E Advanced Research Projects Agency-Energy

ARRA American Recovery and Reinvestment Act of 2009 (Pub. L. 111-5)

BA Budget authority

BCA Budget Control Act of 2011 (Pub. L. 112-25)

BMDO Ballistic Missile Defense Organization

CBO Congressional Budget Office

CR Continuing resolution

DARPA Defense Advanced Research Projects Agency

DOD Department of Defense

DOE Department of Energy

ERDA Energy Research and Development Administration

FSA Federal Security Agency

FY Fiscal year

GAO Government Accountability Office

HEW Department of Health, Education, and Welfare

HHS Department of Health and Human Services

HIV Human immunodeficiency virus

HSMHA Health Services and Mental Health Administration

HUD Department of Housing and Urban Development

ICBM Intercontinental ballistic missile

INF Intermediate-Range Nuclear Forces Treaty

IPP Intellectual property products

ISS International Space Station

OMB Office of Management and Budget

OSRD Office of Scientific Research and Development

MDA Missile Defense Agency

NACA National Advisory Committee for Aeronautics

NASA National Aeronautics and Space Administration

NATO North Atlantic Treaty Organization

NCI National Cancer Institute

NCRR National Center for Research Resources

NEI National Eye Institute

NHGRI National Human Genome Research Institute

NHLBI National Heart, Lung, and Blood Institute

NIA National Institute on Aging

NIAAA National Institute on Alcohol Abuse and Alcoholism

NIAID National Institute of Allergy and Infectious Diseases

NIAMS National Institute of Arthritis and Musculoskeletal and Skin Diseases

NIBIB National Institute of Biomedical Imaging and Bioengineering

NICHD National Institute of Child Health and Human Development

NIDA National Institute on Drug Abuse

NIDCD National Institute on Deafness and Other Communication Disorders

NIDCR National Institute of Dental and Craniofacial Research

NIDDK National Institute of Diabetes and Digestive and Kidney Diseases

NIEHS National Institute of Environmental Health Sciences

NIGMS National Institute of General Medical Sciences

NIH National Institutes of Health

NIMH National Institute of Mental Health

NIMHD National Institute on Minority Health and Health Disparities

NINDS National Institute of Neurological Disorders and Stroke

NINR National Institute of Nursing Research

NIPA National Income and Product Accounts

NNSA National Nuclear Security Administration

NPT Nuclear Non-Proliferation Treaty

NSB National Science Board

NSF National Science Foundation

OAR Office of AIDS Research

OPEC Organization of Petroleum Exporting Countries

PHS Public Health Service

PL Public Law

PTBT Partial Test Ban Treaty

R&D Research and development

RDT&E Research, development, testing, and evaluation

R&RA Research and related activities

SALT Strategic Arms Limitation Talks Agreement

SDI Strategic Defense Initiative

SEI Space Exploration Initiative

SORT Strategic Offensive Reductions Treaty

START Strategic Arms Reduction Treaty

TFP Total factor productivity

VA Department of Veterans Affairs

Note: We ignore a host of less important acronyms defined within pertinent primary sources, particularly for military weapons systems referenced in Section 4.1.

Table 1: Department of Defense R&D Appropriations Shocks

Fiscal Year	Nominal Δ ($ millions)	Nominal YOY%	Real Δ ($2012 millions)	Real YOY%	Narrative Classification	Effective Quarter
1949	91.9	19.6%	494.7	17.1%	Exogenous	1948Q3
1950	50.5	9.0%	290.4	8.6%	Exogenous	1949Q4
1951	564.0	92.2%	2,974.0	80.7%	Exogenous	1950Q3
1952	278.0	23.6%	1,138.3	17.1%	Exogenous	1951Q4
1953	120.0	8.3%	536.3	6.9%	Exogenous	1952Q3
1954	-241.0	-15.3%	-1,312.1	-15.7%	Exogenous	1953Q3
1955	-125.9	-9.4%	-704.3	-10.0%	Exogenous	1954Q3
1956	202.5	16.8%	843.1	13.4%	Exogenous	1955Q3
1957	275.6	19.6%	1,158.1	16.2%	Exogenous	1956Q3
1958	226.5	13.4%	908.3	10.9%	Exogenous	1958Q1
1959	1,509.5	66.9%	6,922.1	63.5%	Exogenous	1958Q3
1960	443.4	11.8%	1,843.3	10.3%	Exogenous	1959Q3
1962	1,075.8	25.1%	4,844.7	24.4%	Exogenous	1961Q3
1963	1,620.8	30.2%	7,434.0	30.1%	Exogenous	1962Q3
1965	-511.1	-7.3%	-2,478.0	-7.8%	Exogenous	1964Q3
1967	426.5	6.3%	1,762.1	5.7%	Exogenous	1966Q4
1970	-222.2	-2.9%	-2,399.1	-7.3%	Endogenous	1969Q4
1971	-340.3	-4.6%	-2,962.6	-9.7%	Endogenous	1971Q1
1974	219.2	2.8%	-1,391.0	-4.9%	Endogenous	1974Q1
1975	395.2	4.8%	-1,203.8	-4.4%	Endogenous	1974Q4
1981	3,048.6	22.6%	3,652.7	12.3%	Exogenous	1980Q4
1982	3,439.9	20.8%	4,012.8	12.1%	Exogenous	1981Q4
1983	2,739.0	13.7%	3,148.9	8.4%	Exogenous	1982Q4
1984	4,071.6	17.9%	5,359.0	13.2%	Exogenous	1983Q4
1985	4,450.9	16.6%	6,371.5	13.9%	Exogenous	1984Q4
1986	2,226.2	7.1%	2,875.6	5.5%	Exogenous	1985Q4
1990	-1,042.1	-2.8%	-2,787.9	-4.9%	Exogenous	1989Q4
1991	-325.5	-0.9%	-1,914.4	-3.6%	Exogenous	1990Q4
1994	-3,379.1	-9.0%	-5,566.7	-10.6%	Exogenous	1993Q4
1995	-59.4	-0.2%	-1,760.0	-3.7%	Exogenous	1994Q4
2001	3,099.0	8.1%	3,109.8	6.7%	Exogenous	2000Q4
2002	6,973.0	16.8%	8,389.9	17.0%	Exogenous	2002Q1
2003	9,381.0	19.3%	10,652.1	18.4%	Exogenous	2002Q4
2004	6,477.0	11.2%	6,117.7	8.9%	Exogenous	2003Q4
2011	-3,257.0	-4.1%	-5,606.7	-6.7%	Exogenous	2011Q2
2012	-4,651.0	-6.1%	-5,915.8	-7.6%	Exogenous	2011Q4
2013	-8,707.0	-12.1%	-9,114.6	-12.7%	Exogenous	2013Q1
2016	5,327.0	8.4%	5,594.2	9.1%	Exogenous	2015Q4
2018	18,016.0	24.5%	15,291.5	21.7%	Exogenous	2018Q1

Table 2: Department of Energy–Defense R&D Appropriations Shocks

Fiscal Year	Nominal Δ ($ millions)	Nominal YOY%	Real Δ ($2012 millions)	Real YOY%	Narrative Classification	Effective Quarter
1949	-16.2	-9.5%	-120.3	-11.4%	Exogenous	1948Q3
1950	38.9	25.0%	230.5	24.5%	Exogenous	1949Q3
1951	93.5	48.1%	460.0	39.3%	Exogenous	1951Q1
1952	83.6	29.0%	361.9	22.2%	Exogenous	1951Q4
1953	-43.5	-11.7%	-255.6	-12.8%	Exogenous	1952Q3
1954	-14.2	-4.3%	-83.9	-4.8%	Exogenous	1953Q3
1955	24.2	7.7%	116.0	7.0%	Exogenous	1954Q3
1956	85.6	25.3%	382.9	21.7%	Exogenous	1955Q3
1957	175.3	41.4%	804.5	37.4%	Exogenous	1956Q3
1958	112.6	18.8%	477.5	16.2%	Exogenous	1957Q3
1959	70.3	9.9%	264.3	7.7%	Exogenous	1958Q3
1960	-22.2	-2.8%	-150.6	-4.1%	Exogenous	1959Q3
1962	182.5	22.9%	820.2	22.2%	Exogenous	1961Q3
1964	75.5	7.4%	315.0	6.7%	Exogenous	1963Q4
1965	-50.8	-4.6%	-255.1	-5.1%	Exogenous	1964Q3
1966	-119.8	-11.4%	-549.8	-11.5%	Exogenous	1965Q4
1968	57.1	9.6%	216.1	8.0%	Exogenous	1967Q4
1969	90.1	13.8%	296.7	10.2%	Exogenous	1968Q3
1970	-57.6	-7.8%	-381.5	-11.9%	Endogenous	1969Q4
1971	-2.7	-0.4%	-161.7	-5.7%	Endogenous	1970Q4
1972	-85.4	-12.5%	-423.4	-15.9%	Exogenous	1971Q4
1973	69.7	11.7%	167.7	7.5%	Exogenous	1972Q3
1974	7.4	1.1%	-153.4	-6.4%	Endogenous	1973Q3
1975	15.5	2.2%	-164.9	-6.9%	Endogenous	1974Q3
1977	118.5	14.7%	205.3	9.0%	Endogenous	1976Q4
1979	30.2	3.1%	-87.1	-3.5%	Exogenous	1978Q4
1980	189.1	19.0%	219.8	9.2%	Exogenous	1979Q4
1981	246.4	20.8%	278.4	10.7%	Exogenous	1980Q4
1982	240.0	16.8%	239.9	8.3%	Exogenous	1981Q4
1984	274.5	15.3%	343.1	10.8%	Exogenous	1983Q4
1985	247.3	12.0%	331.3	9.4%	Exogenous	1984Q4
1989	-35.6	-1.4%	-170.8	-4.4%	Exogenous	1988Q4
1990	-53.6	-2.2%	-161.7	-4.3%	Exogenous	1989Q4
1991	-43.5	-1.8%	-159.1	-4.4%	Exogenous	1990Q4
1994	-213.7	-8.1%	-358.3	-9.8%	Exogenous	1993Q4
1995	-224.8	-9.3%	-415.1	-12.5%	Exogenous	1994Q4
1998	189.0	8.1%	209.1	7.0%	Exogenous	1997Q4
1999	240.0	9.5%	241.0	7.5%	Exogenous	1998Q4
2001	745.0	25.7%	843.5	24.1%	Exogenous	2000Q4
2004	381.0	9.6%	345.9	7.3%	Exogenous	2003Q4
2006	-140.0	-3.2%	-261.1	-5.2%	Exogenous	2005Q4
2007	-118.0	-2.7%	-219.0	-4.6%	Exogenous	2007Q1
2008	-129.0	-3.1%	-263.8	-5.8%	Endogenous	2007Q4
2011	477.0	11.7%	368.9	8.6%	Exogenous	2011Q2

Table 2: DOE-Defense continued...

Fiscal Year	Nominal Δ ($ millions)	Nominal YOY%	Real Δ ($2012 millions)	Real YOY%	Narrative Classification	Effective Quarter
2013	-195.0	-4.2%	-222.4	-4.8%	Exogenous	2013Q1
2014	723.0	16.3%	618.6	14.0%	Exogenous	2014Q1
2015	410.0	8.0%	352.4	7.0%	Exogenous	2014Q4
2016	870.0	15.6%	883.1	16.4%	Exogenous	2015Q4
2018	1,098.0	17.0%	888.4	14.3%	Exogenous	2018Q1
2019	920.0	12.2%	729.1	10.3%	Exogenous	2018Q4

Table 3: Department of Energy–Nondefense R&D Appropriations Shocks

Fiscal Year	Nominal Δ ($ millions)	Nominal YOY%	Real Δ ($2012 millions)	Real YOY%	Narrative Classification	Effective Quarter
1949	-39.2	-31.3%	-245.1	-32.7%	Exogenous	1948Q3
1950	5.3	6.2%	29.0	5.8%	Exogenous	1949Q3
1951	-6.9	-7.6%	-69.7	-13.1%	Exogenous	1950Q3
1952	19.5	23.1%	77.5	16.7%	Exogenous	1951Q4
1953	13.0	12.4%	59.4	11.0%	Exogenous	1952Q3
1955	49.8	41.8%	247.9	40.7%	Exogenous	1954Q3
1956	29.0	17.1%	119.3	13.9%	Exogenous	1955Q3
1957	71.4	36.1%	316.8	32.5%	Exogenous	1956Q3
1958	52.6	19.5%	213.0	16.5%	Exogenous	1957Q3
1959	101.4	31.5%	431.6	28.7%	Exogenous	1958Q3
1960	87.9	20.8%	372.8	19.2%	Exogenous	1959Q3
1962	98.7	18.6%	430.3	18.1%	Exogenous	1961Q3
1963	90.1	14.3%	400.6	14.3%	Exogenous	1962Q4
1965	55.1	7.6%	230.0	7.2%	Exogenous	1964Q3
1970	-26.3	-3.1%	-274.9	-7.7%	Endogenous	1969Q4
1971	3.3	0.4%	-165.3	-5.0%	Endogenous	1970Q4
1972	3.7	0.4%	-112.5	-3.6%	Exogenous	1971Q4
1973	91.1	10.9%	198.9	6.6%	Endogenous	1972Q3
1974	144.3	15.6%	226.1	7.0%	Endogenous	1973Q3
1975	384.4	35.9%	835.4	24.2%	Endogenous	1974Q3
1976	276.9	19.0%	493.0	11.5%	Endogenous	1975Q4
1977	760.7	43.9%	1,769.9	37.1%	Endogenous	1976Q4
1978	1,094.5	43.9%	2,381.2	36.4%	Endogenous	1977Q4
1979	-3.5	-0.1%	-578.3	-6.5%	Endogenous	1978Q4
1981	684.7	17.9%	661.6	8.1%	Exogenous	1980Q4
1982	-1,357.7	-30.1%	-3,101.8	-35.0%	Exogenous	1981Q4
1984	-230.5	-7.1%	-609.5	-10.8%	Exogenous	1983Q4
1986	-324.4	-10.4%	-586.3	-11.5%	Exogenous	1985Q4
1987	-436.7	-15.5%	-748.3	-16.5%	Exogenous	1986Q4
1988	853.1	36.0%	1,183.5	31.4%	Exogenous	1987Q4
1989	330.8	10.3%	323.5	6.5%	Exogenous	1988Q4
1990	294.2	8.3%	295.8	5.6%	Exogenous	1989Q4
1991	510.5	13.3%	542.9	9.7%	Exogenous	1990Q4
1992	760.7	17.4%	960.1	15.7%	Exogenous	1991Q4
1994	415.7	8.1%	413.1	5.9%	Exogenous	1993Q4
1995	-436.0	-7.8%	-804.0	-10.9%	Exogenous	1994Q4
1996	-641.0	-12.5%	-911.1	-13.8%	Exogenous	1995Q4
1997	-128.0	-2.8%	-216.7	-3.8%	Exogenous	1996Q4
1998	-509.0	-11.6%	-675.7	-12.4%	Exogenous	1997Q4
1999	381.0	9.9%	392.8	8.2%	Exogenous	1998Q4
2001	488.0	11.3%	488.0	9.5%	Exogenous	2000Q4
2004	396.0	7.7%	361.4	6.1%	Exogenous	2003Q4
2007	573.0	10.0%	523.5	8.3%	Exogenous	2007Q1
2008	1,044.0	16.6%	921.3	13.5%	Endogenous	2007Q4

Table 3: DOE-Nondefense continued...

Fiscal Year	Nominal Δ ($ millions)	Nominal YOY%	Real Δ ($2012 millions)	Real YOY%	Narrative Classification	Effective Quarter
2009	18,265.0	249.5%	19,127.3	246.7%	Endogenous	2009Q1
2010	-17,109.0	-66.9%	-18,121.2	-67.4%	Endogenous	2009Q4
2011	-573.0	-6.8%	-805.4	-9.2%	Exogenous	2011Q2
2013	-315.0	-3.9%	-369.7	-4.6%	Exogenous	2013Q1
2014	796.0	10.2%	638.8	8.2%	Exogenous	2014Q1
2016	757.0	8.9%	782.6	9.4%	Exogenous	2015Q4
2018	1,729.0	18.8%	1,466.1	16.4%	Exogenous	2018Q1

Table 4: NASA R&D Appropriations Shocks

Fiscal Year	Nominal Δ ($ millions)	Nominal YOY%	Real Δ ($2012 millions)	Real YOY%	Narrative Classification	Effective Quarter
1958	39.1	50.0%	173.2	46.2%	Exogenous	1957Q3
1959	188.1	160.4%	849.0	154.8%	Exogenous	1958Q3
1960	167.0	71.5%	968.3	69.3%	Exogenous	1959Q3
1961	440.4	84.1%	1,959.5	82.8%	Exogenous	1960Q3
1962	860.9	89.3%	3,826.3	88.5%	Exogenous	1961Q3
1963	1,848.1	101.3%	8,246.2	101.2%	Exogenous	1962Q4
1964	1,426.7	38.8%	6,227.5	38.0%	Exogenous	1963Q4
1967	-207.3	-4.0%	-1,037.9	-4.5%	Exogenous	1966Q3
1968	-378.8	-7.6%	-1,954.9	-9.0%	Exogenous	1967Q4
1969	-593.8	-12.9%	-3,158.5	-15.9%	Endogenous	1968Q4
1970	-246.3	-6.2%	-1,775.4	-10.6%	Endogenous	1969Q4
1971	-436.3	-11.6%	-2,448.1	-16.4%	Endogenous	1970Q4
1972	-4.5	-0.1%	-516.9	-4.1%	Exogenous	1971Q3
1974	-367.9	-10.8%	-2,060.0	-17.4%	Endogenous	1973Q4
1975	191.4	6.3%	-275.7	-2.8%	Exogenous	1974Q3
1979	495.1	12.2%	507.1	5.0%	Exogenous	1978Q4
1980	684.6	15.0%	607.4	5.7%	Exogenous	1979Q4
1981	279.3	5.3%	-385.4	-3.4%	Endogenous	1980Q4
1983	821.9	13.6%	956.4	8.7%	Exogenous	1982Q4
1987	3,115.9	39.9%	4,805.4	38.2%	Exogenous	1986Q4
1988	-1,861.7	-17.0%	-3,446.6	-19.8%	Exogenous	1987Q4
1989	1,907.5	21.1%	2,361.4	17.0%	Exogenous	1988Q4
1990	1,344.7	12.3%	1,545.7	9.5%	Exogenous	1989Q4
1991	1,690.5	13.7%	1,817.5	10.2%	Exogenous	1990Q4
1995	-717.8	-4.9%	-1,559.5	-8.1%	Exogenous	1994Q4
2000	-53.0	-0.4%	-514.0	-3.1%	Exogenous	1999Q4
2007	-373.0	-2.2%	-698.0	-3.8%	Exogenous	2007Q1
2009	1,399.0	8.1%	1,325.0	7.3%	Endogenous	2009Q1
2010	-524.0	-2.8%	-863.1	-4.4%	Endogenous	2009Q4
2011	-223.0	-1.2%	-711.8	-3.8%	Exogenous	2011Q2
2012	-730.0	-4.1%	-807.1	-4.5%	Exogenous	2011Q4
2013	-1,034.0	-6.0%	-1,147.7	-6.7%	Exogenous	2013Q1
2016	1,278.0	7.3%	1,335.1	7.8%	Exogenous	2015Q4

Table 5: NIH R&D Appropriations Shocks

Fiscal Year	Nominal Δ ($ millions)	Nominal YOY%	Real Δ ($2012 millions)	Real YOY%	Narrative Classification	Effective Quarter
1948	16.6	205.0%	95.8	186.5%	Exogenous	1947Q3
1949	3.9	15.9%	19.8	13.5%	Exogenous	1948Q3
1950	24.2	84.7%	140.3	84.0%	Exogenous	1949Q3
1951	12.0	22.8%	47.7	15.5%	Exogenous	1950Q3
1952	-7.8	-12.1%	-59.1	-16.6%	Endogenous	1951Q3
1954	12.2	20.8%	60.8	20.2%	Exogenous	1953Q3
1955	10.4	14.6%	49.8	13.8%	Exogenous	1954Q3
1956	17.4	21.4%	74.3	18.1%	Exogenous	1955Q3
1957	79.3	80.5%	367.7	75.7%	Exogenous	1956Q3
1958	32.6	18.3%	130.6	15.3%	Exogenous	1957Q3
1959	81.4	38.7%	351.4	35.7%	Exogenous	1958Q3
1960	107.6	36.9%	469.2	35.1%	Exogenous	1959Q3
1961	151.6	38.0%	667.7	37.0%	Exogenous	1960Q3
1962	189.2	34.3%	834.0	33.7%	Exogenous	1961Q3
1963	140.0	18.9%	623.4	18.9%	Exogenous	1962Q3
1965	91.8	10.6%	389.6	10.1%	Exogenous	1964Q3
1966	141.4	14.7%	622.0	14.7%	Exogenous	1965Q3
1967	178.8	16.3%	758.2	15.6%	Exogenous	1966Q4
1970	-62.2	-4.7%	-512.0	-9.2%	Endogenous	1970Q1
1972	334.8	24.3%	1,002.2	19.3%	Exogenous	1971Q3
1973	167.2	9.8%	339.6	5.5%	Exogenous	1972Q3
1974	96.0	5.1%	-174.8	-2.7%	Endogenous	1973Q4
1975	383.3	19.4%	581.9	9.1%	Exogenous	1974Q4
1976	81.7	3.5%	-212.9	-3.1%	Exogenous	1976Q1
1978	407.3	15.9%	662.8	9.9%	Exogenous	1977Q4
1979	397.7	13.4%	455.2	6.2%	Exogenous	1978Q4
1981	179.9	4.9%	-300.1	-3.8%	Endogenous	1980Q4
1982	29.0	0.8%	-479.5	-6.3%	Endogenous	1981Q4
1984	505.9	11.9%	554.8	7.5%	Exogenous	1983Q4
1985	689.3	14.5%	902.0	11.3%	Exogenous	1984Q4
1987	1,077.0	19.5%	1,607.0	18.1%	Exogenous	1986Q4
1991	695.1	8.4%	602.5	5.0%	Exogenous	1990Q4
1992	741.8	8.3%	837.6	6.7%	Exogenous	1991Q4
1997	722.5	6.4%	759.3	5.3%	Exogenous	1996Q4
1998	905.4	7.5%	997.0	6.6%	Exogenous	1997Q4
1999	1,926.7	14.8%	2,108.6	13.1%	Exogenous	1998Q4
2000	2,227.0	14.9%	2,150.5	11.8%	Exogenous	1999Q4
2001	2,660.5	15.5%	2,782.6	13.7%	Exogenous	2000Q4
2002	2,752.6	13.9%	3,136.8	13.6%	Exogenous	2002Q1
2003	3,359.5	14.9%	3,675.4	14.0%	Exogenous	2003Q1
2009	9,486.4	33.9%	9,730.5	32.8%	Endogenous	2009Q1
2010	-7,922.3	-21.1%	-8,834.7	-22.4%	Endogenous	2009Q4
2011	-257.6	-0.9%	-1,057.0	-3.5%	Exogenous	2011Q2
2013	-1,506.6	-5.2%	-1,699.7	-5.9%	Exogenous	2013Q1

Table 5: NIH continued...

Fiscal Year	Nominal Δ ($ millions)	Nominal YOY%	Real Δ ($2012 millions)	Real YOY%	Narrative Classification	Effective Quarter
2016	1,782.1	6.3%	1,880.4	6.8%	Exogenous	2015Q4
2018	2,789.7	8.7%	2,034.3	6.6%	Exogenous	2018Q1

Table 6: NSF R&D Appropriations Shocks

Fiscal Year	Nominal Δ ($ millions)	Nominal YOY%	Real Δ ($2012 millions)	Real YOY%	Narrative Classification	Effective Quarter
1952	3.3	1,455.6%	17.0	1,375.1%	Exogenous	1951Q4
1953	1.3	35.7%	6.2	33.9%	Exogenous	1952Q3
1954	3.3	68.4%	16.5	67.6%	Exogenous	1953Q3
1955	4.3	53.1%	21.2	52.0%	Exogenous	1954Q3
1956	3.8	30.6%	16.8	27.0%	Exogenous	1955Q3
1957	24.0	150.0%	113.1	143.4%	Exogenous	1956Q3
1958	9.8	24.4%	40.7	21.2%	Exogenous	1958Q1
1959	86.3	173.4%	389.7	167.5%	Exogenous	1958Q3
1960	18.8	13.8%	77.0	12.4%	Exogenous	1959Q3
1961	21.0	13.6%	89.4	12.8%	Exogenous	1960Q3
1962	87.2	49.6%	386.2	49.0%	Exogenous	1961Q3
1963	59.4	22.6%	264.7	22.5%	Exogenous	1962Q4
1964	30.7	9.5%	127.3	8.8%	Exogenous	1963Q4
1965	67.2	19.0%	290.5	18.5%	Exogenous	1964Q3
1966	59.3	14.1%	260.8	14.0%	Exogenous	1965Q3
1969	-95.0	-19.2%	-470.1	-21.9%	Endogenous	1968Q4
1971	65.9	15.0%	154.1	8.8%	Exogenous	1970Q4
1972	115.0	22.8%	339.7	17.9%	Endogenous	1971Q3
1974	-74.1	-11.6%	-403.1	-18.1%	Endogenous	1973Q4
1975	145.1	25.6%	270.5	14.8%	Endogenous	1974Q3
1976	-0.3	0.0%	-132.9	-6.4%	Endogenous	1975Q4
1977	1.1	0.1%	-90.4	-4.6%	Endogenous	1976Q4
1981	48.0	5.3%	-66.7	-3.4%	Endogenous	1980Q4
1982	19.8	2.1%	-95.6	-5.1%	Endogenous	1981Q4
1984	183.4	17.3%	234.3	12.6%	Exogenous	1983Q4
1985	172.1	13.8%	222.6	10.7%	Exogenous	1984Q4
1987	118.9	8.5%	162.2	7.2%	Exogenous	1986Q4
1989	173.7	11.0%	175.9	7.3%	Exogenous	1988Q4
1994	189.3	8.9%	194.0	6.7%	Exogenous	1993Q4
1999	207.0	7.8%	203.0	6.2%	Exogenous	1998Q4
2001	411.0	13.4%	421.9	11.6%	Exogenous	2000Q4
2002	274.0	7.9%	307.0	7.6%	Exogenous	2001Q4
2003	466.0	12.4%	504.1	11.5%	Exogenous	2003Q1
2007	332.0	7.3%	281.8	5.6%	Exogenous	2007Q1
2009	3,204.0	63.7%	3,323.7	62.4%	Endogenous	2009Q1
2010	-2,554.0	-31.0%	-2,781.6	-32.2%	Endogenous	2009Q4
2011	-54.0	-1.0%	-207.7	-3.5%	Exogenous	2011Q2
2013	-146.0	-2.5%	-186.2	-3.2%	Exogenous	2013Q1

A Data Appendix

This section provides more detail on the construction of our data set quantifying the enacted full-year appropriations for the budgetary accounts funding R&D activities for each of these five agencies, which we use to identify "significant" policy changes in real appropriations and construct the narrative R&D appropriations shocks. The budget accounts of federal agencies are periodically reorganized and some agencies of interest have been restructured, expanded, or disbanded and replaced. As such, there are inevitably periodic changes in the budget accounts of interest, but we aim to be as consistent and transparent as possible in tracking comparable budget accounts appropriating funds for R&D activities. Various budget reforms have also changed budgeting concepts and vocabulary, and we try to be as consistent as possible in tracking comparable measures of appropriations for R&D activities over the postwar sample. In the subsections below, we chronologically detail the budgetary concepts, budget accounts, and corresponding data sources used to compile enacted full-year R&D appropriations for each fiscal year and each agency.

As noted in Section 2.2 of the main text, congressional appropriations are just one type of BA, but are by far the most relevant for federal R&D funding. Before diving into budgetary concept line-items and data sources, we first elaborate on why we narrowly focus on discretionary BA from appropriations for our development of the narrative R&D appropriations shocks. We then provide a more detailed overview of the budgetary concept line-items of interest and how they have changed over time.

In the modern budgetary framework, BA can also be provided via borrowing authority, contract authority, or authority to obligate and spend offsetting receipts and collections; borrowing authority and contract authority are generally irrelevant for the R&D activities of interest, but outlays for some R&D activities are funded by offsetting collections. In constructing our R&D appropriations data set, we focus solely on discretionary BA from appropriations and aim to ignore BA from offsetting collections, for several reasons. Offsetting collections, also known as reimbursements or reimbursable programs, are business-like transactions with the public or transfers from other government agencies and funded by those agencies, which are treated as offsets to spending and negative budget authority; see GAO (2005) for details. Focusing on appropriations is in keeping with measuring government R&D by funding source, not performer. Combining appropriations and offsetting collections would also risk double-counting federal funding for R&D activities, as one agency's reimbursable programs may be funded with appropriations for another agency of interest (e.g., DOE being reimbursed by DOD for activities performed by DOE but funded with appropriations for DOD). Moreover, reimbursable program obligations are typically not broken out by activity in the *Budget*, unlike direct program obligations, so it is impossible to quantify what share of reimbursable obligations are for R&D activities, if applicable. Lastly, offsetting collections are typically authorized by authorizing committees, not necessarily on an annual basis, and are only modestly governed (i.e., limited) by the appropriations process; focusing on appropriations makes it easier to discern timely legislative intent for policy decisions at hand and narrows the scope of the narrative analysis above.

For most of our sample of interest, we focus on discretionary BA, which is (generally) also equal to the adjusted appropriations line item (also called "Appropriation (adjusted)" or "Appropriation (total)." Prior to BA being introduced as a budgetary concept in the late 1960s, we focus on "New obligation authority," and we focus on "appropriation" prior to the introduction of obligation authority as a budgetary concept. Starting in FY1990, we adopt "Budget authority (net)" as opposed to "Budget authority (gross)," which amounts

to ignoring offsetting collections and reimbursements for reimbursable programs. The "Budget authority (net)" concept is consistent with "Budget authority" and/or "Appropriation (adjusted)" for preceding years, which measured budget authority or appropriations enacted for that agency and does not include offsetting collections. Prior to the introduction of "Offsetting collections" as a budget concept, we ignore obligations for reimbursable programs and focus only on direct (non-reimbursable) obligations, if applicable.

Lastly, note these abbreviations for data sources in the following sections:

- "FY1960 Budget" is short for *Budget of the United States Government for the Fiscal Year Ending June 30, 1961*, i.e., FY1960
- "FY1960 Budget Appx." is short for *Appendix to the Budget of the United States Government for the Fiscal Year Ending June 30, 1961*

A.1 Quantification of Defense R&D Appropriations

Budgetary concept line-item for DOD appropriations funding R&D:

- **FY1947–FY1949**: "Total budget obligations" or "Direct obligations" and "Indirect obligations"
- **FY1950–FY1954**: "New obligation authority" or "Adjusted appropriation" or "Total appropriation"
- **FY1955–FY1956**: "Appropriation (adjusted)"
- **FY1957–FY1968**: "New obligation authority" also "Appropriation (adjusted)"
- **FY1969–FY1979**: "Budget authority" or "Budget authority (appropriation)" also "Appropriation" or "Appropriation (adjusted)"
- **FY1980–FY1981**: "Budget authority (appropriation)" or "Budget authority" also "Appropriation (adjusted)" plus "Reappropriation" (if applicable)
- **FY1982–FY1984**: "Budget authority" also "Appropriation (adjusted)" plus "Reappropriation" (if applicable)
- **FY1985–FY1987**: "Total budget authority" also "Appropriation (adjusted)" plus "Reappropriation" and/or "Supplemental" (if applicable)
- **FY1988–FY1989**: "Budget authority" also "Appropriation (adjusted)"
- **FY1990–FY1994**: "Budget authority (net)" also "Appropriation (adjusted)" or "Appropriation (total)"
- **FY1995–FY2009**: "Net [discretionary] budget authority" also "Appropriation (total)" or "Appropriation" or "Appropriation (total discretionary)"[31]
- **FY2010–FY2019**: "Budget authority, net (discretionary)" or "Budget authority, net (total)" also "Appropriation, discretionary (total)" or "Appropriations, discretionary: Appropriation"

Budget accounts and data sources for Department of Defense–Military Functions appropriations funding R&D:[32]

[31] "Net [discretionary] budget authority" ignores any mandatory budget authority transferred from other accounts and corresponds almost identically with the total or adjusted appropriation; it also corresponds with the "Budget authority, net (discretionary)" line item introduced in FY2010.

[32] We exclude appropriations for all "Office of the Secretary of Defense" and "Military Personnel" and "Reserve Personnel" and "National Guard" and "Maintenance and Operations" and "Military Construction" and 'Aircraft and Related

- **FY1947**: Total obligations for all "Research and development" activities of the "Quartermaster Service, Army" and "Transportation Service, Army" and "Signal Service of the Army" and "Medical and Hospital Department, Army" and "Engineer Service, Army" and "Ordnance Service and Supplies, Army" and "Chemical Service, Army" and "Maintenance, Bureau of Ships" and "Maintenance, Bureau of Yards and Dock" and "Aviation, Navy" and "Salaries, Bureau of Aeronautics," total obligations for all "Research" and "Development" activities of the "Ordnance and Ordnance Stores, Navy" budget account, total obligations for "Medical and dental research" activities of the "Medical Department, Navy" budget account, total obligations for "Research" activities of the "Salaries, Office of Naval Research" budget account, total obligations for the entire "Research, Navy" budget account, and total obligations for the following activities under the United States Air Force budget account: "Research and development, aeronautical" and "Salaries, research and development, aeronautical" and "Service test equipment, research and development, aeronautical" and "Research and development, medical" and "Salaries, research and development, medical" and "Research and development, meteorological and climatological, sources: FY1949 Budget pp. 645, 665, 668, 670, 673, 675, 680, 683, 736, 748, 750, 761, 762, 766, and 785.[33]
- **FY1948**: Total obligations for all "Research and development" activities of the "Finance Service, Army" and "Quartermaster Service, Army" and "Transportation Service, Army" and "Signal Service of the Army" and "Medical and Hospital Department, Army" and "Engineer Service, Army" and "Ordnance Service and Supplies, Army" and "Chemical Service, Army" and "Working Fund, Army, Chemical Corps" and "Maintenance, Bureau of Ships" and "Maintenance, Bureau of Yards and Dock" and "Aviation, Navy" and total obligations for all "Research" and "Development" activities of the "Ordnance and Ordnance Stores, Navy" and "Maintenance, Bureau of Supplies and Account" budget accounts, total obligations for "Medical and dental research" activities of the "Medical Care, Navy" budget account, total obligations for "Research planning, coordination, evaluation, and dissemination" activities of the "Salaries, Office of Naval Research" budget account, and total obligations for the en-

Procurement" and "Aircraft and Facilities" and "Shipbuilding" and "Ships and Facilities" and "Procurement of Ordinance and Ammunition" and "Ordinance and Facilities" and "Medical Care" and "Service-Wide Operations" and "Developmental Test and Evaluation" and "Operational Test and Evaluation" and "Emergency Fund, Defense" budget accounts, among others. The Korean- and Vietnam war-era "Emergency Fund, Defense" account was available "[f]or transfer by the Secretary of Defense... to any appropriation for military functions under the Department of Defense available for research and development, or procurement or production related thereto" (FY1957 Budget p. 514), but any funds for R&D obligations would have been transferred to the relevant R&D or RDT&E budget account; residual adjusted appropriations for the actual fiscal year were lapsing unobligated balances, and would not have resulted in R&D obligations. We do, however, track and count the initial request for the "Emergency Fund, Defense," as such requests could subsequently be transferred to R&D or RDT&E accounts, above and beyond those initial requests; we also track initial requests for 'Office of the Secretary of Defense and interservice activities, Research and Development," a budget account preceding the "Emergency Fund, Defense" account.

[33]As a modern budgetary concept, "appropriations" were only introduced in the FY1950 budget request, and early postwar budgets instead focused on obligations. With the exception of the Department of the Air Force, which had a dedicated "Research and Development, Department of the Air Force" budget account starting in the FY1950 budget request, obligation line-items for R&D activities tended to be scattered through a multitude of budget accounts; there were no separate budget accounts reporting new obligation authority or (adjusted) appropriations for the R&D functions of the Department of the Army or the Department of the Navy until the FY1956 and FY1957 budget requests, respectively. As such, we use "Obligations by Activities" tables reporting R&D activities for each department for FY1947–FY1949, taking total (direct plus indirect) obligations for R&D activities as a proxy for related appropriations, ignoring any related funding from working fund accounts (funds advanced from other agencies) to potential avoid double-counting of budgetary resources.

tire "Research, Navy" and "Research and Development, Department of the Air Force" budget accounts, sources: FY1950 Budget pp. 709, 725, 734, 737, 740, 743, 751, 754, 810, 825, 827, 831, 838, 839, 845, and 857.

- **FY1949**: Total obligations for all "Research and development" activities of the "Quartermaster Service, Army" and "Transportation Service, Army" and "Signal Service of the Army" and "Medical and Hospital Department, Army" and "Engineer Service, Army" and "Ordnance Service and Supplies, Army" and "Chemical Service, Army" and "Working Fund, Army, Chemical Corps" and "Aircraft and Facilities, Navy" and "Ships and Facilities, Navy" and "Ordnance and Facilities, Navy" and "Medical Care, Navy" and "Civil Engineering, Navy" and "Service-Wide Supply and Finance, Navy" budget accounts, and total obligations for the entire "Research, Navy" and "Research and Development, Department of the Air Force" budget accounts, sources: FY1951 Budget pp. 635, 638, 640, 642, 645, 649, 651, 652, 703, 706, 708, 712, 713, 715, 717, and 751.
- **FY1950-FY1954**: "Department of the Army, Research and Development" and "Department of the Navy, Research and Development" and "Department of the Air Force, Research and Development" budget categories, sources: Senate Appropriations Subcommittee Hearing, Department of Defense Appropriations for [FY]1952, June 7, 1951, p. 47 for actual, enacted new obligation authority for FY1950 and subsequent forecasts; Senate Appropriations Subcommittee Hearing, Department of Defense Appropriations for [FY]1953, February 4, 1952, p. 166 for pending new obligation authority for FY1952 and requests for FY1953; House Appropriations Subcommittee Hearing, Department of Defense Appropriations for [FY]1954, February 24, 1953, pp. 427-428 for pending new obligation authority for FY1953 and requests for FY1954; House Appropriations Subcommittee Hearings, Department of the Navy Appropriations for [FY]1955, February 9, 1954, p. 95 for pending total appropriations for FY1954 and requests for FY1955; House Appropriations Subcommittee Hearings, Department of the Air Force Appropriations for [FY]1955, February 11, 1954, pp. 634-635 for pending adjusted appropriations for FY1954 and requests for FY1955; and House Appropriations Subcommittee Hearing, Department of Defense Appropriations for [FY]1956, January 31, 1955, pp. 502-503 for enacted/actual new obligation authority for FY1951–FY1954 and subsequent forecasts.[34]
- **FY1955-FY1957**: "Research and Development, Army" and "Research and Development, Navy" and "Research and Development, Air Force" budget accounts, sources: FY1957 Budget pp. 514. 527, 555, and 565; FY1958 Budget pp. 495, 505, 531, and 543; and FY1959 Budget pp. 443-445, 455, 481, and 500.
- **FY1958**: "Research, Development, Test and Evaluation, Army" and "Research, De-

[34]The president's budget request often omitted detailed budgets for the Department of Defense during the Korean War; e.g., the President's Budget Message for the FY1952 budget explained "The communist attacks in Korea and the imminent possibility of further attacks elsewhere have already caused us to quadruple the budget for the Department of Defense... Because of the extensive planning involved, I am not submitting detailed 1952 estimates for the Department of Defense at this time" (FY1952 Budget, p. M14). Due to the lack of consistent *Budget* data, we use Congressional hearing transcripts with budget tables from testimony to identify enacted appropriations for the R&D functions of the Army, Navy, and Air Force for FY1950–FY1954, which line up reasonably well with the new R&D budget account line-items for enacted and proposed appropriations for FY1954–FY1956 in the FY1956 budget request; subsequent data from hearings also line up reasonably well with the R&D budget account data in the FY1957 budget request. Detailed appropriations tables are not available from transcripts of appropriation committee hearings prior to FY1950, so this approach cannot be extended back for FY1947–FY1949.

velopment, Test and Evaluation, Navy" and "Research, Development, Test and Evaluation, Air Force" and "Salaries and Expenses, Advanced Research Projects Agency" and "United States Scientific Satellite"[35] budget accounts plus "Adjustment to reflect comparability with proposed 1960 appropriation structure," sources: FY1960 Budget pp. 451, 497-503.[36]

- **FY1959–FY1960**: "Research, Development, Test and Evaluation, Army" and "Research, Development, Test and Evaluation, Navy" and "Research, Development, Test and Evaluation, Air Force" and "Salaries and Expenses, Advanced Research Projects Agency" budget accounts plus "Adjustment to reflect comparability with proposed 1961 appropriation structure," sources: FY1961 Budget pp. 442, 482-488; and FY1962 Budget pp. 478, 528-534.
- **FY1961–FY1962**: "Research, Development, Test and Evaluation, Army" and "Research, Development, Test and Evaluation, Navy" and "Research, Development, Test and Evaluation, Air Force" and "Salaries and Expenses, Advanced Research Projects Agency" budget accounts, sources: FY1963 Budget Appx. pp. 269-277; and FY1964 Budget Appx. pp. 288-297.
- **FY1963–FY1991**: "Research, Development, Test and Evaluation, Army" and "Research, Development, Test and Evaluation, Navy" and "Research, Development, Test and Evaluation, Air Force" and "Research, Development, Test and Evaluation, Defense Agencies" budget accounts, sources: FY1965 Budget Appx. pp. 280-288; FY1966 Budget Appx. pp. 311-319; FY1967 Budget Appx. pp. 327-336; FY1968 Budget Appx. pp. 310-320; FY1969 Budget Appx. pp. 307-315; FY1970 Budget Appx. pp. 292-299; FY1971 Budget Appx. pp. 294-300; FY1972 Budget Appx. pp. 310-316; FY1973 Budget Appx. pp. 311-318; FY1974 Budget Appx. pp. 303-309; FY1975 Budget Appx. pp. 312-319; FY1976 Budget Appx. pp. 306-311; FY1977 Budget Appx. pp. 263-267; FY1978 Budget Appx. pp. 252-257; FY1979 Budget Appx. pp. 296-301; FY1980 Budget Appx. pp. 306-311; FY1981 Budget Appx. pp. 294-299; FY1982 Budget Appx. pp. I-G39-G44; FY1983 Budget Appx. pp. I-G39-G44; FY1984 Budget Appx. pp. I-G34-G39; FY1985 Budget Appx. pp. I-G35-G39; FY1986 Budget Appx. pp. I-G30-G33; FY1987 Budget Appx. pp. I-G42-G47; FY1988 Budget Appx. pp. I-G34-G39; FY1989 Budget Appx. pp. I-G28-G32; FY1990 Budget Appx. pp. I-G32-G35; FY1991 Budget Appx. pp. A-588-590; FY1992 Budget Appx. pp. Part Four-509-513; and FY1993 Budget Supplement pp. Part Two-55-59.
- **FY1992–FY1994**: "Research, Development, Test and Evaluation, Army" and "Research, Development, Test and Evaluation, Navy" and "Research, Development, Test

[35]The U.S. Scientific Satellite budget account for FY1958 "provided the Secretary of Defense with authority to transfer funds from other appropriations to meet expenses of Defense participation in the Vanguard scientific satellite project" (FY1960 Budget p. 503), and unobligated balances were transferred to NASA's "Research and Development" account in FY1959. These funds were appropriated for DOD in FY1958 and there is no double-counting with adjusted NASA appropriations for FY1958 (the funds had not yet been transferred).

[36]The main titles of the Defense budget were reorganized in FY1960, and the "R&D budget accounts were replaced with expanded "RDT&E" budget accounts including funds previously appropriated under the "Procurement" and "Military Personnel" budget accounts (FY1960 Budget p. 445, footnote 2). The FY1960-FY1962 budget requests show the corresponding adjustment for FY1958-FY1960 actual enacted "R&D" appropriations that would now be reclassified as "RDT&E," which we include in our DOD R&D appropriations series. The newly defined "RDT&E" component of the "Procurement" and "Military Personnel" budget accounts cannot be separately identified before FY1958. For an apples-to-apples comparison, we measure the annual change in real DOD R&D appropriations between FY1957-FY1958 excluding the "RDT&E" adjustment for FY1958, and measure the annual change between FY1958-FY1959 including the adjustment for both years.

and Evaluation, Air Force" and "Research, Development, Test and Evaluation, Defense-Wide" budget accounts, sources: FY1994 Budget Appx. pp. 477-481; FY1995 Budget Appx. pp. 312-315; FY1996 Budget Appx. pp. 330-334; FY1997 Budget Appx. pp. 336-340; FY1998 Budget Appx. pp. 345-350; FY1999 Budget Appx. pp. 271-275; FY2000 Budget Appx. pp. 288-292; FY2001 Budget Appx. pp. 288-293; FY2002 Budget Appx. pp. 292-296; FY2003 Budget Appx. pp. 295-299; FY2004 Budget Appx. pp. 273-277; FY2005 Budget Appx. pp. 292-296; FY2006 Budget Appx. pp. 295-299; FY2007 Budget Appx. pp. 295-298; FY2008 Budget Appx. pp. 269-272; FY2009 Budget Appx. pp. 292-296; FY2010 Budget Appx. pp. 293-297; FY2011 Budget Appx. pp. 293-297; FY2012 Budget Appx. pp. 280-284; FY2013 Budget Appx. pp. 297-301; FY2014 Budget Appx. pp. 285-288; FY2015 Budget Appx. pp. 286-289; FY2016 Budget Appx. pp. 274-277; FY2017 Budget Appx. pp. 278-282; FY2018 Budget Appx. pp. 269-272; FY2019 Budget Appx. pp. 266-270; FY2020 Budget Appx. pp. 261-267; and FY2021 Budget Appx. pp. 277-281.

A.2 Quantification of Energy R&D Appropriations

The quantification of Energy R&D programs is complicated by our effort to separate our defense versus nondefense activities. Discretionary budget authority and adjusted appropriations are only reported for entire budget accounts, but a single budget account often funds both defense and nondefense activities; and even a strictly defense-oriented budget account may fund both R&D activities (e.g., nuclear weapons research, development, and testing) as well as a broader range of activities unrelated to R&D (e.g., mining and enriching uranium for the production of nuclear weapons). When necessary, we use data on direct obligations that are separately reported in the *Budget* for each activity of each budget account for our quantification and split between defense and nondefense R&D appropriations for DOE, using descriptions of each budget activity from the *Budget* appendices to guide our categorization.

The nuclear weapons activities of DOE and its preceding agencies pose a particular challenge for quantifying appropriations for R&D activities because RDT&E functions are only separately broken out for FY1968–FY1974 and again FY1991-FY2019. Moreover, those RDT&E obligations only account for roughly 40-60% of total obligations for nuclear weapons activities in those years; the nuclear weapons activities budget account also funds procurement, maintaining operational capabilities (e.g., nuclear missile silos), and monitoring foreign compliance with arms control treaties, more so later in our sample. For more of a consistent series primarily capturing R&D activity, we rely on appropriations committee hearing transcripts of the DOE/ERDA/AEC budget requests for data for FY1967 and FY1975-FY1990. Transcripts for these years report past (actual, adjusted), pending, and requested appropriations or obligations for RDT&E activities of the nuclear weapons budget account, and the nuclear weapons RDT&E appropriations data from the hearings line up perfectly or nearly perfectly with overlapping data from the *Budget* around these years. Due to data limitations, we use total obligations for operations and plant and equipment for nuclear weapons or weapons activities budget accounts for FY1947–FY1966, but during this era—before most Cold War-era arms control treaties had been ratified and predominantly before the nuclear triad had even been deployed—the U.S. was primarily researching, developing, testing, and building nuclear weapons, not maintaining a large existing stock of weapons and launch capacity or monitoring foreign compliance with arms control treaties. To avoid a spurious drop in appropriations when changing data definitions, we measure the

change in DOE's defense R&D appropriations between FY1966-FY1967 using obligations for all nuclear weapons activities and use just obligations for RDT&E weapons activities for the change in appropriations between FY1967-FY1968 and beyond.

Prior to FY1974, there is no detail on the portion of "Plant and Equipment" or "Capital Investment" or "Capital Equipment" obligations for nuclear weapons activities specifically related to R&D, as opposed to mining and enrichment of uranium or other production activities. When a breakout for "Capital Equipment" is first reported for FY1974, obligations for "Capital Equipment: Research and Development" and "Capital Equipment: Testing of Atomic Weapons" only account for 34.8% of total capital equipment obligations for weapons activities. As such, we ignore "Plant and Equipment" or "Capital Equipment" obligations for FY1967–FY1973. To avoid a spurious jump in appropriations when changing data definitions, we measure the change in DOE's defense R&D appropriations between FY1973-FY1974 ignoring "Capital Equipment," whereas subsequent growth is measured using obligations for "Capital Equipment: Research and Development" and "Capital Equipment: Testing of Atomic Weapons" in both years.

Budgetary concept line-item for DOE appropriations funding R&D from the *Budget*:

- **FY1948–FY1973**: "Obligations"
- **FY1974–FY1976**: "Obligations" for direct programs
- **FY1977–FY1981**: "Budget authority" or "Budget authority (appropriation)" also "Appropriation" or "Appropriation (adjusted)" for Energy: Nondefense, "Obligations" for direct programs for Energy: Defense
- **FY1990–FY1995**: "Budget authority (net)" also "Appropriation (adjusted)" or "Appropriation (total)" for Energy: Nondefense, "Obligations" for direct programs for Energy: Defense
- **FY1995–FY2009**: "Net [discretionary] budget authority " also "Appropriation (total)" or "Appropriation" or "Appropriation (total discretionary)", "Obligations" for direct programs for Energy: Defense "Weapons Activities"
- **FY2010–FY2019**: "Budget authority, net (discretionary)" or "Budget authority, net (total)" also "Appropriation, discretionary (total)" or "Appropriations, discretionary: Appropriation", "Obligations" for direct programs for Energy: Defense "Weapons Activities"

Budget accounts and data sources for DOE: Defense R&D appropriations:[37]

- **FY1948**: Obligations for the "Weapons" activities and a share of the "Reactor development" activities of the "Salaries and Expenses, Atomic Energy Commission" budget account, sources: FY1950 Budget p. 76.[38]

[37]We ignore obligations for operating expenses, facilities, and capital equipment for "Raw materials" and "Special nuclear materials" and "Training, education, and information" and "Communities" and "Administrative" and "Security investigations" activities and adjusted appropriations/net budget authority for the "Uranium Supply and Enrichment Activities" and "Strategic Petroleum Reserve" and "Energy Information Administration" and "Federal Energy Regulatory Commission" and "Departmental Administrative" budget accounts, among others.

[38]The early emphasis for "Reactor development" activities was a mix of submarine propulsion and civilian nuclear reactor development, but civilian versus defense reactor function activities are not broken out prior to FY1955 budget. We split the "Reactor development" activities of the "Salaries and Expenses" budget account into Defense/Nondefense functions for FY1948 using the FY1955 shares of "Reactor development" of the "Operating Expenses" budget account for FY1955, see footnote for FY1955.

- **FY1949**: Obligations for the "Operations: Weapons" and a share of obligations for the "Operations: Reactor development" activities and "Plant and Equipment: Research facilities" and "Plant and Equipment: Multipurpose facilities" activities of the "Salaries and Expenses, Atomic Energy Commission" budget account, sources: FY1951 Budget p. 73.[39]
- **FY1950–FY1951**: Obligations for the "Operations: Weapons" and "Plant and equipment: Weapons facilities" and a share of obligations for the "Operations: Reactor development" and "Plant and equipment: Reactor development facilities" activities of the "Salaries and Expenses, Atomic Energy Commission" budget account, sources: FY1952 Budget p. 91; and FY1953 Budget p. 112.[40]
- **FY1952–FY1954**: Obligations for the "Weapons" and a share of obligations for the "Reactor development" activities of the "Operating Expenses, Atomic Energy Commission" budget account and obligations for the "Weapons facilities" and a share of obligations for the "Reactor development" activities of the "Plant and Equipment, Atomic Energy Commission" budget account, sources: FY1954 Budget pp. 96-97; FY1955 Budget pp. 98-102; and FY1956 Budget pp. 100-105.
- **FY1955**: Obligations for the "Weapons" activities and "Reactor development: Army package power reactor program" and "Reactor development: Naval propulsion reactor program" and "Reactor development: Aircraft propulsion reactor program" activity categories of the "Operating Expenses, Atomic Energy Commission" budget account and obligations for the "Weapons facilities" and a 'defense share' of obligations for "Reactor development" activities of the "Plant and Equipment, Atomic Energy Commission" budget account, sources: FY1957 Budget pp. 116-120.[41]
- **FY1956**: Obligations for the "Weapons" activities and "Reactor development: Army package power reactor program" and "Reactor development: Naval propulsion reactor program" and "Reactor development: Aircraft propulsion reactor program" activity categories of the "Operating Expenses, Atomic Energy Commission" budget account and obligations for the "Weapons facilities" and a 'defense share' of obligations for "Reactor development" activities of the "Plant Acquisition and Construction, Atomic Energy Commission" budget account, sources: FY1958 Budget pp. 111-116.
- **FY1957**: Obligations for the "Weapons" activities and "Reactor development: Army package power reactor program" and "Reactor development: Naval propulsion reactor program" and "Reactor development: Aircraft propulsion reactor program" and "Reactor development: Controlled thermonuclear project" activity categories of the "Op-

[39]We split the "Operations: Reactor development" activities into Defense/Nondefense functions for FY1949 using the FY1955 shares of "Reactor development" of the "Operating Expenses" budget account for FY1955, see footnote for FY1955. The "Plant and Equipment: Research facilities" and "Plant and Equipment: Multipurpose facilities" activities for FY1949 are split into the "Plant and equipment: Weapons facilities" and "Plant and equipment: Reactor development facilities" activities (which we classify as "Energy: Defense') and the "Plant and equipment: Physical research facilities" and "Plant and equipment: Biology and medicine facilities" activities (which we classify as 'Energy: Nondefense') in FY1950. We split the FY1949 "Research Facilities" and "Multipurpose facilities" into Defense/Nondefense obligations using the Defense/Nondefense shares of these four subsequent obligation activities in FY1950.

[40]We split the "Operations: Reactor development" and "Plant and equipment: Reactor development facilities" activities into Defense/Nondefense functions for FY1950-FY1954 using the FY1955 shares of "Reactor development" of the "Operating Expenses" budget account for FY1955, see footnote for FY1955.

[41]Starting with the FY1957 budget, the "Operating Expenses: Reactor development" activities are broken out by category, but the "Plant and Equipment: Reactor development" activities are not. We apportion the "Plant and Equipment: Reactor development" activities between defense and nondefense categories based on the defense and nondefense category shares of total "Operating Expenses: Reactor development" activities.

erating Expenses, Atomic Energy Commission" budget account and obligations for the "Weapons facilities" and a 'defense share' of obligations for "Reactor development" activities of the "Plant Acquisition and Construction, Atomic Energy Commission" budget account, sources: FY1959 Budget pp. 117-121.

- **FY1958–FY1959**: Obligations for the "Weapons" activities and "Reactor development: Army package power reactor program" and "Reactor development: Naval propulsion reactor program" and "Reactor development: Aircraft propulsion reactor program" and "Reactor development: Missile propulsion reactors" and "Reactor development: Satellite power sources" activity categories of the "Operating Expenses, Atomic Energy Commission" budget account and obligations for the "Weapons facilities" and a 'defense share' of obligations for "Reactor development" activities of the "Plant Acquisition and Construction, Atomic Energy Commission" budget account, sources: FY1960 Budget pp. 129-132; and FY1961 Budget pp. 116-121.
- **FY1960–FY1962**: Obligations for the "Weapons" activities and "Reactor development: Army package power reactor program" and "Reactor development: Naval propulsion reactor program" and "Reactor development: Aircraft propulsion reactor program" and "Reactor development: Missile propulsion reactors" and "Reactor development: Satellite and small power sources" activity categories of the "Operating Expenses, Atomic Energy Commission" budget account and obligations for the "Weapons facilities" and a 'defense share' of obligations for "Reactor development" activities of the "Plant Acquisition and Construction, Atomic Energy Commission" budget account, sources: FY1962 Budget pp. 129-125; FY1963 Budget Appx pp. 655-662; and FY1964 Budget Appx pp. 690-696.
- **FY1963**: Obligations for the "Weapons" activities and "Reactor development: Army package power reactor program" and "Reactor development: Naval propulsion reactor program" and "Reactor development: Aircraft propulsion reactor program" and "Reactor development: Missile propulsion reactors" and "Reactor development: Satellite and small power sources" activity categories of the "Operating Expenses, Atomic Energy Commission" budget account and obligations for the "Weapons facilities" and a 'defense share' of obligations for "Reactor development" activities of the "Plant and Capital Equipment, Atomic Energy Commission" budget account, sources: FY1965 Budget Appx pp. 675-682.
- **FY1964–FY1965**: Obligations for the "Weapons" activities and "Reactor development: Army package power reactor program" and "Reactor development: Naval propulsion reactor program" and "Reactor development: Missile propulsion reactors" and "Reactor development: Satellite and small power sources" activity categories of the "Operating Expenses, Atomic Energy Commission" budget account and obligations for the "Weapons facilities" and a 'defense share' of obligations for "Reactor development" activities of the "Plant and Capital Equipment, Atomic Energy Commission" budget account, sources: FY1966 Budget Appx. pp. 741-748; and FY1967 Budget Appx. pp. 817-822.
- **FY1966**: Obligations for the "Weapons" activities and "Reactor development: Army package power reactor program" and "Reactor development: Naval propulsion reactor program" and "Reactor development: Space electric power development" activity categories of the "Operating Expenses, Atomic Energy Commission" budget account and obligations for the "Weapons facilities" and a 'defense share' of obligations for "Reactor development" activities of the "Plant and Capital Equipment, Atomic Energy

Commission" budget account, sources: FY1968 Budget Appx. pp. 835-840.

- **FY1967**: Obligations for the "Reactor development: Naval propulsion reactor program" and "Reactor development: Space electric power development" activity categories of the "Operating Expenses, Atomic Energy Commission" budget account and a 'defense share' of obligations for "Reactor development" activities of the "Plant and Capital Equipment, Atomic Energy Commission" budget account, sources: FY1969 Budget Appx. pp. 837-841. Appropriations for the "Research and Development" and "Testing of Atomic Weapons" activities of the "Weapons Program" budget account, source: House Appropriations Subcommittee Hearing, Public Works Appropriations for [FY]1969 for Water and Power Resources Development and the Atomic Energy Commission, Part 3, April 23, 1968, p. 149.[42]
- **FY1968–FY1971**: Obligations for the "Weapons: Research and development" and "Weapons: Testing of nuclear weapons" and "Reactor development: Naval propulsion reactor program" and "Reactor development: Space electric power development" activity categories of the "Operating Expenses, Atomic Energy Commission" budget account and a 'defense share' of obligations for "Reactor development" activities of the "Plant and Capital Equipment, Atomic Energy Commission" budget account, sources: FY1970 Budget Appx. pp. 813-818; FY1971 Budget Appx. pp. 793-798; FY1972 Budget Appx. pp. 797-802; and FY1973 Budget Appx. pp. 771-777.
- **FY1972–FY1973**: Obligations for the "Weapons activity: Research and development" and "Weapons activity: Testing" categories and "Naval reactor development" activity categories of the "Operating Expenses, Atomic Energy Commission" budget account and obligations for the "Naval reactor development" facilities and equipment activities of the "Plant and Capital Equipment, Atomic Energy Commission" budget account, sources: FY1974 Budget Appx. pp. 767-773; and FY1975 Budget Appx. pp. 753-759.
- **FY1974**: Direct obligations for the "National security: Weapons: Research and development" and "National security: Weapons: Testing" and "National security: Laser fusion" categories and "Nuclear energy development: Naval reactor development" direct program activity categories and capital outlay program activities of ERDA's "Operating Expenses" and "Plant and Capital Equipment" budget accounts, sources: FY1976 Budget Appx. pp. 755-762. Obligations for the "Capital Equipment: Research and Development" and "Capital Equipment: Testing of Atomic Weapons" activities of the "National Security: Weapons" budget account, source: Senate Appropriations Subcommittee Hearing, Public Works for Water and Power Development and Energy Research Appropriations for Fiscal Year 1976, Part 5, April 16, 1975, p. 4912.
- **FY1975-FY1976**: Obligations for the "Fusion power research and development: Laser fusion" and "Naval reactor development" direct program activity categories and capital outlay (facilities and equipment) program activities of ERDA's "Operating Expenses" and "Plant and Capital Equipment, Fossil Fuels" budget accounts, sources: FY1977 Budget Appx. pp. 625-630; FY1978 Budget Appx. pp. 617-625. Obligations

[42]Starting with the FY1969 hearings and FY1970 budget, the "Weapons" activity of the "Operating Expenses" budget account is separately reported by three categories; we include "Research and development" and "Testing of nuclear weapons" and exclude "Production and surveillance" from our measure of DOE R&D appropriations for data starting in FY1967. No such category distinction is made for the "Weapons" facilities activities of the "Plant and Capital Equipment" budget account until FY1974; we ignore any RDT&E obligations within "Plant and Capital Equipment" between FY1967-FY1973, until related data is available by category.

for the "Operating Expenses: Research and Development" and "Operating Expenses: Testing of Atomic Weapons" and "Operating Expenses: Special Test Detection Activities" and "Capital Equipment: Research and Development" and "Capital Equipment: Testing of Atomic Weapons" activities of the "National Security: Weapons Activities" budget account, source: Senate Appropriations Subcommittee Hearing, Public Works for Water and Power Development and Energy Research Appropriations for Fiscal Year 1977, Part 5, March 18, 1976, pp. 3996, 4014; Senate Appropriations Subcommittee Hearing, Public Works for Water and Power Development and Energy Research Appropriations for Fiscal Year 1978, Part 4, March 17, 1977, p. 705.[43]

- **FY1977**: Direct program obligations and capital investments for the "Naval reactor development" and "Inertial confinement fusion" categories of DOE's "Atomic Energy Defense Activities" budget account, sources: FY1979 Budget Appx. pp. 357-358. Obligations for the "Operating Expenses: Research and Development" and "Operating Expenses: Testing of Atomic Weapons" and "Operating Expenses: Special Test Detection Activities" and "Capital Equipment: Research and Development" and "Capital Equipment: Testing of Atomic Weapons" activities of the "National Security: Weapons Activities" budget account, source: Senate Appropriations Subcommittee Hearing, Public Works for Water and Power Development and Energy Research Appropriations for Fiscal Year 1979, Part 5, March 15, 1978, p. 1263.
- **FY1978**: Direct program obligations and capital investments for the "Naval reactor development" and "Inertial confinement fusion" categories of DOE's "Atomic Energy Defense Activities, Operating Expenses" and "Atomic Energy Defense Activities, Plant and Capital Equipment" budget accounts, sources: FY1980 Budget Appx. pp. 369-371. Obligations for the "Weapons Budget: Research and Development" and "Weapons Budget: Testing" activities of DOE's "Weapons Program" budget, source: Senate Appropriations Subcommittee Hearing, Energy and Water Development Appropriations for [FY]1980, Part 7, March 19, 1979, pp. 2194, 2202.
- **FY1979**: Direct program obligations and capital investments for the "Naval reactor development" and "Inertial confinement fusion" categories of DOE's "Atomic Energy Defense Activities, Operating Expenses" and "Atomic Energy Defense Activities, Plant and Capital Equipment" budget accounts, sources: FY1981 Budget Appx. pp. 395-397. Appropriations for the "Research, Development, and Testing" activities of DOE's "Weapons" budget, source: House Appropriations Subcommittee Hearing, Energy and Water Development Appropriations for [FY]1981, Part 6, March 10, 1980, pp. 1626.
- **FY1980**: Direct program obligations and capital investments for the "Naval reactor development" categories of DOE's "Atomic Energy Defense Activities, Operating Expenses" and "Atomic Energy Defense Activities, Plant and Capital Equipment" budget accounts, sources: FY1982 Budget Appx. pp. I-J1-J3. Appropriations for the "Research, Development, and Testing" activities (the sum of "Weapons Program" and "Inertial Confinement Fusion" activities) of DOE's "Weapons Activities" budget, source: House Appropriations Subcommittee Hearing, Energy and Water Development Appropriations for [FY]1982, Part 5, February 1981, p. 27.[44]

[43]Hearings for the FY1976 budget request show that the "National security: Weapons: Testing" budget activity for FY1974 reflected both the "Testing of Atomic Weapons" and "Special Test Detection Activities" functions reported in the hearings transcripts for that year, so we include both functions for continuity. Funding for "Special Test Detection Activities" accounts for just 4.3% of the total obligations for "National security: Weapons: Testing" activity in FY1975.

[44]DOE's "Inertial Confinement Fusion" activities were reported separately from "Weapons Activities" before FY1980.

- **FY1981-FY1986**: Direct program obligations for the "Naval reactor development" categories of DOE's "Atomic Energy Defense Activities" budget account, sources: FY1983 Budget Appx. pp. I-F40-F42; FY1984 Budget Appx. pp. I-J1-J2; FY1985 Budget Appx. pp. I-J1-J2; FY1986 Budget Appx. pp. I-J1-J2; FY1987 Budget Appx. pp. I-J1-J2; and FY1988 Budget Appx. pp. I-J1-J2. Appropriations for the "Research, Development, and Testing" and (when applicable) "Inertial Confinement Fusion" weapons activities of DOE's "Atomic Energy Defense Activities" budget, source: House Appropriations Subcommittee Hearing, Energy and Water Development Appropriations for [FY]1983, Part 4, February 1982, p. 105; House Appropriations Subcommittee Hearing, Energy and Water Development Appropriations for [FY]1984, Part 4, February 1983, p. 74; House Appropriations Subcommittee Hearing, Energy and Water Development Appropriations for [FY]1985, Part 4, February 1984, p. 77; House Appropriations Subcommittee Hearing, Energy and Water Development Appropriations for [FY]1986, Part 4, February 1985, p. 80; and House Appropriations Subcommittee Hearing, Energy and Water Development Appropriations for [FY]1987, Part 4, February 1986, p. 70; House Appropriations Subcommittee Hearing, Energy and Water Development Appropriations for [FY]1988, Part 4, January 1987, p. 64.[45]
- **FY1987**: Direct program obligations for the "Naval reactor development" categories of DOE's "Atomic Energy Defense Activities" budget account, sources: FY1989 Budget Appx. pp. I-J1-J2. Appropriations for the "Weapons Research, Development, and Testing" activities of DOE's "Weapons Activities" budget, source: Senate Appropriations Subcommittee Hearing, Energy and Water Development Appropriations for [FY]1989, Part 1, March 25, 1988, pp. 428, 576.
- **FY1988-FY1989**: Direct program obligations for the "Naval reactor development" categories of DOE's "Atomic Energy Defense Activities" budget account, sources: FY1990 Budget Appx. pp. I-J1-J2; and FY1991 Budget Appx. pp. A-661-662. Appropriations for the "Weapons Activities: Research, Development and Testing" activities of DOE's "Atomic Energy Defense Activities" budget, source: House Appropriations Subcommittee Hearing, Energy and Water Development Appropriations for [FY]1990, Part 4, January 1989, p. 8; and House Appropriations Subcommittee Hearing, Energy and Water Development Appropriations for [FY]1991, Part 4, January 1989, p. 8.
- **FY1990**: Direct program obligations for the "Naval reactor development" category of DOE's "Atomic Energy Defense Activities" budget account, sources: FY1992 Budget Appx. pp. Part Four-595-596. Appropriations for the "Research, Development and Testing" activities of DOE's "Defense Programs–Weapons Activities" budget, source: Senate Appropriations Subcommittee Hearing, Energy and Water Development Appropriations for [FY]1992, Part 1, May 7, 1991, p. 72.
- **FY1991**: Direct program obligations for the "Research and development" and "Nuclear weapons testing" activities of DOE's "Atomic Energy Defense Activities: Weapons Activities" budget account and for the "Naval reactor development" activities of DOE's "Materials Production and Other Defense Programs" budget account, sources: FY1993 Budget Appx. pp. Appendix One-459-462.
- **FY1992-FY1993**: Direct program obligations for the "Research and development" and "Nuclear weapons testing" activities of DOE's "Atomic Energy Defense Activities:

[45]The "Inertial Confinement Fusion" activities are included in and reported under "Research, Development, and Testing" activities for FY1984 and FY1986.

Weapons Activities" budget account and for the "Naval reactor development" activities of DOE's "Materials Support and Other Defense Programs" budget account, sources: FY1994 Budget Appx. pp. Appendix One-569-572; and FY1995 Budget Appx. pp. 395-398.

- **FY1994-FY1995**: Direct program obligations for the "Research and development" and "Nuclear weapons testing" activities of DOE's "Atomic Energy Defense Activities: Weapons Activities" budget account and for the "Naval reactor development" activities of DOE's "Other Defense Activities" budget account, sources: FY1996 Budget Appx. pp. 425-430; FY1997 Budget Appx. pp. 433-437.
- **FY1996-FY1997**: Direct program obligations for the "Stockpile stewardship" activities of DOE's "Atomic Energy Defense Activities: Weapons Activities" budget account and for the "Naval reactor development" activities of DOE's "Defense Environmental Management Privatization" budget account, sources: FY1998 Budget Appx. pp. 453-457; FY1999 Budget Appx. pp. 359-363.[46]
- **FY1998, FY2000**: Direct program obligations for the "Stockpile stewardship" activities of DOE's "Weapons Activities" budget account and for the "Naval reactor development" activities of DOE's "Other Defense Activities" budget account, sources: FY2000 Budget Appx. pp. 389-394; and FY2002 Budget Appx. pp. 393-401.
- **FY1999**: Direct program obligations for the "Stockpile stewardship" activities of DOE's "Weapons Activities" budget account and for the "Naval reactors" activities of DOE's "Other Nuclear Security Activities" budget account, sources: FY2001 Budget Appx. pp. 393-395.
- **FY2001-FY2009**: Direct program obligations for the "Directed stockpile work" and "Campaigns" activities of DOE's "Weapons Activities" budget account and net budget authority for the "Naval reactors" budget account, sources: FY2003 Budget Appx. pp. 385-387; FY2004 Budget Appx. pp. 361-363; FY2005 Budget Appx. pp. 381-383; FY2006 Budget Appx. pp. 387-389; FY2007 Budget Appx. pp. 379-381; FY2008 Budget Appx. pp. 351-353; FY2009 Budget Appx. pp. 379-381; FY2010 Budget Appx. pp. 405-407; and FY2011 Budget Appx. pp. 411-413.[47]
- **FY2010-FY2015**: Direct program obligations for the "Directed stockpile work" and "Science campaign" and "Engineering campaign" and "Inertial confinement fusion ignition and high yield campaign" and "Advanced simulation and computing campaign" and "Readiness campaign" activities of DOE's "Weapons Activities" budget account and net budget authority for the "Naval reactors" budget account, sources: FY2012 Budget Appx. pp. 389-391; FY2013 Budget Appx. pp. 421-423; FY2014 Budget Appx. pp. 369-371; FY2015 Budget Appx. pp. 381-384; FY2016 Budget Appx. pp. 393-395; and FY2017 Budget Appx. pp. 395-397.
- **FY2016-FY2019**: Direct program obligations for the "Directed stockpile work" and "Science" and "Engineering" and "Inertial confinement fusion ignition and high yield" and "Advanced simulation and computing" of DOE's "Weapons Activities" budget

[46]Starting in FY1996, the "Weapons Activities: Research and Development" and "Weapons Activities: Nuclear weapons testing" activities are combined into a new "Stockpile stewardship" activity with similar functions.

[47]Starting in FY2001, the "Stockpile stewardship" activity is split into the "Directed stockpile work" and "Campaigns" activities, which include "research, development, and certification technology efforts to meet future stockpile requirements" and "scientific and technical efforts to develop and maintain critical capabilities" (FY2002 Budget Appx. p. 387).

account and net budget authority for the "Naval reactors" budget account, sources: FY2018 Budget Appx. pp. 371-373; FY2019 Budget Appx. pp. 371-373; FY2020 Budget Appx. pp. 371-373; and FY2021 Budget Appx. pp. 385-387.

Budget accounts and data sources for DOE: Nondefense R&D appropriations:

- **FY1948**: Obligations for the "Physical research" and "Biology and medicine" activities of the "Salaries and Expenses, Atomic Energy Commission" budget account, sources: FY1950 Budget p. 76.
- **FY1949**: Obligations for the "Operations: Physical research" and "Operations: Biology and medicine" activities and a share of obligations for "Plant and Equipment: Research facilities" activities of the "Salaries and Expenses, Atomic Energy Commission" budget account, sources: FY1951 Budget p. 73.[48]
- **FY1950–FY1951**: Obligations for the "Operations: Physical research" and "Operations: Biology and medicine" and "Plant and equipment: Physical research facilities" and "Plant and equipment: Biology and medicine facilities" activities of the "Salaries and Expenses, Atomic Energy Commission" budget account, sources: FY1952 Budget p. 91; and FY1953 Budget p. 112.
- **FY1952–FY1954**: Obligations for the "Physical research" and "Biology and medicine" activities of the "Operating Expenses, Atomic Energy Commission" budget account and obligations for the "Physical research facilities" and "Biology and medicine facilities" activities of the "Plant and Equipment, Atomic Energy Commission" budget account, sources: FY1954 Budget pp. 96-97; FY1955 Budget pp. 98-102; and FY1956 Budget pp. 100-105.
- **FY1955**: Obligations for the "Reactor development: Civilian power reactor program" and "Reactor development: Training and education" and "Reactor development: Advanced development, operational services, and all other" activity categories and "Physical research" and "Biology and medicine" activities of the "Operating Expenses, Atomic Energy Commission" budget account and obligations for the "Physical research facilities" and "Biology and medicine facilities" and a civilian share of obligations for "Reactor development" activities of the "Plant and Equipment, Atomic Energy Commission" budget account, sources: FY1957 Budget pp. 116-120.[49]
- **FY1956**: Obligations for the "Reactor development: Civilian power reactor program" and "Reactor development: Advanced development, operational services, and all other" and "Reactor development: Commercial ship reactors" activity categories and "Physical research" and "Biology and medicine" activities of the "Operating Expenses, Atomic Energy Commission" budget account and obligations for the "Physical research facilities" and "Biology and medicine facilities" and a civilian share of obligations for "Reactor development" activities of the "Plant Acquisition and Construction, Atomic Energy Commission" budget account, sources: FY1958 Budget pp. 111-116.
- **FY1957**: Obligations for the "Reactor development: Civilian power reactor program" and "Reactor development: Civilian power supporting effort" and "Reactor development: Commercial ship reactors" and "Reactor development: All other" activity categories and "Physical research" and "Biology and medicine" activities of the "Operating Expenses, Atomic Energy Commission" budget account and obligations for the

[48] See footnote for Energy: Defense, FY1949.
[49] See footnote for Energy: Defense, FY1955.

"Physical research facilities" and "Biology and medicine facilities" and a civilian share of obligations for "Reactor development" activities of the "Plant Acquisition and Construction, Atomic Energy Commission" budget account, sources: FY1959 Budget pp. 117-121.

- **FY1958**: Obligations for the "Reactor development: Civilian power reactors" and "Reactor development: Commercial ship reactors" and "Reactor development: Operational services and equipment" activity categories and "Physical research" and "Biology and medicine" and "Isotopes development" activities of the "Operating Expenses, Atomic Energy Commission" budget account and obligations for the "Physical research facilities" and "Biology and medicine facilities" and a civilian share of obligations for "Reactor development" activities of the "Plant Acquisition and Construction, Atomic Energy Commission" budget account, sources: FY1960 Budget pp. 129-132.
- **FY1959**: Obligations for the "Reactor development: Civilian power reactors" and "Reactor development: Commercial ship reactors" and "Reactor development: Operational services and equipment" activity categories and "Physical research" and "Biology and medicine" and "Civilian applications of isotopes and nuclear explosives" activities of the "Operating Expenses, Atomic Energy Commission" budget account and obligations for the "Physical research facilities" and "Biology and medicine facilities" and a civilian share of obligations for "Reactor development" activities of the "Plant Acquisition and Construction, Atomic Energy Commission" budget account, sources: FY1961 Budget pp. 116-121.
- **FY1960**: Obligations for the "Reactor development: Civilian power reactors" and "Reactor development: Merchant ship propulsion reactors" and "Reactor development: Rocket propulsion reactors" and "Reactor development: Equipment and operational services " activity categories and "Physical research" and "Biology and medicine" and "Civilian applications of isotopes and nuclear explosives" activities of the "Operating Expenses, Atomic Energy Commission" budget account and obligations for the "Physical research facilities" and "Biology and medicine facilities" and "Civilian applications of isotopes and nuclear explosives facilities" and a civilian share of obligations for "Reactor development" activities of the "Plant Acquisition and Construction, Atomic Energy Commission" budget account, sources: FY1962 Budget pp. 129-125.
- **FY1961**: Obligations for the "Reactor development: Civilian power reactors" and "Reactor development: Power demonstration reactor program" and "Reactor development: Cooperative program with Euratom" and "Reactor development: Merchant ship reactors" and "Reactor development: Rocket propulsion reactors" and "Reactor development: General reactor technology" and "Reactor development: Advanced systems research and development" and "Reactor development: Nuclear safety" and "Reactor development: Operational services" and "Reactor development: General purpose capital equipment" activity categories and "Physical research" and "Biology and medicine" and "Civilian applications of isotopes" and "Civilian applications of nuclear explosives" activities of the "Operating Expenses, Atomic Energy Commission" budget account and obligations for the "Physical research facilities" and "Biology and medicine facilities" and "Civilian applications of isotopes facilities" and a civilian share of obligations for "Reactor development" activities of the "Plant Acquisition and Construction, Atomic Energy Commission" budget account, sources: FY1963 Budget Appx. pp. 655-662.
- **FY1962**: Obligations for the "Reactor development: Civilian power reactors" and

"Reactor development: Power demonstration reactor program" and "Reactor development: Cooperative program with Euratom" and "Reactor development: Merchant ship reactors" and "Reactor development: Rocket propulsion reactors" and "Reactor development: General reactor technology" and "Reactor development: Advanced systems research and development" and "Reactor development: Nuclear safety" and "Reactor development: Operational services " activity categories and "Physical research" and "Biology and medicine" and "Civilian applications of isotopes" and "Civilian applications of nuclear explosives" activities of the "Operating Expenses, Atomic Energy Commission" budget account and obligations for the "Physical research facilities" and "Biology and medicine facilities" and "Civilian applications of isotopes facilities" and a civilian share of obligations for "Reactor development" activities of the "Plant Acquisition and Construction, Atomic Energy Commission" budget account, sources: FY1964 Budget Appx. pp. 690-696.

- **FY1963–FY1964**: Obligations for the "Reactor development: Civilian power reactors" and "Reactor development: Cooperative power demonstration reactor program" and "Reactor development: Cooperative program with Euratom" and "Reactor development: Merchant ship reactors" and "Reactor development: Rocket propulsion reactors" and "Reactor development: General reactor technology" and "Reactor development: Advanced systems research and development" and "Reactor development: Nuclear safety" and "Reactor development: Operational services " activity categories and "Physical research" and "Biology and medicine" and "Civilian applications of isotopes" and "Civilian applications of nuclear explosives" activities of the "Operating Expenses, Atomic Energy Commission" budget account and obligations for the "Physical research facilities" and "Biology and medicine facilities" and "Civilian applications of isotopes facilities" and "Civilian applications of nuclear explosives facilities" and a civilian share of obligations for "Reactor development" activities of the "Plant and Capital Equipment, Atomic Energy Commission" budget account, sources: FY1965 Budget Appx. pp. 675-682; FY1966 Budget Appx. pp. 741-748.
- **FY1965**: Obligations for the "Reactor development: Civilian power reactors" and "Reactor development: Cooperative power demonstration reactor program" and "Reactor development: Cooperative program with Euratom" and "Reactor development: Merchant ship reactors" and "Reactor development: Space propulsion systems" and "Reactor development: General reactor technology" and "Reactor development: Advanced systems research and development" and "Reactor development: Nuclear safety" and "Reactor development: Operational services " activity categories and "Physical research" and "Biology and medicine" and "Isotopes development" and "Civilian applications of nuclear explosives" activities of the "Operating Expenses, Atomic Energy Commission" budget account and obligations for the "Physical research facilities" and "Biology and medicine facilities" and "Isotopes development facilities" and "Civilian applications of nuclear explosives facilities" and a civilian share of obligations for "Reactor development" activities of the "Plant and Capital Equipment, Atomic Energy Commission" budget account, sources: FY1967 Budget Appx. pp. 817-822.
- **FY1966-FY1968**: Obligations for the "Reactor development: Civilian power reactors" and "Reactor development: Cooperative power demonstration reactor program" and "Reactor development: Cooperative program with Euratom" and "Reactor development: Merchant ship reactors" and "Reactor development: Space propulsion systems" and "Reactor development: Terrestrial electric power development" and "Reactor

development: General reactor technology" and "Reactor development: Advanced systems research and development" and "Reactor development: Nuclear safety" and "Reactor development: Operational services " activity categories and "Physical research" and "Biology and medicine" and "Isotopes development" and "Civilian applications of nuclear explosives" activities of the "Operating Expenses, Atomic Energy Commission" budget account and obligations for the "Physical research facilities" and "Biology and medicine facilities" and "Isotopes development facilities" and "Civilian applications of nuclear explosives facilities" and a civilian share of obligations for "Reactor development" activities of the "Plant and Capital Equipment, Atomic Energy Commission" budget account, sources: FY1968 Budget Appx. pp. 835-840; FY1969 Budget Appx. pp. 837-841; and FY1970 Budget Appx. pp. 813-818.

- **FY1969**: Obligations for the "Reactor development: Civilian power reactors" and "Reactor development: Cooperative power demonstration reactor program" and "Reactor development: Euratom" and "Reactor development: Space propulsion systems" and "Reactor development: Terrestrial electric power development" and"Reactor development: General reactor technology" and "Reactor development: Nuclear safety" and "Reactor development: Operational services " activity categories and "Physical research" and "Biology and medicine" and "Isotopes development" and "Civilian applications of nuclear explosives" activities of the "Operating Expenses, Atomic Energy Commission" budget account and obligations for the "Physical research facilities" and "Biology and medicine facilities" and "Isotopes development facilities" and "Civilian applications of nuclear explosives facilities" and a civilian share of obligations for "Reactor development" activities of the "Plant and Capital Equipment, Atomic Energy Commission" budget account, sources: FY1971 Budget Appx. pp. 793-798.
- **FY1970–FY1971**: Obligations for the "Reactor development: Civilian power reactors" and "Reactor development: Cooperative power demonstration reactor program" and "Reactor development: Space propulsion systems" and "Reactor development: Terrestrial electric power development" and"Reactor development: General reactor technology" and "Reactor development: Nuclear safety" and "Reactor development: Operational services " activity categories and "Physical research" and "Biology and medicine" and "Isotopes development" and "Civilian applications of nuclear explosives" activities of the "Operating Expenses, Atomic Energy Commission" budget account and obligations for the "Physical research facilities" and "Biology and medicine facilities" and "Isotopes development facilities" and "Civilian applications of nuclear explosives facilities" and a civilian share of obligations for "Reactor development" activities of the "Plant and Capital Equipment, Atomic Energy Commission" budget account, sources: FY1972 Budget Appx. pp. 797-802; and FY1973 Budget Appx. pp. 771-777.
- **FY1972**: Obligations for the "Civilian reactor development" and "Applied energy technology" and "Space nuclear systems" and "Physical research" and "Controlled thermonuclear research" and "Biomedical and environmental research" activities of the "Operating Expenses, Atomic Energy Commission" budget account and obligations for the "Civilian reactor development" and "Applied energy technology" and "Space nuclear systems" and "Physical research" and "Controlled thermonuclear research" and "Biomedical and environmental research" facilities and equipment activities of the "Plant and Capital Equipment, Atomic Energy Commission" budget account, sources: FY1974 Budget Appx. pp. 767-773.

- **FY1973**: Obligations for the "Civilian reactor development" and "Reactor safety research" and "Applied energy technology" and "Space nuclear systems" and "Physical research" and "Controlled thermonuclear research" and "Biomedical and environmental research and safety" activities of the "Operating Expenses, Atomic Energy Commission" budget account and obligations for the "Civilian reactor development" and "Reactor safety research" and "Applied energy technology" and "Space nuclear systems" and "Physical research" and "Controlled thermonuclear research" and "Biomedical and environmental research and safety" facilities and equipment activities of the "Plant and Capital Equipment, Atomic Energy Commission" budget account, sources: FY1975 Budget Appx. pp. 753-759.
- **FY1974**: Obligations for the "Fossil energy development" and "Solar, geothermal, and advanced energy systems development" and "Conservation research and development" and "Fusion power research and development" and "Fission power reactor development" and "Space nuclear systems" and "Advanced isotope separation technology" and "Environmental and safety research" direct program activities and capital outlay program activities of ERDA's "Operating Expenses" and "Plant and Capital Equipment" budget accounts, sources: FY1976 Budget Appx. pp. 755-762.
- **FY1975**: Obligations for the "Fossil energy development" and "Solar energy development" and "Geothermal energy development" and "Conservation research and development" and "Fusion power research and development: Magnetic fusion" and "Fission power reactor development" and "Environmental research and safety" and "High energy physics" and "Basic energy sciences" and "Space nuclear systems" and "Advanced isotope separation technology" direct program activities and capital outlay program activities of ERDA's "Operating Expenses" and "Plant and Capital Equipment" budget accounts, sources: FY1977 Budget Appx. pp. 625-630.
- **FY1976**: Obligations for the "Fossil energy development" and "Solar energy development" and "Geothermal energy development" and "Conservation research and development" and "Fusion power research and development: Magnetic fusion" and "Fuel cycle research and development" and "Liquid fast breeder reactor" and "Nuclear research and applications" and 'Environmental research and development" and "Life sciences research and biomedical applications" and "High-energy physics" and "Nuclear physics" and "Basic energy sciences" direct program activities and capital outlay program activities of ERDA's "Operating Expenses" and "Plant and Capital Equipment" budget accounts, sources: FY1978 Budget Appx. pp. 617-625.
- **FY1977**: Budget authority (appropriation) for DOE's "General Science and Research" budget account and obligations for the "Research and Technology Development" and "Conservation" and "Environment" operating costs and capital investment program activities of DOE's "Energy" budget account, sources: FY1979 Budget Appx. pp. 358-360.
- **FY1978–FY1980**: Budget authority (appropriation, adjusted if applicable) for DOE's "General Science and Research: Operating Expenses" and "General Science and Research: Plant and Capital Equipment" and "Energy Supply, Research and Development: Operating Expenses" and "Energy Supply, Research and Development: Plant and Capital Equipment" and "Fossil Fuel Research and Development: Operating Expenses" budget accounts, sources: FY1980 Budget Appx. pp. 371-378; FY1981 Budget Appx. pp. 397-404; and FY1982 Budget Appx. pp. I-J3-I-J9.

- **FY1981**: Budget authority (appropriation) for DOE's "General Science and Research Activities" and "Energy Supply, Research and Development Activities" and "Fossil Fuel Research and Development Activities" and "Energy Conservation Research Activities" budget accounts, sources: FY1983 Budget Appx. pp. I-F42-F49.
- **FY1982-FY1991**: Budget authority (appropriation, adjusted or net budget authority, if applicable) for DOE's "General Science and Research Activities" and "Energy Supply, Research and Development Activities" and "Fossil Fuel Research and Development Activities" and "Energy Conservation" budget accounts, save direct obligations for "State and local assistance" activities in the "Energy Conservation" budget account, sources: FY1984 Budget Appx. pp. I-J2-J10; FY1985 Budget Appx. pp. I-J3-J11; FY1986 Budget Appx. pp. I-J2-J11; FY1987 Budget Appx. pp. I-J2-J12; FY1988 Budget Appx. pp. I-J2-J11; FY1989 Budget Appx. pp. I-J2-J11; FY1990 Budget Appx. pp. I-J2-J10; FY1991 Budget Appx. pp. A-662-670; FY1992 Budget Appx. pp. Part Four-597-607; and FY1993 Budget Appx. pp. Appendix One-462-472.[50]
- **FY1992-FY1996**: Budget authority (appropriation, adjusted or net budget authority, if applicable) for DOE's "General Science and Research Activities" and "Energy Supply, Research and Development Activities" and "Fossil Fuel Research and Development Activities" and "Energy Conservation" budget accounts, save direct obligations for "Technical and financial assistance" activities in the "Energy Conservation" budget account, sources: FY1994 Budget Appx. pp. Appendix One-572-581; FY1995 Budget Appx. pp. 398-407; FY1996 Budget Appx. pp. 430-441; FY1997 Budget Appx. pp. 437-446; and FY1998 Budget Appx. pp. 457-468.[51]
- **FY1997-FY2003**: Budget authority (appropriation, adjusted or net budget authority, if applicable) for DOE's "Science" and "Energy Supply" and "Fossil Energy Research and Development" and "Energy Conservation" budget accounts, save direct obligations for "Building technology, State and community programs" activities in the "Energy Conservation" budget account, sources: FY1999 Budget Appx. pp. 364-373; FY2000 Budget Appx. pp. 395-403; FY2001 Budget Appx. pp. 400-409; FY2002 Budget Appx. pp. 401-412; FY2003 Budget Appx. pp. 394-404; FY2004 Budget Appx. pp. 369-379; and FY2005 Budget Appx. pp. 388-398.
- **FY2004**: Budget authority (appropriation, adjusted or net budget authority, if applicable) for DOE's "Science" and "Energy Supply" and "Fossil Energy Research and Development" and "Energy Conservation" budget accounts, save direct obligations for "Weatherization Assistance Program Grants" and "State Energy Program Grants" and "State Energy Activities" activities in the "Energy Conservation" budget account, sources: FY2006 Budget Appx. pp. 395-403.
- **FY2005**: Net budget authority for DOE's "Science" and "Energy Supply and Conservation" and "Fossil Energy Research and Development" budget accounts, save direct obligations for "Intergovernmental activities" in the "Energy Supply and Conservation" budget account and net of the direct obligations for "Weatherization Assistance Program Grants" and "State Energy Program Grants" and "State Energy Activities" activities in the "Energy Conservation" budget account, sources: FY2007 Budget

[50]State and local assistance for conservation efforts (e.g., weatherization) were under a separate "Energy Conservation Grants" budget account before FY1982.

[51]State and local grants and assistance for conservation efforts were transferred into a new "Technical and financial assistance" activity category starting in FY1992.

Appx. pp. 387-394.[52]

- **FY2006-FY2007**: Net budget authority for DOE's "Science" and "Energy Supply and Conservation" and "Fossil Energy Research and Development" budget accounts, save direct obligations for "Weatherization and intergovernmental activities" in the "Energy Supply and Conservation" budget account, sources: FY2008 Budget Appx. pp. 359-366; and FY2009 Budget Appx. pp. 387-396.
- **FY2008**: Net budget authority for DOE's "Science" and "Nuclear Energy" and "Electricity Delivery and Energy Reliability" and "Energy Efficiency and Renewable Energy" and "Fossil Energy Research and Development" budget accounts, save direct obligations for "Weatherization and intergovernmental activities" in the "Energy Efficiency and Renewable Energy" budget account, sources: FY2010 Budget Appx. pp. 413-423.
- **FY2009**: Net budget authority for DOE's "Science" and "Energy Transformation Acceleration Fund" and "Energy Transformation Acceleration Fund, Recovery Act" and "Nuclear Energy" and "Electricity Delivery and Energy Reliability" and "Energy Efficiency and Renewable Energy" and "Fossil Energy Research and Development" budget accounts, save direct obligations for "Weatherization and intergovernmental activities" and "Energy Efficiency and Conservation Block Grants - Recovery Act" and "Weatherization Assistance Program - Recovery Act" and "State Energy Program - Recovery Act" and "Appliance Rebate Programs - Recovery Act" activities in the "Energy Efficiency and Renewable Energy" budget account, sources: FY2011 Budget Appx. pp. 411-429.
- **FY2010**: Net budget authority for DOE's "Science" and "Nuclear Energy" and "Electricity Delivery and Energy Reliability" and "Energy Efficiency and Renewable Energy" and "Fossil Energy Research and Development" budget accounts, save direct obligations for "Weatherization and intergovernmental activities" and "Energy Efficiency and Conservation Block Grants - Recovery Act" and "Weatherization Assistance Program - Recovery Act" and "State Energy Program - Recovery Act" and "Appliance Rebate Programs - Recovery Act" activities in the "Energy Efficiency and Renewable Energy" budget account, sources: FY2012 Budget Appx. pp. 396-407.
- **FY2011-FY2016**: Net budget authority for DOE's "Science" and "Advanced Research Projects Agency—Energy" and "Nuclear Energy" and "Electricity Delivery and Energy Reliability" and "Energy Efficiency and Renewable Energy" and "Fossil Energy Research and Development" budget accounts, save direct obligations for "Weatherization and Intergovernmental Activities" in the "Energy Efficiency and Renewable Energy" budget account, sources: FY2013 Budget Appx. pp. 429-437; FY2014 Budget Appx. pp. 377-387; FY2015 Budget Appx. pp. 389-400; FY2016 Budget Appx. pp. 400-411; FY2017 Budget Appx. pp. 402-415; and FY2018 Budget Appx. pp. 378-387.
- **FY2017**: Net budget authority for DOE's "Science" and "Advanced Research Projects Agency—Energy" and "Nuclear Energy" and "Electricity Delivery" and "Energy Efficiency and Renewable Energy" and "Fossil Energy Research and Development" budget accounts, save direct obligations for "Weatherization and Intergovernmental Activities" in the "Energy Efficiency and Renewable Energy" budget account, sources: FY2019 Budget Appx. pp. 378-387.

[52]DOE's "Energy Supply" and "Energy Conservation" budget accounts are merged into the "Energy Supply and Conservation" budget account starting with the FY2007 Budget; netting out obligations for grants to state and local governments from the legacy "Energy Conservation" account keeps things consistent during the transition year.

- **FY2018**: Net budget authority for DOE's "Science" and "Advanced Research Projects Agency—Energy" and "Nuclear Energy" and "Electricity" and "Energy Efficiency and Renewable Energy" and "Fossil Energy Research and Development" budget accounts, save direct obligations for "Weatherization and Intergovernmental Activities" in the "Energy Efficiency and Renewable Energy" budget account, sources: FY2020 Budget Appx. pp. 377-388; and FY2021 Budget Appx. pp. 391-403.

A.3 Quantification of NASA R&D Appropriations

Budgetary concept line-item for NASA appropriations funding R&D:

- **FY1956**: "Appropriation"
- **FY1957**: "New obligation authority" or "Appropriation (new obligation authority)"
- **FY1958**: "Appropriation (adjusted)" also "New obligation authority"
- **FY1959**: "Appropriation (new obligation authority)" or "New obligation authority (appropriation)" also "Appropriation (adjusted)"
- **FY1960–FY1967**: "New obligation authority" also "Appropriation (adjusted)"
- **FY1968–FY1971, FY1973–FY1975, FY1977-FY1978, FY1980-FY1989**: "Budget authority" also "Appropriation" or "Appropriation (adjusted)"
- **FY1972, FY1976, FY1979**: "Budget authority (appropriation)" or "Budget authority"
- **FY1990**: "Budget authority (net)" also "Appropriation (adjusted)"
- **FY1991–FY1994**: "Budget authority (net)" also "Appropriation (total)" or "Appropriation"
- **FY1995–FY2009**: "Net budget authority" also "Appropriation (total)" or "Appropriation" or "Appropriation (total discretionary)"
- **FY2010–FY2019**: "Budget authority, net (discretionary)" or "Budget authority, net (total)" also "Appropriation, discretionary (total)" or "Appropriations, discretionary: Appropriation"

Budget accounts and data sources for NASA appropriations funding R&D:[53]

- **FY1956-FY1958**: NACA "Salaries and Expenses" and "Construction and Equipment" budget accounts, sources: FY1958 Budget pp. 146-148; FY1959 Budget pp. 161-163; and FY1960 Budget pp. 177-181.
- **FY1959-FY1961**: NASA "Salaries and Expenses" and "Research and Development" and "Construction and Equipment" budget accounts, sources: FY1961 Budget pp. 163-168.
- **FY1960-FY1961**: NASA "Salaries and Expenses" and "Research and Development" and "Construction of Facilities" budget accounts, sources: FY1962 Budget pp. 177-179; FY1963 Budget Appx. pp. 745-750; and FY1964 Budget Appx. pp. 781-787.
- **FY1962**: NASA "Salaries and Expenses" and "Research, Development, and Operations" and "Construction of Facilities" budget accounts, sources: FY1964 Budget Appx. pp. 781-787.

[53] We exclude appropriations for the "Office of the Inspector General" and "Education" and "Construction and Environmental Compliance and Restoration" budget accounts, among others. The "Construction and Equipment" account is included because it funds R&D plant, i.e., equipment and structures supporting NASA research and development.

- **FY1963**: NASA "Research and Development" and "Construction of Facilities" budget accounts, sources: FY1965 Budget Appx. pp. 765-768.
- **FY1964-FY1967**: NASA "Research and Development" and "Administrative Operations" and "Construction of Facilities" budget accounts, sources: FY1966 Budget Appx. p. 845; FY1967 Budget Appx. pp. 867-868; FY1968 Budget Appx. pp. 873-874; and FY1969 Budget Appx. pp. 873-874.
- **FY1968-FY1983**: NASA "Research and Development" and "Research and Program Management" and "Construction of Facilities" budget accounts, sources: FY1970 Budget Appx. pp. 845-850; FY1971 Budget Appx. pp. 825-830; FY1972 Budget Appx. pp. 835-840; FY1973 Budget Appx. pp. 809-814; FY1974 Budget Appx. pp. 809-815; FY1975 Budget Appx. pp. 797-803; FY1976 Budget Appx. pp. 799-805; FY1977 Budget Appx. pp. 661-666; FY1978 Budget Appx. pp. 655-660; FY1979 Budget Appx. pp. 787-794; FY1980 Budget Appx. pp. 819-826; FY1981 Budget Appx. pp. 787-793; FY1982 Budget Appx. pp. I-T1-7; FY1983 Budget Appx. pp. I-T1-7; FY1984 Budget Appx. pp. I-T1-7; and FY1985 Budget Appx. pp. I-U1-8.
- **FY1984-FY1994**: NASA "Research and Development" and "Space Flight, Control and Data Communications" and "Research and Program Management" and "Construction of Facilities" budget accounts, sources: FY1986 Budget Appx. pp. I-U1-6; FY1987 Budget Appx. pp. I-V1-7; FY1988 Budget Appx. pp. I-V1-5; FY1989 Budget Appx. pp. I-V1-5; FY1990 Budget Appx. pp. IW1-6; FY1991 Budget Appx. pp. 1061-1064; FY1992 Budget Appx. pp. Part Four-1037-1041; FY1993 Budget Appx. One pp. 895-899; FY1994 Budget Appx. pp. 1003-1006; FY1995 Budget Appx. pp. 821-827; and FY1996 Budget Appx. pp. 899-902.
- **FY1995**: NASA "Human Space Flight" and "Science, Aeronautics and Technology" and "Mission Support" and "Research and Development" and "Space Flight, Control and Data Communications" and "Research and Program Management" budget accounts, sources: FY1997 Budget Appx. pp. 905-912.[54]
- **FY1996-FY2001**: NASA "Human Space Flight" and "Science, Aeronautics and Technology" and "Mission Support" budget accounts, sources: FY1998 Budget Appx. pp. 965-970; FY1999 Budget Appx. pp. 985-990; FY2000 Budget Appx. pp. 1051-1057; FY2001 Budget Appx. pp. 1049-1056; FY2002 Budget Appx. pp. 1061-1069; and FY2003 Budget Appx. pp. 1023-1032.
- **FY2002-FY2003**: NASA "Human Space Flight" and "Science, Aeronautics and Technology" budget accounts, sources: FY2004 Budget Appx. pp. 955-961 and FY2005 Budget Appx. pp. 1043-1048.[55]
- **FY2004**: NASA "Science, Aeronautics, and Exploration" and "Space Flight Capabilities" budget accounts, sources: FY2006 Budget Appx. pp. 1073-1080
- **FY2005-FY2007**: NASA "Science, Aeronautics, and Exploration" and "Exploration Capabilities" budget accounts, sources: FY2007 Budget Appx. pp. 1065-1069; FY2008 Budget Appx. pp. 985-989; and FY2009 Budget Appx. pp. 1079-1087.
- **FY2008**: NASA "Science, Aeronautics, and Exploration" and "Space Operations" budget accounts, sources: FY2010 Budget Appx. pp. 1129-1137.

[54]The latter three budget accounts were moved into the former three, and small unobligated balances in the latter three were rescinded in FY1995 as the budget categories were terminated.

[55]The "Mission Support" budget account was folded into these two budget accounts starting in FY2002.

- **FY2009**: NASA "Science" and "Aeronautics and Space Research and Technology" and "Exploration" and "Cross Agency Support" and "Space Operations" budget accounts, sources: FY2011 Budget Appx. pp. 1171-1176.
- **FY2010-FY2011**: NASA "Science" and "Aeronautics" and "Exploration" and "Cross Agency Support" and "Space Operations" budget accounts, sources: FY2012 Budget Appx. pp. 1133-1138; and FY2013 Budget Appx. pp. 1233-1239.
- **FY2012-FY2013**: NASA "Science" and "Aeronautics" and "Space Technology" and "Exploration" and "Cross Agency Support" and "Space Operations" budget accounts, sources: FY2014 Budget Appx. pp. 1143-1149; and FY2015 Budget Appx. pp. 1207-1213.
- **FY2014-FY2019**: NASA "Science" and "Aeronautics" and "Space Technology" and "Exploration" and "Safety, Security, and Mission" and "Space Operations" budget accounts, sources: FY2016 Budget Appx. pp. 1165-1171; FY2017 Budget Appx. pp. 1183-1190; FY2018 Budget Appx. pp. 1073-1079; FY2019 Budget Appx. pp. 1081-1091; FY2020 Budget Appx. pp. 1097-1107; and FY2021 Budget Appx. pp. 1177-1187.[56]
- **FY2017**: NASA "Science" and "Aeronautics" and "Exploration Research and Technology" and "Deep Space Exploration Systems" and "Safety, Security, and Mission" and "LEO and Spaceflight Operations" budget accounts, sources: FY2019 Budget Appx. pp. 1081-1086.
- **FY2018-FY2019**: NASA "Science" and "Aeronautics" and "Exploration Technology" and "Deep Space Exploration Systems" and "Safety, Security, and Mission" and "LEO and Spaceflight Operations" budget accounts, sources: FY2020 Budget Appx. pp. 1097-1102; and FY2021 Budget Appx. pp. 1177-1183.

A.4 Quantification of NIH R&D Appropriations

Our quantification of NIH R&D appropriations is largely based on the *NIH Almanac* Historical Budget Information database, which reports the actual enacted appropriations for all related centers and institutes for every fiscal year over FY1938-FY2020.[57] We use all appropriations save those for the "Fogarty International Center," "National Library of Medicine," "Office of the Director," and "Buildings and Facilities." The remaining centers and institutes compiled in our quantification of NIH research appropriations are listed below for each fiscal year. In addition to supplementing data from the *NIH Almanac* Historical Budget Information with data from the *Bugdet* for the NIMH, NIAAA, and NIDA over FY1967-FY1992 (discussed in Section 2.2), we also use supplementary data for emergency supplemental appropriations from ARRA of 2009 for FY2009, again detailed below. We ignore supplemental appropriations for NIH from the (Hurricane Sandy) Disaster Relief Appropriations Act, 2013 (Public Law 113-2), which was also excluded from the *NIH Almanac* Historical Budget Information database; HHS was appropriated $100 million, partly for the "repair or rebuilding of non-Federal biomedical or behavioral research facilities damaged as a result of Hurricane Sandy," as opposed to research.

- **FY1947-FY1949**: Appropriations from the *NIH Almanac* for the National Cancer Institute (NCI) and National Center for Research Resources (NCRR).

[56] The "Safety, Security, and Mission" budget account replaces the "Cross Agency Support" in FY2014.
[57] See https://www.nih.gov/about-nih/what-we-do/nih-almanac/appropriations-section-1.

- **FY1950-FY1953**: Appropriations from the *NIH Almanac* for the NCI, NCRR, National Heart, Lung, and Blood Institute (NHLBI), National Institute of Dental and Craniofacial Research (NIDCR), and the National Institute of Mental Health (NIMH).
- **FY1954-FY1961**: Appropriations from the *NIH Almanac* for the NCI, NCRR, NHLBI, NIDCR, NIMH, National Institute of Diabetes and Digestive and Kidney Diseases (NIDDK), National Institute of Neurological Disorders and Stroke (NINDS), and the National Institute of Allergy and Infectious Diseases (NIAID).
- **FY1962-FY1965**: Appropriations from the *NIH Almanac* for the NCI, NCRR, NHLBI, NIDCR, NIMH, NIDDK, NINDS, NIAID, and the National Institute of Child Health and Human Development (NICHD).
- **FY1966**: Appropriations from the *NIH Almanac* for the NCI, NCRR, NHLBI, NIDCR, NIMH, NIDDK, NINDS, NIAID, NICHD, National Institute of General Medical Sciences (NIGMS), and the National Institute of Environmental Health Sciences (NIEHS).
- **FY1967**: Appropriations from the *NIH Almanac* for the NCI, NCRR, NHLBI, NIDCR, NIMH, NIDDK, NINDS, NIAID, NICHD, NIGMS, and the NIEHS. "Appropriation (adjusted)" (also "New obligation authority") from the *Budget* for the "Mental Health Research and Services" budget account of the NIMH, sources: FY1969 Budget Appx. p. 445.[58]
- **FY1968**: Appropriations from the *NIH Almanac* for the NCI, NCRR, NHLBI, NIDCR, NIMH, NIDDK, NINDS, NIAID, NICHD, NIGMS, and the NIEHS. Total obligations for the "Support and conduct of research" and "Manpower development" program activities of the "Mental Health" budget account of the Health Services and Mental Health Administration from the *Budget*, sources: FY1970 Budget Appx. p. 380.
- **FY1969**: Appropriations from the *NIH Almanac* for the NCI, NCRR, NHLBI, NIDCR, NIMH, NIDDK, NINDS, NIAID, NICHD, NIGMS, and the NIEHS. Total obligations for the "Research" and "Manpower development" program activities of the "Mental Health" budget account of the Health Services and Mental Health Administration from the *Budget*, sources: FY1971 Budget Appx. p. 375.[59]
- **FY1970-FY1971**: Appropriations from the *NIH Almanac* for the NCI, NCRR, NHLBI, NIDCR, NIMH, NIDDK, NINDS, NIAID, NICHD, NIGMS, NIEHS, and the National Eye Institute (NEI). Total obligations for the "Research" and "Manpower development" program activities of the "Mental Health" budget account of the Health Services and Mental Health Administrationh from the *Budget*, sources: FY1972 Budget Appx. p. 390; and FY1973 Budget Appx. p. 388.
- **FY1972**: Appropriations from the *NIH Almanac* for the NCI, NCRR, NHLBI, NIDCR, NIMH, NIDDK, NINDS, NIAID, NICHD, NIGMS, NIEHS, and the NEI. Total obligations for "Research" and "Training" activities of the "General mental health" and "Drug abuse" and "Alcoholism" program activities of the "Mental Health" budget account of the Health Services and Mental Health Administration from the *Budget*, sources: FY1974 Budget Appx. pp. 379-380.[60]

[58]The "Mental Health Research and Services" budget account largely funds grants fro research, training, and fellowships as well as intramural research. We ignore NIMH appropriations for the "Community Mental Health Resource Support" and "Saint Elizabeth Hospital, Salaries and Expenses" and "Saint Elizabeth Hospital, Buildings and Facilities" budget accounts.

[59]We ignore the "State and community programs" and "Rehabilitation of drug users" and "Program support activities" activities of the "Mental Health" budget account.

[60]We ignore the "Community programs" and "Management and information" activities of the same program activities.

- **FY1973-FY1975**: Appropriations from the *NIH Almanac* for the NCI, NCRR, NHLBI, NIDCR, NIMH, NIDDK, NINDS, NIAID, NICHD, NIGMS, NIEHS, and the NEI. Direct obligations for "Research" and "Training" activities of the "General mental health" and "Drug abuse" and "Alcoholism" program activities of the "Alcohol, Drug Abuse, and Mental Health" budget account of the Alcohol, Drug Abuse, and Mental Health Administration from the *Budget*, sources: FY1975 Budget Appx. p. 410; FY1976 Budget Appx. p. 402; and FY1977 Budget Appx. p. 334.
- **FY1976-FY1977**: Appropriations from the *NIH Almanac* for the NCI, NCRR, NHLBI, NIDCR, NIMH, NIDDK, NINDS, NIAID, NICHD, NIGMS, NIEHS, NEI, and the National Institute on Aging (NIA). Direct obligations for "Research" and "Training" activities of the "General mental health" and "Drug abuse" and "Alcohol abuse" program activities of the "Alcohol, Drug Abuse, and Mental Health" budget account of the Alcohol, Drug Abuse, and Mental Health Administration from the *Budget*, sources: FY1978 Budget Appx. pp. 320-321; and FY1979 Budget Appx. p. 403.
- **FY1978-FY1981**: Appropriations from the *NIH Almanac* for the NCI, NCRR, NHLBI, NIDCR, NIMH, NIDDK, NINDS, NIAID, NICHD, NIGMS, NIEHS, NEI, and NIA. Direct obligations for "Research" and "Training" activities of the "Mental health" and "Drug abuse" and "Alcohol abuse" program activities of the "Alcohol, Drug Abuse, and Mental Health" budget account of the Alcohol, Drug Abuse, and Mental Health Administration from the *Budget*, sources: FY1980 Budget Appx. p. 423; FY1981 Budget Appx. p. 454; FY1982 Budget Appx. p. I-K30; and FY1983 Budget Appx. p. I-K25.
- **FY1982-FY1986**: Appropriations from the *NIH Almanac* for the NCI, NCRR, NHLBI, NIDCR, NIMH, NIDDK, NINDS, NIAID, NICHD, NIGMS, NIEHS, NEI, and NIA. Direct obligations for the "Mental health" and "Drug abuse" and "Alcohol abuse" program activities of the "Alcohol, Drug Abuse, and Mental Health" budget account of the Alcohol, Drug Abuse, and Mental Health Administration from the *Budget*, sources: FY1984 Budget Appx. p. I-K23; FY1985 Budget Appx. p. I-K21; FY1986 Budget Appx. p. I-K22; FY1987 Budget Appx. p. I-K28; and FY1988 Budget Appx. p. I-K23.[61]
- **FY1987-FY1988**: Appropriations from the *NIH Almanac* for the NCI, NCRR, NHLBI, NIDCR, NIMH, NIDDK, NINDS, NIAID, NICHD, NIGMS, NIEHS, NEI, NIA, National Institute of Arthritis and Musculoskeletal and Skin Diseases (NIAMS), and the National Institute of Nursing Research (NINR). Direct obligations for the "Mental health" and "Drug abuse" and "Alcohol abuse" program activities of the "Alcohol, Drug Abuse, and Mental Health" budget account of the Alcohol, Drug Abuse, and Mental Health Administration from the *Budget*, sources: FY1989 Budget Appx. p. I-K22; and FY1990 Budget Appx. p. I-K25.[62]
- **FY1989**: Appropriations from the *NIH Almanac* for the NCI, NCRR, NHLBI, NIDCR, NIMH, NIDDK, NINDS, NIAID, NICHD, NIGMS, NIEHS, NEI, NIA, NIAMS, NINR,

[61] Starting in the FY1984 budget, services are removed the "Mental health" and "Drug abuse" and "Alcohol abuse" program activities (into a separate block grant), leaving just "Research" and "Training" and "Direct operations" for the "Mental health" and "Drug abuse" and "Alcohol abuse" program activities. We ignore obligations for "Service block grant" and "Buildings and facilities" and "Program management" program activities. And we previously ignore "Program support" because there is no breakout between support for services versus research and training activities; appropriations for "Program support" are quite small relative to those for research and training activities.

[62] We ignore "Grants to states" and "Substance abuse prevention" and "Buildings and facilities" and "Program management and support" program activities, among others.

and the National Institute on Deafness and Other Communication Disorders (NIDCD). Budget authority ("Appropriation, current") for the "Health research" and "Education and training of health care work force" budget accounts of the Alcohol, Drug Abuse, and Mental Health Administration from the *Budget*, sources: FY1991 Budget Appx. p. A-207.

- **FY1990**: Appropriations from the *NIH Almanac* for the NCI, NCRR, NHLBI, NIDCR, NIMH, NIDDK, NINDS, NIAID, NICHD, NIGMS, NIEHS, NEI, NIA, NIAMS, NINR, NIDCD, and the National Human Genome Research Institute (NHGRI). Net budget authority ("Appropriation, current") for the "Health research" and "Education and training of health care work force" budget accounts of the Alcohol, Drug Abuse, and Mental Health Administration from the *Budget*, sources: FY1992 Budget Appx. pp. Part Four-94-95.
- **FY1991**: Appropriations from the *NIH Almanac* for the NCI, NCRR, NHLBI, NIDCR, NIMH, NIDDK, NINDS, NIAID, NICHD, NIGMS, NIEHS, NEI, NIA, NIAMS, NINR, NIDCD, and the NHGRI. Budget authority ("Appropriation, current") for the "Health research and training" budget account of the Alcohol, Drug Abuse, and Mental Health Administration from the *Budget*, sources: FY1993 Budget Appx. p. Appendix One-56.
- **FY1992**: Appropriations from the *NIH Almanac* for the NCI, NCRR, NHLBI, NIDCR, NIMH, NIDDK, NINDS, NIAID, NICHD, NIGMS, NIEHS, NEI, NIA, NIAMS, NINR, NIDCD, and the NHGRI. Budget authority ("Appropriation, current") for the "Health research and training" budget account of the Substance Abuse and Mental Health Services Administration from the *Budget*, sources: FY1994 Budget Appx. p. Appendix-86.
- **FY1993-FY1994**: Appropriations from the *NIH Almanac* for the NCI, NCRR, NHLBI, NIDCR, NIMH, NIDDK, NINDS, NIAID, NICHD, NIGMS, NIEHS, NEI, NIA, NIAMS, NINR, NIDCD, NHGRI, National Institute on Drug Abuse (NIDA), and the National Institute on Alcohol Abuse and Alcoholism (NIAAA).
- **FY1995**: Appropriations from the *NIH Almanac* for the NCI, NCRR, NHLBI, NIDCR, NIMH, NIDDK, NINDS, NIAID, NICHD, NIGMS, NIEHS, NEI, NIA, NIAMS, NINR, NIDCD, NHGRI, NIDA, NIAAA, and the Office of AIDS Research (OAR).
- **FY1996-FY1999**: Appropriations from the *NIH Almanac* for the NCI, NCRR, NHLBI, NIDCR, NIMH, NIDDK, NINDS, NIAID, NICHD, NIGMS, NIEHS, NEI, NIA, NIAMS, NINR, NIDCD, NHGRI, NIDA, and NIAAA.
- **FY2000**: Appropriations from the *NIH Almanac* for the NCI, NCRR, NHLBI, NIDCR, NIMH, NIDDK, NINDS, NIAID, NICHD, NIGMS, NIEHS, NEI, NIA, NIAMS, NINR, NIDCD, NHGRI, NIDA, NIAAA, and the National Center for Complementary and Alternative Medicine (NCCAM).
- **FY2001**: Appropriations from the *NIH Almanac* for the NCI, NCRR, NHLBI, NIDCR, NIMH, NIDDK, NINDS, NIAID, NICHD, NIGMS, NIEHS, NEI, NIA, NIAMS, NINR, NIDCD, NHGRI, NIDA, NIAAA, NCCAM, and the National Institute on Minority Health and Health Disparities (NIMHD).
- **FY2002-FY2008**: Appropriations from the *NIH Almanac* for the NCI, NCRR, NHLBI, NIDCR, NIMH, NIDDK, NINDS, NIAID, NICHD, NIGMS, NIEHS, NEI, NIA, NIAMS, NINR, NIDCD, NHGRI, NIDA, NIAAA, NCCAM, NIMHD, and the National Institute of Biomedical Imaging and Bioengineering (NIBIB).
- **FY2009**: Appropriations from the *NIH Almanac* for the NCI, NCRR, NHLBI, NIDCR, NIMH, NIDDK, NINDS, NIAID, NICHD, NIGMS, NIEHS, NEI, NIA, NIAMS, NINR,

NIDCD, NHGRI, NIDA, NIAAA, NCCAM, NIMHD, NIBIB, and ARRA supplemental appropriations for the National Center for Research Resources (NCRR) and Office of the Director (OD).[63]

- **FY2010-FY2011**: Appropriations from the *NIH Almanac* for the NCI, NCRR, NHLBI, NIDCR, NIMH, NIDDK, NINDS, NIAID, NICHD, NIGMS, NIEHS, NEI, NIA, NIAMS, NINR, NIDCD, NHGRI, NIDA, NIAAA, NCCAM, NIMHD, and NIBIB.
- **FY2012-FY2019**: Appropriations from the *NIH Almanac* for the NCI, NHLBI, NIDCR, NIMH, NIDDK, NINDS, NIAID, NICHD, NIGMS, NIEHS, NEI, NIA, NIAMS, NINR, NIDCD, NHGRI, NIDA, NIAAA, NCCAM, NIMHD, NIBIB, and the National Center for Advancing Translational Sciences (NCATS).

A.5 Quantification of NSF R&D Appropriations

Budgetary concept line-item for NSF appropriations funding R&D:

- **FY1951–FY1954**: "Appropriation or estimate"
- **FY1955–FY1956**: "Appropriation"
- **FY1957**: "Appropriation (new obligation authority)"
- **FY1958**: "Appropriation (adjusted)" also "New obligation authority"
- **FY1959**: "New obligation authority (appropriation)"
- **FY1960–FY1967**: "New obligation authority" also "Appropriation (adjusted)"
- **FY1968**: "Budget authority (adjusted appropriation)"
- **FY1969, FY1974, FY1987–FY1988**: "Budget authority (appropriation)"
- **FY1970–FY1973, FY1975–FY1986**: "Budget authority" also "Appropriation" or "Appropriation (adjusted)"
- **FY1990**: "Appropriation (total)" also "Budget authority (net)"
- **FY1991–FY1994**: "Appropriation" also "Budget authority (net)" or "Budget authority (appropriation)"
- **FY1995–FY2009**: "Net budget authority" also "Appropriation" or "Appropriation (total)" or "Appropriation (total discretionary)"
- **FY2010–FY2019**: "Budget authority, net (discretionary)" or "Budget authority, net (total)" also "Appropriation, discretionary (total)" or "Appropriations, discretionary: Appropriation"

Budget accounts and data sources for NSF appropriations funding R&D:[64]

- **FY1951-FY1983**: NSF "Research and Related Activities" budget account, sources: FY1952 Budget p. 118; FY1953 Budget p. 143; FY1954 Budget p. 129; FY1955 Budget p. 138; FY1956 Budget p. 138; FY1957 Budget p. 159; FY1958 Budget p. 157; FY1959 Budget p. 169; FY1960 Budget p. 186; FY1961 Budget p. 173; FY1962

[63] ARRA supplemental appropriations data include $1.3 billion for the NCRR and the $7.4 billion of OD appropriations earmarked for transfer to the "Institutes and Centers of the National Institutes of Health... and to the Common Fund" (Public Law 111-5, pp. 175-176). We ignore other funds for the OD and Building and Facilities.

[64] We exclude appropriations for the "Scientific Activities (Special Foreign Currency Program)" and "Scientific Education Activities" and "Education and Human Resources" and "Salaries and Expenses" and "Office of Inspector General" budget accounts, among others.

Budget p. 186; FY1963 Budget Appx. p. 828; FY1964 Budget Appx. p. 864; FY1965 Budget Appx. p. 846; FY1966 Budget Appx. p. 944; FY1967 Budget Appx. p. 969; FY1968 Budget Appx. pp. 965-966; FY1969 Budget Appx. p. 983; FY1970 Budget Appx. p. 951; FY1971 Budget Appx. p. 932; FY1972 Budget Appx. p. 945; FY1973 Budget Appx. p. 921; FY1974 Budget Appx. p. 920; FY1975 Budget Appx. p. 904; FY1976 Budget Appx. p. 915; FY1977 Budget Appx. p. 757; FY1978 Budget Appx. p. 756; FY1979 Budget Appx. p. 908; FY1980 Budget Appx. p. 945; FY1981 Budget Appx. p. 935; FY1982 Budget Appx. p. I-V105; FY1983 Budget Appx. p. I-V115; FY1984 Budget Appx. p. I-V89; and FY1985 Budget Appx. p. I-Y63.

- **FY1984-FY1989**: NSF "Research and Related Activities" and "U.S. Antarctic [Program] Research Activities" budget accounts, sources: FY1986 Budget Appx. pp. I-Y65-66; FY1987 Budget Appx. pp. I-Z81-82; FY1988 Budget Appx. pp. I-Z65-66; FY1989 Budget Appx. pp. I-Z67-68; FY1990 Budget Appx. pp. I-Z71-72; and FY1991 Budget Appx. pp. A-1155-1157;
- **FY1990**: NSF "Research and Related Activities" and "U.S. Antarctic [Program] Research Activities" and "U.S. Antarctic Logistical Support Activities" and "Academic Research Facilities" budget accounts, sources: FY1992 Budget Appx. pp. Part Four-1148-1151.
- **FY1991-FY1992**: NSF "Research and Related Activities" and "U.S. Antarctic [Program] Research Activities" and "U.S. Antarctic Logistical Support Activities" and "Academic Research Facilities and Instrumentation" budget accounts, sources: FY1993 Budget Appx. pp. Appendix One-1004-1007; and FY1994 Budget Appx. pp. 1114-1117.
- **FY1993-FY1994**: NSF "Research and Related Activities"[65] and "Academic Research Infrastructure" budget accounts, sources: FY1995 Budget Appx. pp. 936-937; and FY1996 Budget Appx. pp. 1029-1030.
- **FY1995-FY1996**: NSF "Research and Related Activities" and "Academic Research Infrastructure" and "Major Research Equipment" budget accounts, sources: FY1997 Budget Appx. pp. 1024-1025; and FY1998 Budget Appx. pp. 1086-1087.
- **FY1997-FY2000**: NSF "Research and Related Activities" and "Major Research Equipment" budget accounts, sources: FY1999 Budget Appx. pp. 995-997; FY2000 Budget Appx. pp. 1061-1063; FY2001 Budget Appx. pp. 1061-1063; and FY2002 Budget Appx. pp. 1073-1075.
- **FY2001-FY2019**: NSF "Research and Related Activities" and "Major Research Equipment and Facilities Construction" budget accounts, sources: FY2003 Budget Appx. pp. 1035-1036; FY2004 Budget Appx. pp. 965-966; FY2005 Budget Appx. pp. 1051-1052; FY2006 Budget Appx. pp. 1081-1082; FY2007 Budget Appx. pp. 1073-1074; FY2008 Budget Appx. pp. 993-994; FY2009 Budget Appx. pp. 1091-1092; FY2010 Budget Appx. pp. 1141-1142; FY2011 Budget Appx. pp. 1181-1182; FY2012 Budget Appx. pp. 1143-1145; FY2013 Budget Appx. pp. 1245-1246; FY2014 Budget Appx. pp. 1155-1156; FY2015 Budget Appx. pp. 1217-1218; FY2016 Budget Appx. pp. 1175-1176; FY2017 Budget Appx. pp. 1195-1196; FY2018 Budget Appx. pp. 1083-1084; FY2019 Budget Appx. pp. 1091-1092; FY2020 Budget Appx. pp. 1107-1108; and FY2021 Budget Appx. pp. 1187-1188.

[65] The U.S. Antarctic Program budget accounts are folded into "Research and Related Activities" starting in FY1993.

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