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Pandemic and War Inflation: Lessons from the International Experience

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Pandemic and War Inflation: Lessons from the International Experience*

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The analysis in this paper was presented to the Federal Open Market Committee as background for its discussion of the Federal Reserve's 2025 review of its monetary policy strategy, tools, and communications.

Abstract

This paper examines the drivers of the 2020–23 inflation surge, with an emphasis on the similarities and differences across countries, as well as the role that monetary policy frameworks might have played in shaping central banks' responses. The inflation surge in the U.S. and abroad was set in motion by two global events: the COVID-19 pandemic and Russia's invasion of Ukraine. Pandemic-related supply disruptions, a rotation of consumer spending toward goods, and commodity price increases exacerbated by Russia's invasion of Ukraine resulted in unusually large relative price increases, which required time to be absorbed. A simple Phillips curve framework suggests that the inflation surge was mainly driven by "cost push" factors, such as supply shortages and relative price shifts. Tight labor markets contributed to the persistence of above-target inflation. Despite differences in mandates of the monetary policy frameworks, central banks around the world responded similarly to recent global events.

JEL codes: E31, E52, E58, F33, F40.

Keywords: International comparison, inflation, global shortages, aggregate demand, aggregate supply, commodity prices, Phillips curve, inflation expectations, monetary policy.

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1. Introduction and overview

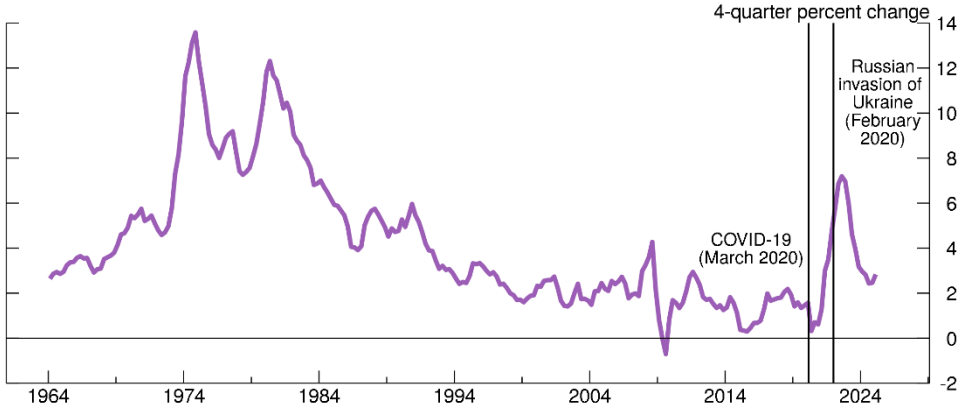
In the aftermath of COVID-19, the world experienced the worst inflationary episode since the Great Inflation of the 1970s. This paper examines the drivers of this episode, with an emphasis on the similarities and differences across economies, as well as the role that monetary policy frameworks might have played in shaping central banks' responses and economic outcomes. Our main findings are the following:

- The inflation surge in the U.S. and abroad was set in motion by two global events: the COVID-19 pandemic and Russia's invasion of Ukraine. The exceptional nature and size of these shocks made real-time assessments of their likely economic effects and of the appropriate policy response unusually challenging.
- Misalignments of demand and supply in a broad range of sectors and countries, as well as an associated upswing in commodity prices, were key drivers of the global inflation surge. The relative importance of these driving factors is the object of active academic and policy debate.
    - Pandemic-related supply disruptions, a rotation of consumer spending toward goods, and commodity price increases exacerbated by Russia's invasion of Ukraine resulted in unusually large relative price increases, which required a long time to be absorbed.
    - Fiscal and monetary stimulus supported the recovery in aggregate demand and labor markets. The recovery in demand, however, was tilted toward goods and not immediately met by a recovery in supply, contributing to higher inflation. The size of the U.S. fiscal stimulus was substantially larger than the fiscal support provided abroad.
- A simple Phillips curve framework suggests that the 2021–22 surge in inflation was mainly driven by "cost push" factors, such as supply shortages and relative price shifts. Tight labor markets contributed to the subsequent persistence of above-target inflation.
    - These results suggest that policymakers would have had to inflict significant damage to labor markets and economic activity to keep inflation near targets.
- Notwithstanding differences in mandates or other features of the monetary policy frameworks, the response of central banks around the world to recent global events displayed a high degree of synchronicity. Overall, longer-term inflation expectations remained anchored.

2. The inflation surge was global

The 2021–22 inflation surge interrupted a decades-long period of low and relatively stable global inflation (figure 1). At the onset of the pandemic in early 2020, global headline inflation at first fell amid a collapse in global activity but subsequently shot up, peaking at nearly 8 percent in mid-2022, shortly after Russia's invasion of Ukraine. Inflation then fell steadily through 2023 and has since been converging toward its pre-pandemic level. All told, the global inflation surge of the past five years was the worst since the Great Inflation of the 1970s.[1]

Figure 1: Global headline inflation



Note: Data extend through 2025:Q1. Global headline inflation is GDP-weighted headline inflation across 26 economies: Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Ireland, Israel, Italy, Japan, Korea, Mexico, the Netherlands, New Zealand, Norway, Portugal, Singapore, Spain, Sweden, Switzerland, Taiwan, Thailand, the U.K., and the U.S.

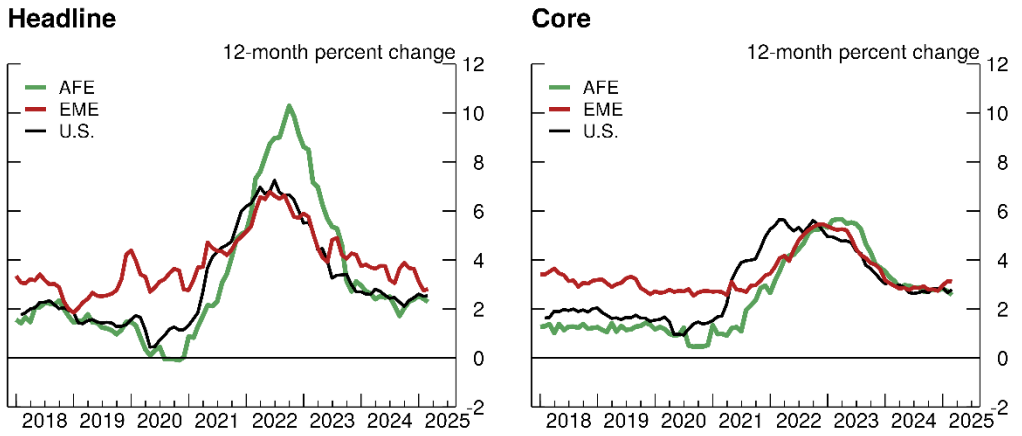
Source: National sources via Haver Analytics.

Inflation has displayed significant co-movement across economies since the onset of the pandemic. As illustrated in figure 2, the co-movement was observed not only for headline inflation (left panel), but also for core inflation (right panel), reflecting soaring food and energy prices as well as outsized increases in goods and, subsequently, services prices. That said, some differences in timing and magnitude were due to different health, fiscal, and monetary policy responses. As discussed in the next section, inflation rose earlier in the U.S. likely due to an earlier reopening and larger fiscal support to income, and it also declined somewhat earlier than elsewhere. In the advanced foreign economies (AFEs), headline inflation increased substantially more than in the U.S. and peaked later, reflecting mainly the larger exposure of European economies to cuts in energy supply from Russia. The comparatively muted rise of inflation in emerging market economies (EMEs) masks substantial regional heterogeneity, with inflation in

[1] For a discussion of the global nature of the 1970s inflation, see Cecchetti and others (2007). For more recent treatments comparing the global nature of post-pandemic inflation with past inflation dynamics, see Cascaldi-Garcia and others (2024), Akinci and others (2025), and Otrok and Strackman (2024). Whereas Cascaldi-Garcia and others (2024) find an increased role of global shocks in generating transitory fluctuations in inflation in recent years, Akinci and others (2025) find that the contribution of global shocks was similar for the more persistent components.

Asian economies, where COVID-19 restrictions were more stringent and commodity prices more tightly controlled, generally rising by less than in Latin America.

Figure 2: Inflation across economies

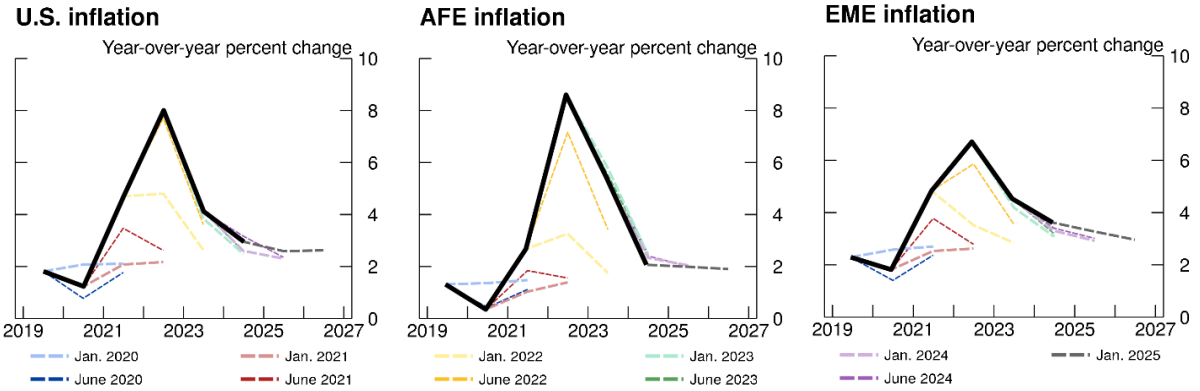


Note: Data extend through February for the U.S. and March for all other economies. Aggregate series are constructed using purchasing power parity–adjusted GDP weights. The advanced foreign economy (AFE) aggregate consists of Canada, the euro area, and the U.K. The emerging market economy (EME) aggregate consists of Brazil, Chile, Hong Kong, India, Indonesia, Israel, Korea, Malaysia, Mexico, the Philippines, Russia, Saudi Arabia, Singapore, Taiwan, and Thailand.

Source: National sources via Haver Analytics; Board staff calculations.

The size and persistence of the inflation surge wrong-footed professional forecasters, international organizations, and central banks across the world. Figure 3 plots the evolution of inflation forecasts produced by professional forecasters since 2020. The dashed colored lines show the forecasts made in January (lighter shade) and June (darker shade) of each year for the current and following year. Although professional forecasters began to revise up their inflation forecasts starting in mid-2021—as inflation was rising—they also consistently projected that the rise in inflation would be transitory, reversing more quickly than it did. Only when inflation had peaked did the accuracy of inflation forecasts improve. These misses were not specific to private-sector forecasters. The inflation forecast errors of central banks, the International Monetary Fund (IMF), and the Organization for Economic Co-operation and Development were similarly large during the inflation surge (see table A.1 in the appendix and Koch and Noureldin (2024) for further details).

Figure 3: Evolution of Consensus forecasts

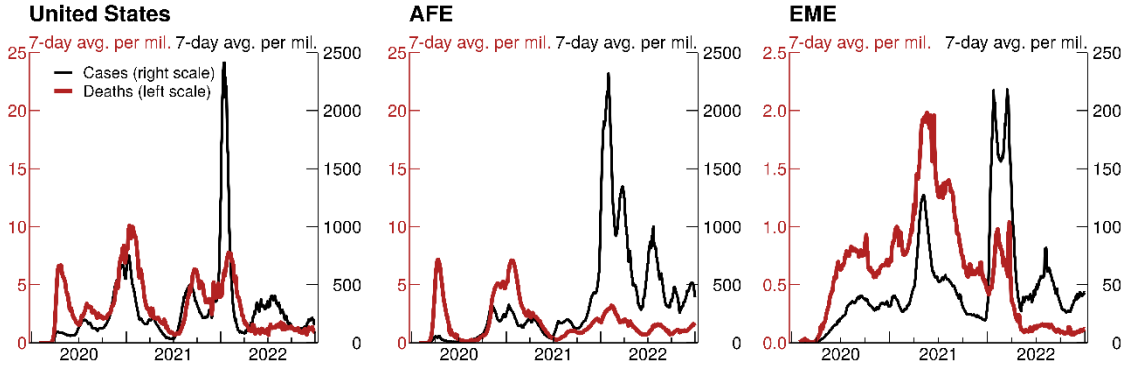


Note: Black line indicates realized year-over-year headline consumer price index (CPI) inflation. Dashed colored lines indicate the realized inflation rate in the previous year and successive mean Consensus Economics forecasts for the current year and next year. Lighter shades indicate forecasts made in January, and darker shades indicate forecasts made in June. Aggregates are created using purchasing power parity–adjusted GDP weights. The advanced foreign economy (AFE) aggregate consists of Canada, the euro area, Sweden, Switzerland, and the U.K. The emerging market economy (EME) aggregate consists of Brazil, Colombia, Hong Kong, Israel, Korea, Malaysia, Mexico, the Philippines, and Taiwan.

Source: Consensus Economics; U.S. Bureau of Labor Statistics; national sources via Haver Analytics.

These forecast errors reflected in part the intrinsically unpredictable nature and persistence of the shocks hitting the global economy during this period. COVID-19 spread in multiple waves, with varying levels of intensity and morbidity, well into 2022 (figure 4). Although vaccines arrived earlier than many had expected, their uptake and their effectiveness against evolving COVID-19 variants remained important sources of uncertainty. Similarly, Russia's invasion of Ukraine was largely unforeseen and rendered forecasts made up to that point obsolete. More generally, Londono, Ma, and Wilson (2023, 2024) show that, during this period, inflation in both advanced and emerging economies became less predictable when using a comprehensive set of financial and economic variables for forecasting.

Figure 4: Reported COVID-19 cases and deaths across economies



Note: The advanced foreign economy (AFE) aggregate consists of the euro area, Australia, Canada, Japan, Sweden, Switzerland, the United Kingdom, and New Zealand. The emerging market economy aggregate consists of Hong Kong, Korea, Singapore, Taiwan, Indonesia, Philippines, Malaysia, Vietnam, Thailand, India, China, Mexico, Chile, Brazil, Colombia, Argentina, Israel, Russia, and Saudi Arabia.

Source: Johns Hopkins Center for Systems Science and Engineering; Our World in Data.

In addition, the likely economic effects of these shocks were difficult to ascertain in real time, and their respective contributions to the surge in inflation remains the subject of ongoing debate. For example, Bernanke and Blanchard (2024, 2025) and Dao and others (2024) emphasize the outsized role of supply factors and the pass-through from relative price dislocations in lifting overall inflation. By contrast, Giannone and Primiceri (2024) and Bergholt and others (2024) argue that strong aggregate demand was the main driver of inflation.

In section 3, we summarize the consensus about the common drivers of global inflation and highlight their differential evolution in specific regions. In section 4, we perform an empirical exercise for a group of selected advanced economies that aims to quantify, in an accounting sense, the role of the different factors that led to the inflation surge. In section 5, we discuss the monetary policy response to the inflation surge and its role in bringing inflation down.

3. The main drivers of inflation were common, but there was some heterogeneity in policy responses and effects

The pandemic and Russia's invasion of Ukraine affected economies across the globe. At the onset of the pandemic, most countries imposed mobility restrictions that reduced aggregate spending and supply. However, there was significant heterogeneity in the subsequent fiscal response, reopening policies and social-distancing dynamics, exposures to global supply chain disruptions, and the effect of Russia's war in Ukraine.

3.1 The pandemic generated an unprecedented re-allocation in demand

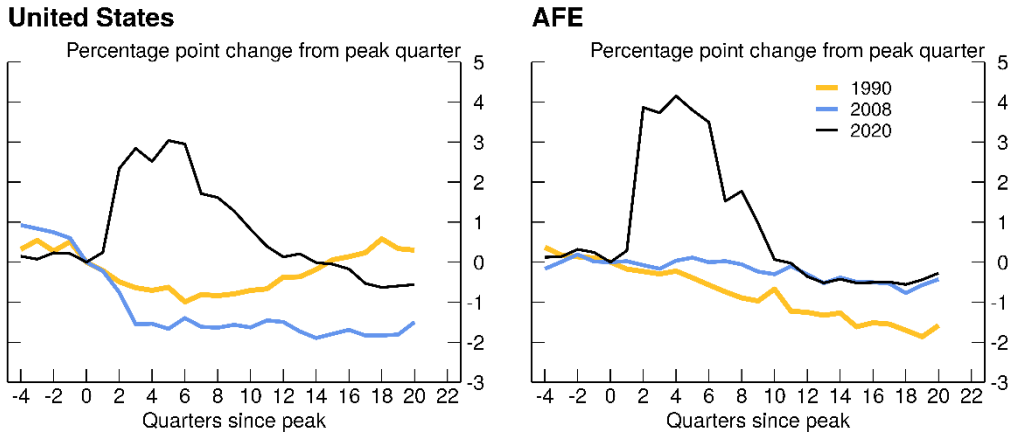
At the onset of the pandemic, governments across the world imposed strict measures to slow contagion, including closures of establishments and widespread mobility restrictions.[2] Social distancing severely restricted access to high-contact services, setting in motion a relative shift in consumer spending from services toward goods, especially medical supplies, home office equipment, and home furnishings.[3] The relative and persistent shift in demand from services to goods was a defining feature of the pandemic across countries, which had not characterized previous recessions (figure 5). That said, the evolution of aggregate demand differed substantially between countries due to health and fiscal policy choices. While in the U.S. the

[2] Figure A.1 in the appendix presents a comparison of stringency measures and mobility indexes across regions.

[3] As pointed out by Guerrieri and others (2021, 2022), the sectoral supply shock may have led to a shortfall in aggregate demand. Shutdowns not only caused consumer demand to shift spending to goods that were available, but also made spending less attractive, causing consumers to postpone spending to the future. If the tendency to postpone to the future was high, the supply disruptions caused by the shutdowns would trigger a shortfall in aggregate demand.

relative shift towards goods consumption was associated with a large increase in the demand for goods supported by robust fiscal stimulus, in Europe the relative shift was mainly associated with a strong decline in services consumption amid stringent mobility restrictions.

Figure 5: Comparison of goods share of real private consumption during recessions



Note: The advanced foreign economy (AFE) aggregate is constructed using purchasing power parity–adjusted GDP weights and includes Canada, France, Germany, and the U.K. Germany and the U.K. are omitted from the 1990 recession due to insufficient data. All series are detrended using the preceding 20 quarters.

Source: U.S. Bureau of Economic Analysis; national sources via Haver Analytics.

3.2 Fiscal and monetary measures supported aggregate demand

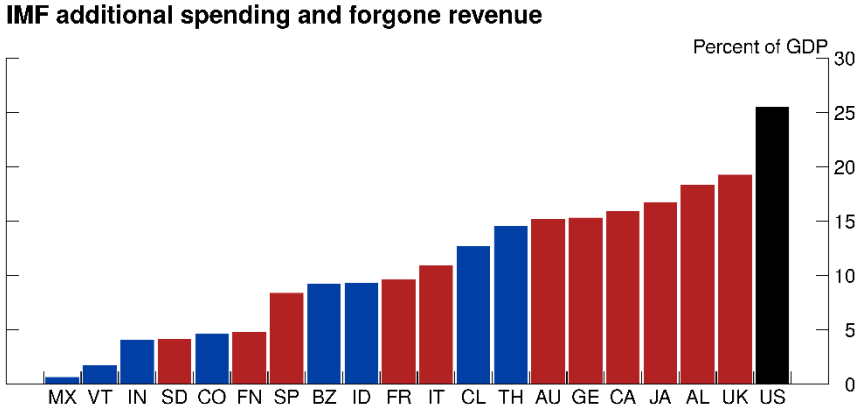
Policymakers across the world reacted to the pandemic with forceful measures to contain market stress, ensure access to credit, and protect incomes. Central banks responded to the economic disruptions by quickly lowering policy rates at the onset of the pandemic—which reached their effective lower bounds in some jurisdictions—and by providing additional stimulus to ease financial conditions and bolster financial stability. The exact amount of conventional monetary stimulus depended on the policy space at the onset of the pandemic.[4] Governments implemented a wide range of support measures, from labor market policies (in the form of extended unemployment insurance and subsidies to protect job matches) to widespread transfers to support incomes and prevent loan defaults (such as temporary deferrals of payments to governments, loans to affected businesses, direct government funding and credit guarantees to firms, and relaxed capital requirements and suspension of dividend payments for banks).

Although many governments across the world deployed fiscal support programs, IMF estimates suggest that the size of the U.S. stimulus, at nearly 25 percent of gross domestic product, was exceptionally large (figure 6). Fiscal stimulus played a pivotal role in supporting

[4] As shown in figure 16, in the euro area and the U.K., policy rates were close to the zero lower bound in early 2020.

the recovery in economic activity and, as such, may have helped to prevent long-term scarring. That said, the stimulus may have increased inflation, as it provided a boost to the unbalanced recovery in demand at a time when supply was still constrained or even disrupted. Indeed, as shown in the left panel of figure 7, real consumption spending picked up much faster in the U.S. than in other advanced economies.

Figure 6: Fiscal stimulus across economies



Note: Estimates from January 2020 to September 2021. Additional spending and forgone revenue from January 2020 to September 2021 in percent of GDP based on the International Monetary Fund's (IMF) October 2021 *World Economic Outlook.* Countries shown are Mexico, Vietnam, India, Sweden, Colombia, Finland, Spain, Brazil, Indonesia, France, Italy, Chile, Thailand, Austria, Germany, Canada, Japan, Australia, the U.K., and the U.S. Emerging market economies are shown in blue, advanced foreign economies are shown in red, and the U.S. is shown in black.

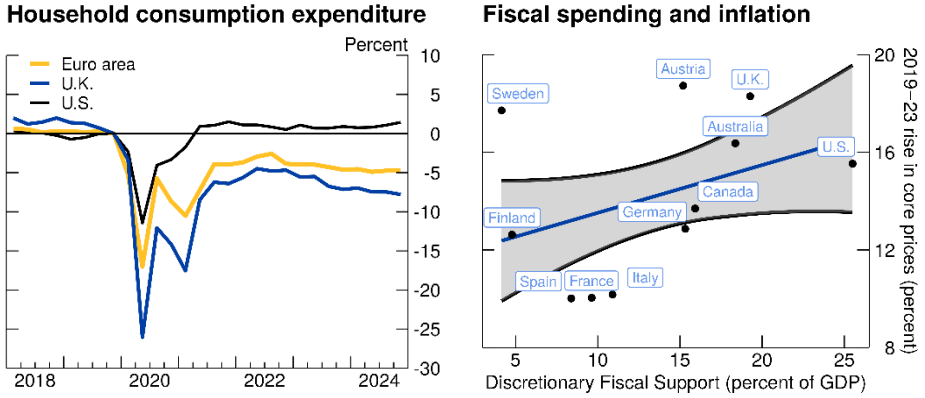
Source: IMF; Board staff calculations.

As shown in the right panel of figure 7, the size of countries' pandemic-era stimulus is positively correlated with the cumulative rise in core prices from 2019 to 2023. While suggestive, recent literature has argued that this simple correlation may not appropriately represent the true effect of the fiscal impulse. First, the correlation does not account for cross-country spillovers. In particular, Ho, Sarte, and Schwartzman (2022) and de Soyres, Santacreu, and Young (2022) suggest that fiscal policy in any given country may have affected others through the trade network. Second, Jordà and Nechio (2023) argue that in countries where fiscal measures were more focused on transfers to households, real disposable income increased more, thus fueling inflation further.

Some research has placed even greater emphasis on the role of fiscal policy during the pandemic through "fiscal theory of the price level" channels, in which private-sector expectations that nominal debt obligations will not be met through reductions in real spending or increases in real tax revenues lead to inflation that erodes the real value of government debt. Barro and Bianchi (2023) show that the correlation between fiscal outlays and inflation is even

stronger once fiscal spending is normalized by government debt and its duration, consistent with the idea that inflationary pressures reflected to some extent concerns about debt sustainability.[5]

Figure 7: Consumption expenditure, fiscal spending, and inflation



Note: In the left panel, series reflect the percent deviations of quarterly household consumption expenditure from its pre-pandemic log-linear trend in the 2015–19 period. In the right panel, the rise in the core consumer price index (CPI) is measured from 2019:Q4 to 2023:Q4. U.S. prices are core personal consumption expenditures; all others are CPI excluding food and energy. Discretionary fiscal support is calculated as the additional spending and forgone revenue from January 2020 to September 2021. The solid dark-blue line indicates the linear regression line, and the shaded region indicates the confidence interval.

Source: International Monetary Fund; U.S. Bureau of Economic Analysis; national sources via Haver Analytics; Board staff calculations.

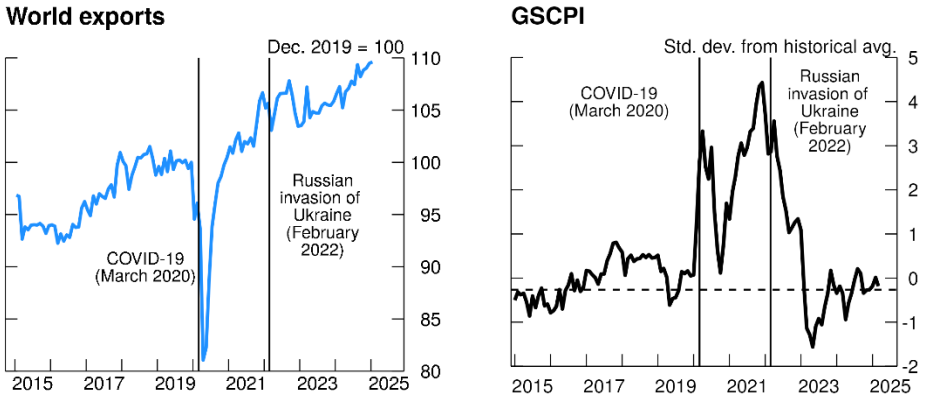
3.3 Supply chains came under pressure amid pandemic restrictions and abrupt swings in demand

At the onset of the pandemic, the global supply of goods collapsed in response to lockdowns, plant closures, reduced labor supply, and the decline in aggregate demand. Transportation providers reduced shipping capacity, and global supply chains came under strain given their reliance on a deeply integrated international production network that suffered from disruptions in different parts of the world. As a result, world trade collapsed (left panel of figure 8). Manufacturers around the world experienced shortages, transportation delays, backlogs, and increased delivery times, as summarized by the Global Supply Chain Pressure Index (GSCPI) developed by Benigno and others (2022) and shown in the right panel of figure 8.[6] The subsequent surge in demand for goods aided the recovery in trade, but also created renewed supply pressures as global supply chains struggled to handle the rapid bounceback in demand and continued to be under strain amid the continuing pandemic-related restrictions in key manufacturing EMEs, especially in Asia.

[5] Bianchi and Melosi (2022), Smets and Wouters (2024) and Cochrane (2025) also emphasize this channel.

[6] A similar pattern is visible in indicators of shortages, such as the shortage index constructed by Caldara, Iacoviello, and Yu (2025) for the U.S.

Figure 8: World export volumes and Global Supply Chain Pressure Index

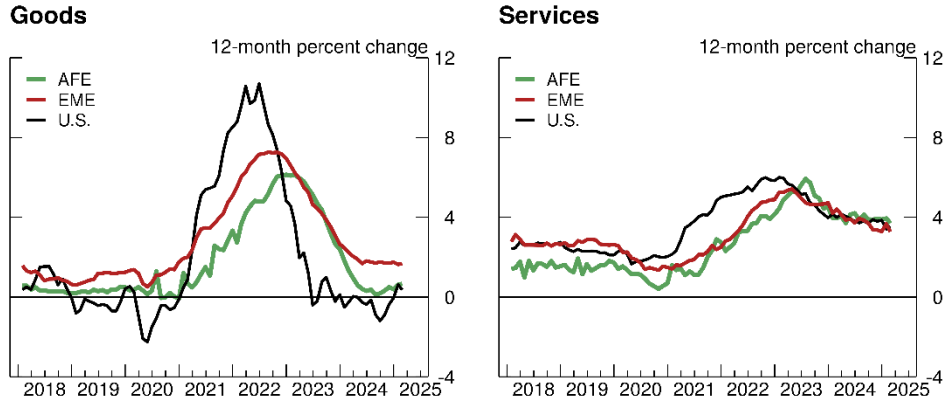


Note: In the left panel, world export volume represents world exports of goods and services. Data extend through January 2025. In the right panel, Global Supply Chain Pressure Index (GSCPI) data extend through March 2025, and the dashed line indicates the pre-pandemic average (1998 to 2019).

Source: Netherlands Bureau for Economic Policy Analysis via Haver Analytics; Federal Reserve Bank of New York, GSCPI, https://www.newyorkfed.org/research/policy/gscpi.

All told, the unbalanced recovery, boosted by accommodative policies, together with supply disruptions and shortages resulted in widespread demand–supply imbalances, which led to sectoral price pressures. These imbalances were particularly large in the U.S., where fiscal support sustained a strong increase in goods consumption. As shown in figure 9, over the course of 2021, goods inflation increased sharply and much faster than services inflation. Amid supply constraints, commodity prices recovered quickly from their 2020 lows and import prices in many economies increased, leading to large swings in the terms of trade.

Figure 9: All goods and services inflation across economies



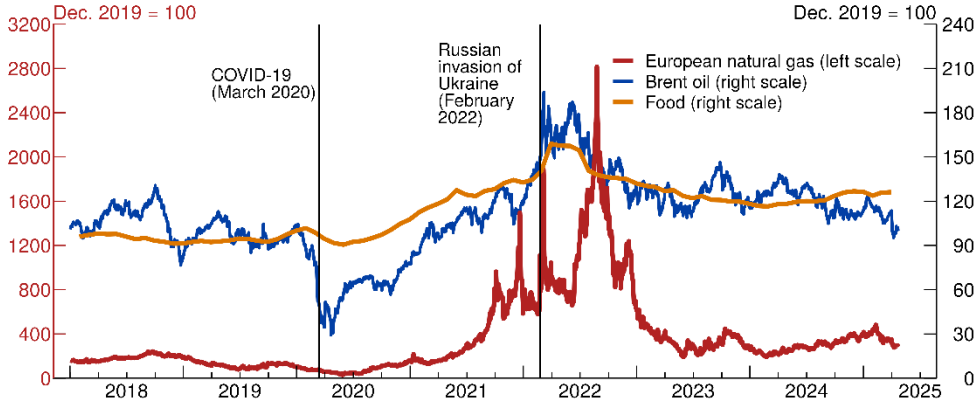
Note: Data are monthly and extend through February 2025. Aggregate series are constructed using purchasing power parity–adjusted GDP weights. The advanced foreign economy (AFE) aggregate consists of Canada, the euro area, Japan, and the U.K. The emerging market economy (EME) aggregate consists of Brazil, Colombia, Hong Kong, Israel, Korea, Malaysia, Mexico, the Philippines, and Taiwan.

Source: National sources via Haver Analytics; Board staff calculations.

3.4 Russia's invasion of Ukraine added persistence to inflation, especially in Europe

Russia's invasion of Ukraine in February 2022 provided a direct boost to commodity prices, which were already lifted by the recovery from the COVID-19 pandemic (figure 10). This surge was mainly driven by the collapse in Russia's and Ukraine's exports of energy and agricultural commodities due to sanctions and disruptions brought about by the war. As a result, European natural gas prices soared and global oil prices reached $125 per barrel, with many analysts contemplating scenarios with even larger increases. Food and metals prices also experienced large increases, as input costs rose, and supply chain disruptions worsened.

Figure 10: Commodity prices



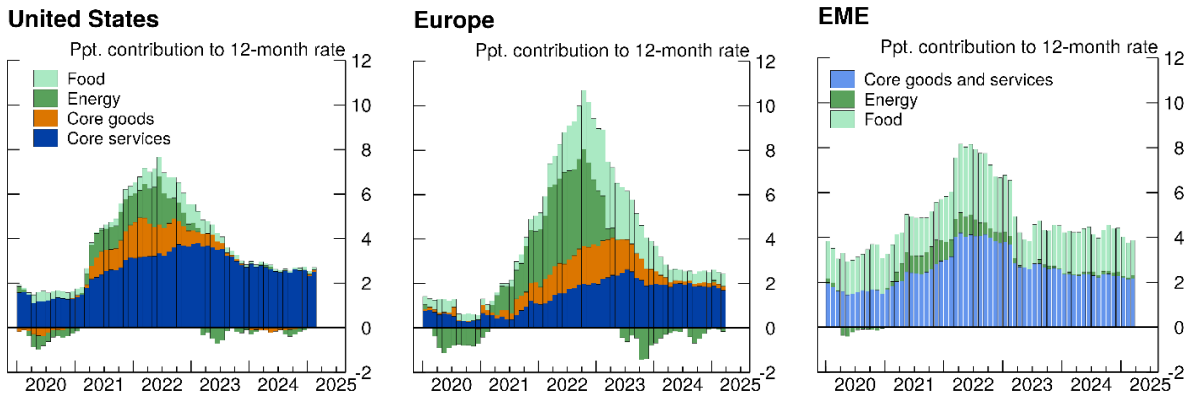
Note: The natural gas series is the daily European natural gas spot price and extends through April 22, 2025. The Brent oil series is the daily Brent oil spot price and extends through April 23, 2025. The food series is the monthly Food and Agriculture Association of the United Nations (UN FAO) index and extends through March 2025.

Source: Bloomberg; Intercontinental Exchange; UN FAO; Board staff calculations.

As shown in figure 11, Russia's invasion of Ukraine aggravated the inflationary pressures associated with the reopening of the economy, most notably among AFEs.[7] The direct dependence of European economies on Russian energy supplies resulted in a nearly 6 percentage point contribution of energy inflation to headline inflation in 2022. The adverse effects of higher commodity prices were also quite intense in the EMEs, as the food shares of consumption baskets in these economies are typically larger than in the advanced economies. The energy price contribution in the EMEs was more muted due to widespread usage of price controls.

[7] The decomposition of inflation is not directly comparable between the U.S. and Europe. The consumer price index measure, used in Europe, does not contain the costs associated with owner-occupied housing.

Figure 11: Inflation components across regions



Note: Data are monthly and extend through February 2025 for the U.S. and March 2025 for all other economies. Inflation series reflect personal consumption expenditures for the U.S. and consumer price index for all other economies. Aggregate series are constructed using purchasing power parity–adjusted GDP weights. The Europe aggregate consists of the euro area and the U.K. The emerging market economy (EME) aggregate consists of Brazil, Chile, Hong Kong, India, Indonesia, Israel, Korea, Malaysia, Mexico, the Philippines, Russia, Saudi Arabia, Singapore, Taiwan, and Thailand.

Source: National sources via Haver Analytics; Board staff calculations.

3.5 Labor markets tightened as the recovery gained pace

Pandemic-related restrictions led to declines in both labor demand (plant closures) and labor supply (workers staying at home), which initially resulted in limited inflationary pressure coming from the labor market. Amid elevated uncertainty facing firms and households, governments adopted different approaches to support the labor market. For instance, in the U.S., policies largely focused on protecting income through extended unemployment insurance and direct transfers, while European governments subsidized reductions in hours worked to protect firm-worker matches. As a result, as shown in figure 12, unemployment spiked in the U.S., and labor force participation fell sharply as many workers left the labor force to care for family members or to retire early. By contrast, in Europe, unemployment barely rose, and labor force participation remained relatively stable. Total hours worked, however, declined more in Europe, as the reduced hours of employed workers in Europe outweighed the hours decline resulting from the unemployed workers in the U.S.

Figure 12: Labor market indicators

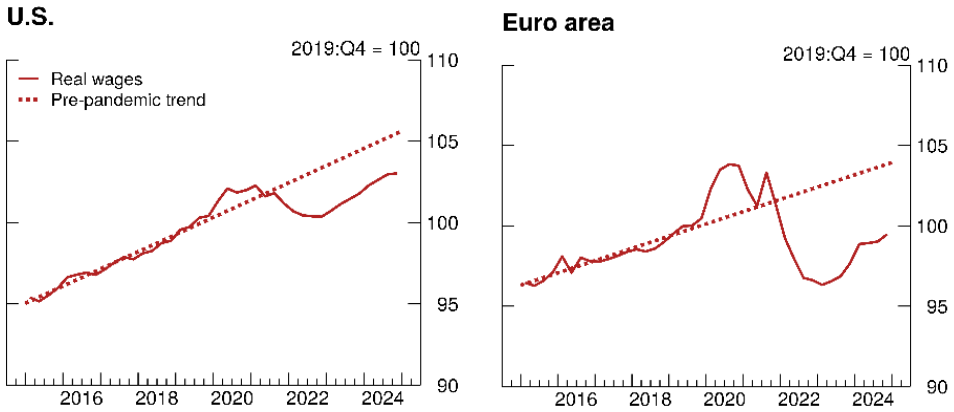
Note: In the left panel, data are monthly and extend through March 2025 for the U.S. and through February 2025 for the euro area. In the middle panel, U.S. data are monthly and extend through April 2025, and euro-area data are quarterly and extend through 2024:Q4. In both cases, we present labor force participation rate for working age population (16-64 for the U.S. and 15-64 for the euro area). In the right panel, total hours worked reflect total hours worked divided by the working-age population; hours to working-age population data are quarterly and extend through 2024:Q4.

Source: Statistical Office of the European Communities; U.S. Bureau of Labor Statistics; Board staff calculations.

As the recovery gained pace, labor markets tightened, with unemployment rates quickly returning to 2019 levels and vacancies rising. In the U.S., a more persistent contraction in labor supply led to labor shortages amid a pickup in demand, which may have contributed to an earlier rise in inflation. In Europe, workers stayed employed thanks to employment protection policies but, as suggested by García-Cabo, Lipińska, and Navarro (2023), a necessary sectoral reallocation of labor was much more limited, likely hampering the economy's supply recovery and limiting labor productivity growth. At the same time, these policies mitigated labor shortages and buildup in wage pressures during the recovery and thus contained to some extent the initial increase in inflation.

Despite differences across countries, the labor market generally does not appear to be the main source of the inflation surge. As shown in figure 13, real wages declined markedly in 2021 and 2022, when price pressures related to (goods) supply–demand imbalances and increasing energy prices emerged. That said, the subsequent recovery in real wages—that is, higher nominal wage growth relative to consumer price inflation—likely contributed to the persistence of inflation, as we discuss in the next section.

Figure 13: Real wages



Note: Real wages data extend through 2024:Q4. Data are the negotiated wage tracker for the euro area and the employment cost index for the U.S. Real wages are nominal wages divided by consumer price index inflation (in the case of the U.S., by the personal consumption expenditures index). Pre-pandemic trend reflects average growth of real wages from 2015 through 2019.

Source: National sources via Haver Analytics.

4. A simple Phillips curve framework suggests that the 2021–22 surge in inflation was mainly driven by cost-push factors

Empirical model

Building on the previous analysis, we adopt a simple formulation of the Phillips curve framework—relating core inflation to longer-term inflation expectations, a measure of resource utilization, and "cost push" factors, such as supply shortages and relative prices, discussed in the previous section—to provide an empirical accounting of the post-pandemic inflation surge.

Specifically, we use data for several major advanced economies (Canada, the euro area, the U.K., and the U.S.) to fit the relation:

$$\pi_t^{core} = \pi_t^{exp} + \alpha x_t + \beta c_t + e_t, \qquad (1)$$

where π_t^{core} is quarterly core inflation, π_t^{exp} represents longer-term inflation expectations, x_t is a measure of resource utilization in each economy, c_t includes cost-push factors—such as shortages and relative energy price inflation—and e_t is a residual term.[8] The coefficient α measures the slope of the Phillips curve.

For comparability across countries, we use the detrended ratio of total hours worked to the working-age population (hours gap) as the baseline measure of labor market slack and tightness.[9] As discussed above, European countries adopted policies to protect jobs, even if

[8] Shortages are measured by the GSCPI, expressed in standard deviations from its historical average. Relative energy price inflation is calculated as the difference between energy price inflation and core inflation. Because it takes time for energy prices to pass through to core prices, we lag relative energy price inflation by four quarters.

[9] We detrend total hours to working-age population using a Hodrick-Prescott filter with λ=250,000.

workers were not in fact working, which resulted in a muted response of the unemployment rate to the pandemic and the war.[10]

We estimate equation (1) using data for the past 25 years allowing for a break in 2020:Q2.[11] This break may indicate a structural change, or it may capture nonlinearities in the response of inflation to resource utilization and other factors. One limitation is that the post-pandemic sample is short, and thus inference is limited. We maintain parsimony in the estimation of coefficients by assuming inflation changes one-to-one with longer-term inflation expectations and by using a statistical procedure to select cost-push factors separately for each country.[12]

This estimation exercise is subject to additional important caveats. First, it does not intend to provide a structural interpretation of underlying demand and supply factors, but just a simple accounting of potential channels. While the analysis separates the effects of cost-push factors from resource utilization, both may be driven by structural shocks to aggregate demand and supply. To the extent that our cost-push factors are in fact driven by demand, the estimated relationship between resource utilization and inflation would understate the contribution of demand to inflation and should be viewed as a lower bound of that contribution.[13] Second, the short sample prevents the formulation of rich dynamics and lag structures. That said, it allows for the comparison of estimated coefficients between the post-COVID-19 and the pre-COVID-19 periods. Third, and relatedly, it does not intend to put forward a forecasting model of inflation.[14] The additional factors discussed here—such as the shortages (measured by the GSCPI) and shifts in relative prices—are per se difficult to forecast and are simply meant to approximate some of the unusual dynamics experienced since 2020, with the benefit of hindsight. Together, these caveats underscore the challenges faced by policymakers required to make decisions in real time. We next proceed to the discussion of the three main empirical results.

[10] We include robustness exercises with other measures of resource utilization such as the output gap (measured by the IMF), unemployment gap, and vacancies-to-unemployment gap in the appendix.

[11] Specific sample periods for each country are detailed in table A.2 in the appendix.

[12] As discussed later, longer-term inflation expectations were little changed during this episode. Hence, in the estimation, we redefine the dependent variable as inflation in deviation from longer-term inflation expectations and do not include a constant term. Based on standard t-tests, we choose the GSCPI and lagged relative energy price inflation as additional regressors for all economies, except for the U.S. for which the GSCPI is the only significant cost-push factor.

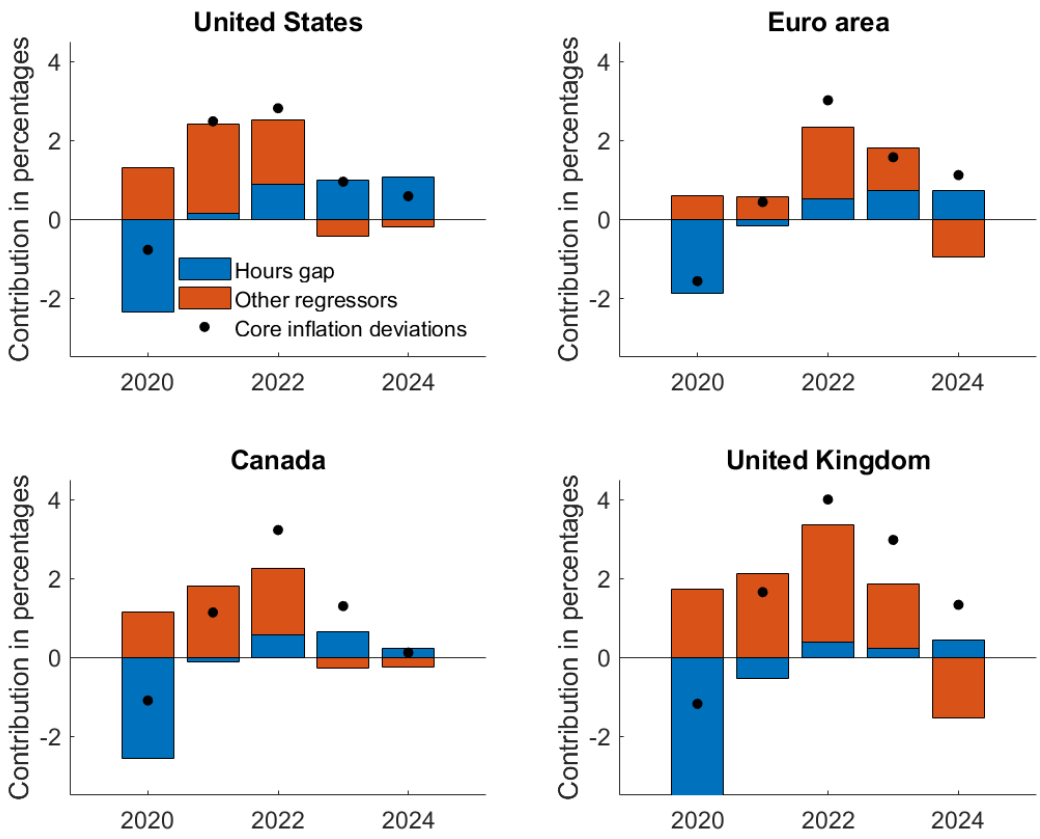
[13] For instance, a recent paper by Leiva-León and others (2025) on U.S. data finds that during the pandemic, the GSCPI correlated positively with demand-driven goods inflation.

[14] Note that the regression's goodness-of-fit, measured by the adjusted R-squared, in the post-2020 period ranges from 0.5 to 0.6.

Result 1: Across countries, labor markets played a small role during the inflation surge but contributed to the persistence of inflation later

Figure 14 presents the historical decompositions of core inflation—in deviation from long-run inflation expectations—into those originating from resource utilization (the blue bars) and cost-push supply factors (the orange bars). The decompositions reveal a common story. The initial surge in core inflation appears to be largely explained by cost-push factors, such as shortages and a rise in energy inflation. These factors seemed to play a larger role in the U.S. and Canada in 2020 and 2021 and became especially important in Europe in 2022 and 2023 as a rise in energy inflation, accentuated by Russia's invasion of Ukraine, passed through to the wider economy. As these additional factors dissipated, tightness in labor markets (the blue bars) produced further inflationary pressures later in the recovery, contributing to the persistence of inflation through 2024. All told, these results suggest that the inflation surge does not appear to have originated from tightness in the labor market. Using a different empirical framework, Bernanke and Blanchard (2024) find similar results in a sample of 11 economies. Their estimated model, however, does not investigate the role of parameter instability or structural breaks during the pandemic inflation episode, a topic we discuss next.

Figure 14: Historical decomposition of core inflation: Hours gap and other factors



Note: Contributions obtained from estimating equation (1) separately for each economy, regressing core inflation deviations on slack and the best set of additional regressors based on the statistical significance of their coefficients. The difference between the dots and sum of the orange and blue bars owes to the residual.

Source: Authors' calculation.

Result 2: The slope of the Phillips curve increased some

As can be seen in table 1, our estimation suggests that the slope of the Phillips curve increased in all economies after 2020:Q2.[15] The stability tests indicate that the increase in slope is statistically significant for all economies, except for the euro area. That said, the estimated increase in the slope post-2020 is economically small—as revealed by the accounting discussed earlier. This finding is consistent with the view that the inflation surge did not originate from the

[15] We also find that the pass-through coefficient from relative energy inflation to core inflation increased after 2020:Q1, especially for the euro area and the U.K., consistent with the view that second-round effects were more prominent during this inflation episode than in the pre-COVID-19 period. See table A.2. in the appendix for estimation details.

labor market but from shortages and sectoral imbalances.[16] Moreover, economic theory suggests that the increase may have been a temporary phenomenon related to the inflation surge that may have subsided as inflation fell back and resource tightness diminished.

Table 1: Slope of the Phillips curve

Economy	Pre-2020	Post-2020	Stability test (p-value)
U.S.	.01	.11	.00
Euro area	.04	.09	.20
Canada	.02	.08	.03
U.K.	-.02	.12	.00

Note: Slack is measured as the ratio of total hours to population gap (Hodrick-Prescott filtered with λ=250,000).[17]

Source: Authors' calculations based on the estimation of equation (1) for each country individually.

Several authors have documented that the flattening of the Phillips curve in the pre-COVID-19 sample reflected, in part, a greater focus on price stability in the conduct of monetary policy over the preceding decades.[18] Thus, the increase in our estimates of the slope coefficient of the Phillips curve in the recent years could, in principle, reflect a shift in the response of monetary policy to the pandemic and war shocks.[19] However, the rapid pivot to a restrictive stance implies that the period over which such effects would have been operative was short.[20]

Theoretically, an increase in the slope of the Phillips curve can also be rationalized by several considerations. First, the shift in household consumption away from rigidly priced services toward more flexibly priced goods would mechanically increase inflation by more for any given increase in labor market tightness, thus steepening the Phillips curve.[21] Second, the

[16] In a companion paper, Hajdini and others (2025) also emphasize the role of nonlinearities captured here by these higher slope estimates.

[17] This relatively high value of λ allows for a slow-moving trend of labor market series, consistent with, among others Shimer (2005).

[18] See, for example, Boivin, Kiley, and Mishkin (2010), Hooper, Mishkin, and Sufi (2019), Fitzgerald and others (2024), McLeay and Tenreyro (2020), and Bundick and Smith (2020).

[19] In the case of the U.S., several studies, including Eggertsson and Kohn (2023), English and Sack (2024), Romer and Romer (2024), Coulter, Ducan and Martínez García (2022), and Duncan, Martínez García, and Miller (2025), suggest that the response of monetary policy was late, thus contributing to the run-up in inflation.

[20] See Kiley and Mishkin (2024, 2025).

[21] In a model with two sectors, say, goods and services, the aggregate Phillips curve slope can be expressed as a weighted average of the sector-specific Phillips curves, with weights determined by the (consumption) shares. See the earlier theoretical work of Aoki (2001) and, more recently, Rubbo (2023). A related point can be made with

slope of the Phillips curve may have steepened because high inflation led firms to change their prices more frequently or tie their decisions more closely to incoming macroeconomic news.[22] Third, the relation between inflation and marginal production costs—which are directly linked to resource utilization—can also change temporarily because of nonlinearities arising from product shortages, supply constraints or labor market tightness.[23]

All told, the normalization in consumption shares, the reduction in the frequency of price adjustments apparent in more recent data, and the amelioration of supply constraints as well as labor markets distortions suggest that the effect of resource utilization on inflation may have returned to near pre-pandemic values. As such, the increase in the Phillips curve slope we found may have reflected a temporary movement to a steeper portion of the nonlinear Phillips curve rather than a permanent shift.

Result 3: The pandemic and the war led to important policy tradeoffs

We next use the estimated model to provide a quantitative assessment of the near-term policy tradeoffs induced by recent events. Specifically, holding fixed the cost-push terms, we calculate the counterfactual damage to the labor market, measured as a decline in the hours gap, that would have been required to fully stabilize core inflation around 2 percent in the 2021–23 period. Figure 15 presents this decline in each year as a ratio of the hours gap decline in 2020, so that a number equal to one implies the same amount of labor market slack as in 2020.

Full stabilization of core inflation could have required imparting significant damage to labor markets (and economic activity). The U.S. economy would have had to experience a recession as large as the one in 2020 in each of the two subsequent years.[24] In Europe, given the somewhat delayed pickup in inflation and the larger exposure to the energy crisis caused by the war, an even larger recession would have been necessary in 2022 and 2023 to fully stabilize core inflation.

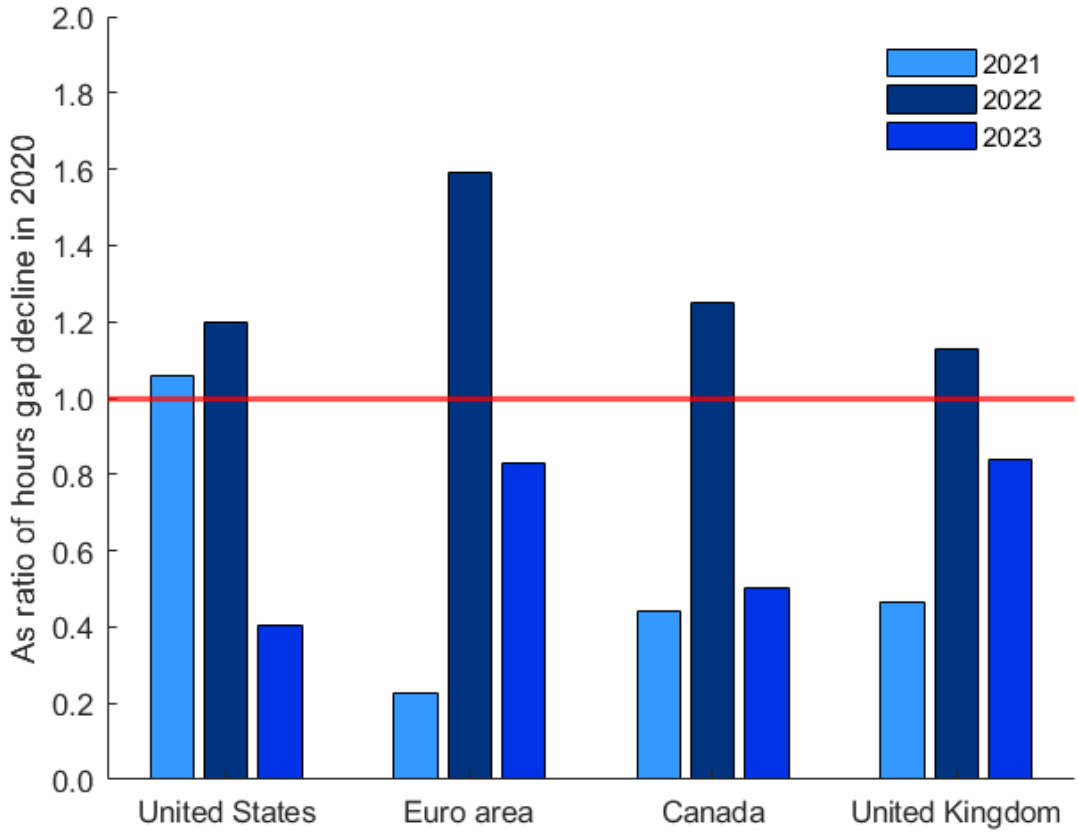
open-economy models where the aggregate Phillips curve is a weighted-average of domestic and foreign goods underpinned by the import share (Martínez García and Wynne, 2010) and, therefore, exposed to a steepening of the Phillips curve resulting from higher import inflation amid the pandemic trade disruptions.

[22] Montag and Villar (2023) provide evidence on the former for the U.S. and Henkel and others (2023) for the euro area. Gagnon (2009) provides additional evidence from Mexico. For evidence of higher responsiveness to news, see Schwartzman and Waddell (2022, 2024). An increased sensitivity of inflation to economic slack when inflation is high and volatile is in line with classic international evidence from Lucas (1973) and more recent findings by Forbes, Gagnon, and Collins (2022).

[23] See Ari, Garcia-Macia, and Mishra (2023), Comin, Johnson, and Jones (2023), Gudmundsson, Jackson, and Portillo (2024) or Benigno and Eggertson (2023, 2024). Similar arguments can be made in relation to the pass-through of commodity price increases into marginal costs and thus core inflation, as analyzed by Afrouzi and others (2024), Alp, Klepacz, and Saxena (2023), Baumeister (2023), and Kilian and Zhou (2023).

[24] In other words, the U.S. unemployment rate would have had to stay, on average, at around 8.5 percent in 2021 and 2022 to keep core inflation near 2 percent. See also Reifschneider (2024) and Barnichon (2022) for a similar point.

Figure 15: Decline in hours gap necessary to keep zero core inflation deviations



Note: Decline in hours gap necessary to keep zero core inflation deviations derived from the estimated equation (1) separately for each country. Red horizontal line indicates value of 1 representing the same decline in hours gap as in 2020.
Source: Authors' calculation.

Some caveats apply to this counterfactual exercise. First, these calculations need to be interpreted as an upper bound of potential policy tradeoffs, as such large labor market and activity declines would likely have reduced shortages and energy prices, thus decreasing the contribution of cost-push factors. Second, these estimates do not consider the possibility that a change in the monetary policy reaction function to keep inflation at target could affect the relationship between inflation and slack. That said, the exercise highlights the critical tradeoffs faced by central banks around world in their management of the pandemic and war crisis, which we discuss in the next section.

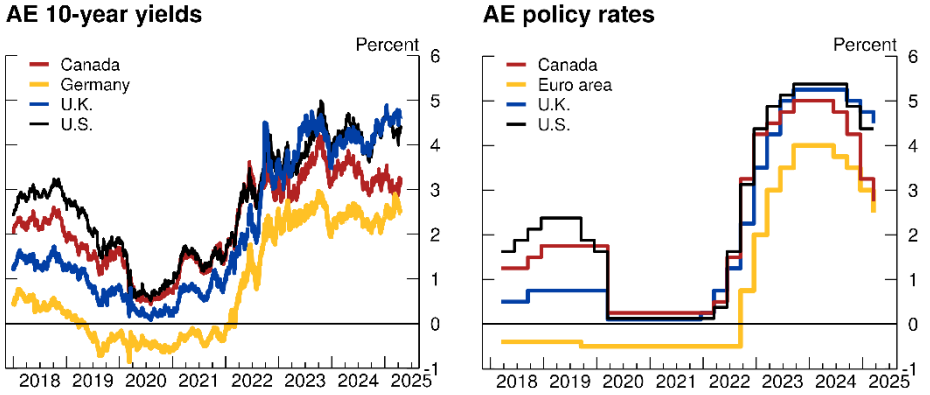
5. Amid rising inflation, central banks acted forcefully

The response of central banks around the world to recent global events displayed a high degree of synchronicity despite differences in their mandates and, more broadly, in their

monetary policy frameworks.[25] All foreign central banks provided exceptional stimulus in the early phases of the pandemic. Amid rising commodity prices and increasing inflationary pressures from shortages and sectoral imbalances, central banks subsequently shifted their emphasis to the necessity of restoring price stability as a foundation for achieving their long-term goals. These actions were successful in keeping longer-term inflation expectations anchored.

Central banks, especially in advanced economies, adjusted their policy stance initially through communications about higher future paths for policy rates and plans to reduce balance sheets, which contributed to a significant tightening of financial conditions. For instance, 10-year bond yields in these economies increased significantly starting in mid-2021, well before actual liftoffs began in most countries in early 2022 (left panel of figure 16).

Figure 16: 10-year yields and policy rates across advanced economies



Note: Advanced-economy (AE) data extend through April 23, 2025, in the left panel and through 2025:Q1 in the right panel. Yield data are daily, while policy rate data are quarterly (end of period).

Source: National sources via Haver Analytics; Bloomberg.

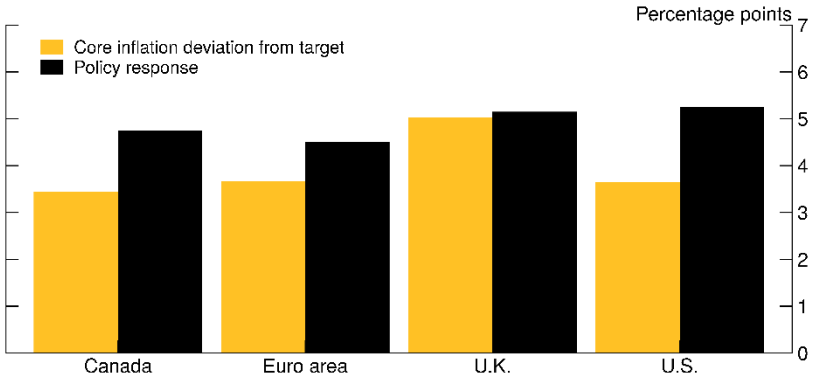
Given the additional projected boost to inflation caused by the war, in 2022 central banks around the world forcefully increased their policy rates to ensure that inflation would not become entrenched (right panel of figure 16). As emphasized by Clarida (2023), almost all advanced economy central banks did not begin to hike rates until both core and headline exceeded their respective target rates for a sustained period of time.[26] At the same time, the cumulative policy rate increases in the U.S. and other major advanced economies from January 2020 to their peaks in mid-2023 were as large as the increases in core inflation (figure 17). In addition, central banks signaled their intentions to hold a restrictive stance for an extended period to return inflation to target. For instance, policy rates were kept elevated while inflation declined,

[25] For a thorough description of the monetary policy frameworks see companion paper by Gordon and others (2025) .

[26] Clarida (2023) shows that, with exception of Norway and Switzerland, central banks in advanced economies waited between 3 months to 1 year from the time core inflation in their economy exceeded its target rate before raising rates.

yielding higher real interest rates and exerting persistent pressure on aggregate demand. The totality of these actions across countries helped to ensure that inflation returned near targets and inflation expectations remained anchored.

Figure 17: Policy rate response to core inflation in advanced economies



Note: Black bars show the percentage point difference between the peak policy rate during the most recent inflationary surge (2024:Q1 for Canada and the euro area and 2024:Q2 for the U.K. and the U.S.) and the policy rate in January 2020. Yellow bars represent the maximum deviation of 12-month core inflation from target over the same period (September 2022 for Canada, March 2023 for the euro area, May 2023 for the U.K., and February 2022 for the U.S.). The inflation series reflect core personal consumption expenditures for the U.S. and the core consumption price index for all other economies.

Source: National sources via Haver Analytics; Board staff calculations.

The extent to which these synchronized tightening actions amplified the cross-border effects of monetary policy remains uncertain. Recent research suggests that, historically, episodes of synchronous policy tightening have been associated with tighter financial conditions and larger effects on economic activity than asynchronous ones.[27] The current recovery, while uneven across countries in terms of activity, has been generally associated with resilient labor market conditions.

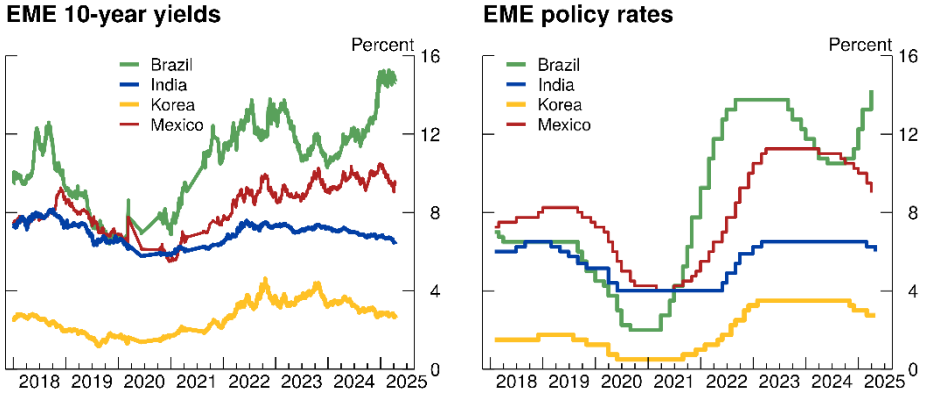
Differences in the timing and magnitude of policy actions across countries largely reflected country-specific conditions. For instance, the delayed pickup in euro-area inflation resulted in a later liftoff of European Central Bank (ECB) policy rates. The ECB also began cutting rates a bit earlier than other central banks in response to weak domestic economic growth.[28] Similarly, the Bank of Canada, which had followed a similar approach to the Federal Reserve during the tightening phase, cut policy rates in early 2024, citing concerns about deteriorating labor market conditions. Finally, while many EME central banks generally followed the path of the advanced economies' policy, some EME central banks in countries that previously experienced high inflation episodes, notably Brazil and Mexico, raised their policy

[27] See, for instance, Caldara and others (2024).

[28] Arguably, monetary policy tightening abroad has had stronger transmission than in the U.S., consistent with greater reliance of foreign corporations and households on floating-rate and relatively short-term borrowing.

rates already in 2021 to guard against currency depreciation and de-anchoring of inflation expectations, with swift effects on their longer rates (figure 18).[29]

Figure 18: 10-year yields and policy rates across economies



Note: Emerging market economy (EME) data extend through April 22, 2025, for Brazil and through April 23, 2025, for all other economies in the left panel. In the right panel, EME data extend through April 2025 for India and Korea and through March 2025 for Brazil and Mexico. Yield data are daily, while policy rate data are monthly (end of period).

Source: National sources via Haver Analytics; Bloomberg.

5.1 Longer-term inflation expectations remained anchored

The success over time in bringing down inflation in the face of such large shocks was predicated on the credibility of many central banks that kept inflation expectations anchored. While measures of short-term inflation expectations rose along with actual inflation, they generally pointed to gradual reversion toward target levels. Furthermore, longer-term inflation expectations based on household surveys, professional forecasts, and market prices remained anchored around the world (see figure 19 for Consensus expectations collected from private forecasters).

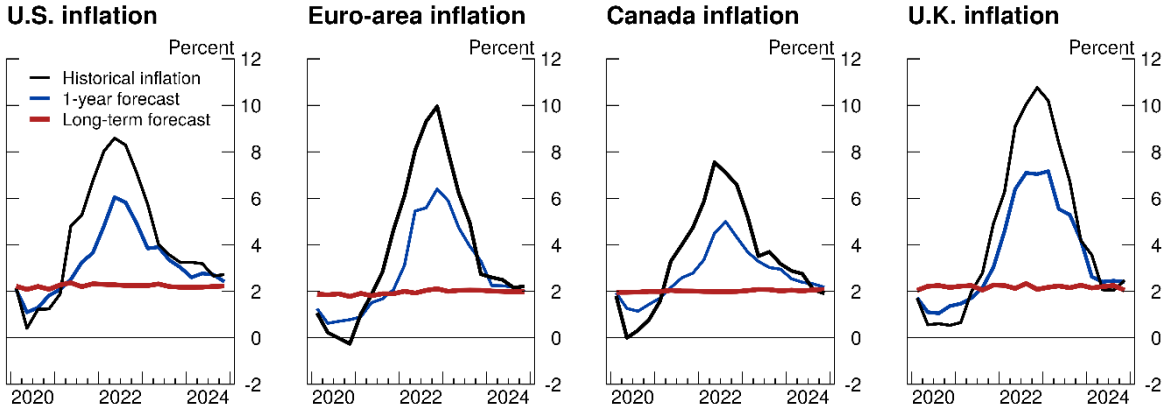
Flexible inflation targeting appears to have contributed substantially to the anchoring of inflation expectations and the return of inflation toward target levels. But the details of inflation-targeting regimes (dual vs. single mandate, preferred inflation measure, etc.) appear less important, and the widespread shift toward inflation targeting makes it difficult to identify the precise role of this policy strategy.[30] All the same, Bundick, Smith, and Van der Meer (2024) find that, for central banks in advanced economies, having a numerical inflation target and

[29] Guerra and others (2025) find that Latin American central banks did not change their reaction function in response to the recent inflation surge, but rather acted in a nonlinear way by responding more aggressively the higher inflation rose.

[30] Kiley and Mishkin (2025) review the evolution of inflation targeting since the 1990s and highlight the similarities in approach across many countries. As in Kamin and Kearns (2021), they note some tendency for certain inflation-targeting EMEs (especially in Latin America) to shift to a restrictive stance earlier than in the advanced economies to secure their inflation anchor.

executing policy through rate changes and forward guidance proved very effective in keeping inflation expectations anchored. Robitaille, Zhang, and Weisberg (2024) draw similar conclusions for Latin American central banks, emphasizing the expectations-stabilizing roles of earlier reforms that granted central banks independence and the adoption of numerical inflation targets. As such, success was directly linked to the basic principles of inflation-targeting implementation that rely on transparency and extensive communication of policy objectives, in line with the international evidence in Bernanke and others (1999).

Figure 19: Consensus long-term inflation expectations



Note: Black line indicates historical 12-month headline consumer price index inflation for all economies. Blue line indicates the mean Consensus expectations 1-year-ahead year-over-year inflation forecast. Red line indicates the mean consensus expectations 6-to-10-year-ahead inflation forecast.
Source: Consensus Economics; national sources via Haver Analytics.

6. Lessons from the international experience

The post-pandemic surge in inflation was a global phenomenon which gave rise to significant policy tradeoffs. While the evidence is far from being conclusive, some preliminary lessons emerge from our analysis:

1. The size, persistence, and nature of recent global events underscore the relevance of sectoral demand–supply imbalances, international trade networks, and global production chains for the dynamics of inflation and its transmission across countries. As such, a better understanding of supply-side linkages and potential reverberations of future disruptions is crucial to inform monetary policy deliberations.

2. History may provide little guidance about infrequent events. Cross-country analysis can provide some assistance in the real-time evaluation of the effects of global shocks.

3. Flexible inflation-targeting regimes proved important in achieving the policy credibility that kept longer-term inflation expectations anchored and helped address the post-pandemic inflation surge with relatively low economic costs. There is little

indication that differences in mandates or other features of the policy framework (like the preferred inflation measure) played a significant role in inflation outcomes.

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Appendix

Average inflation misses by institutional forecasters

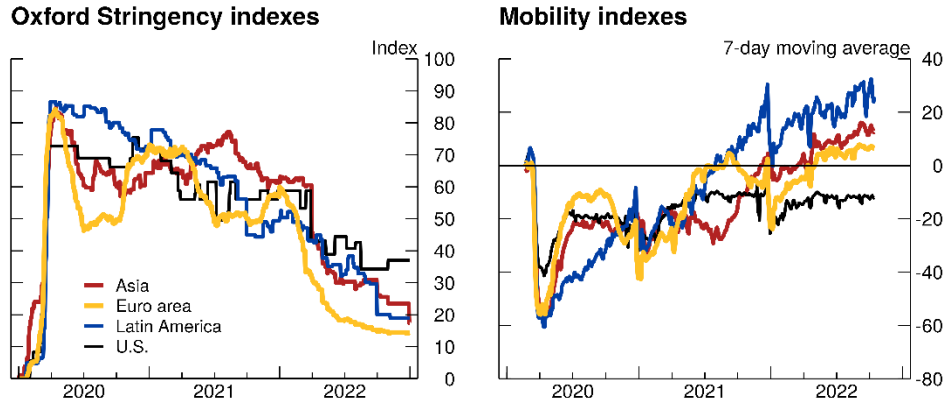
Table A.1: Average inflation misses of 1-year-ahead forecasts

Forecasters	U.S.	AFE	EME
IMF			
Pre-2020	.45	.51	.22
Inflation surge (2020–22)	-3.16	-3.74	-3.41
OECD			
Pre-2020	.39	.49	n.a.
Inflation surge (2020–22)	-2.54	-3.27	n.a.

Note: The table reports the mean biases calculated as the average of the difference between the forecast for consumer price index inflation next year and the realized inflation as reported by the International Monetary Fund (IMF) in its two biannual forecasting exercises over the pre-pandemic period (2012:H1–2019:H2) and the inflation surge (2020:H1–2022:H1). Forecast and realized aggregates are constructed using purchasing power parity–adjusted GDP weights. The advanced foreign economy (AFE) aggregate consists of Australia, Canada, France, Germany, Italy, Spain, and the U.S. The emerging market economy (EME) aggregate consists of Brazil, Colombia, Czech Republic, Hungary, Korea, Malaysia, Mexico, the Philippines, Poland, and Thailand. n.a. Not available.

Source: IMF; Organization for Economic Co-operation and Development (OECD); authors' calculations.

Figure A.1: Stringency and mobility indexes



Note: The Oxford Stringency Index (left panel) is a composite measure based on 9 response indicators, including school closures, workplace closures, and travels bans, rescaled to a value from 0 to 100, with 100 being the strictest response. Data are daily and extend through December 31, 2022. The mobility index (right panel) is the average of retail, recreation, grocery, pharmacy, transit, and workplace mobility. Series reflect a 7-day moving average of daily data and extend through October 15, 2022. In both panels, the euro area includes France, Germany, Italy, and Spain; Latin America includes Argentina, Brazil, Chile, Colombia, and Mexico; Asia includes Indonesia, Malaysia, the Philippines, and Thailand (in case of the Oxford stringency Index Asia includes also Vietnam).

Source: Thomas Hale, Sam Webster, Anna Petherick, Toby Phillips, and Beatriz Kira (2020), *Oxford COVID-19 Government Response Tracker* (Blavatnik School of Government); Google *Community Mobility Reports*.

Baseline model estimation results

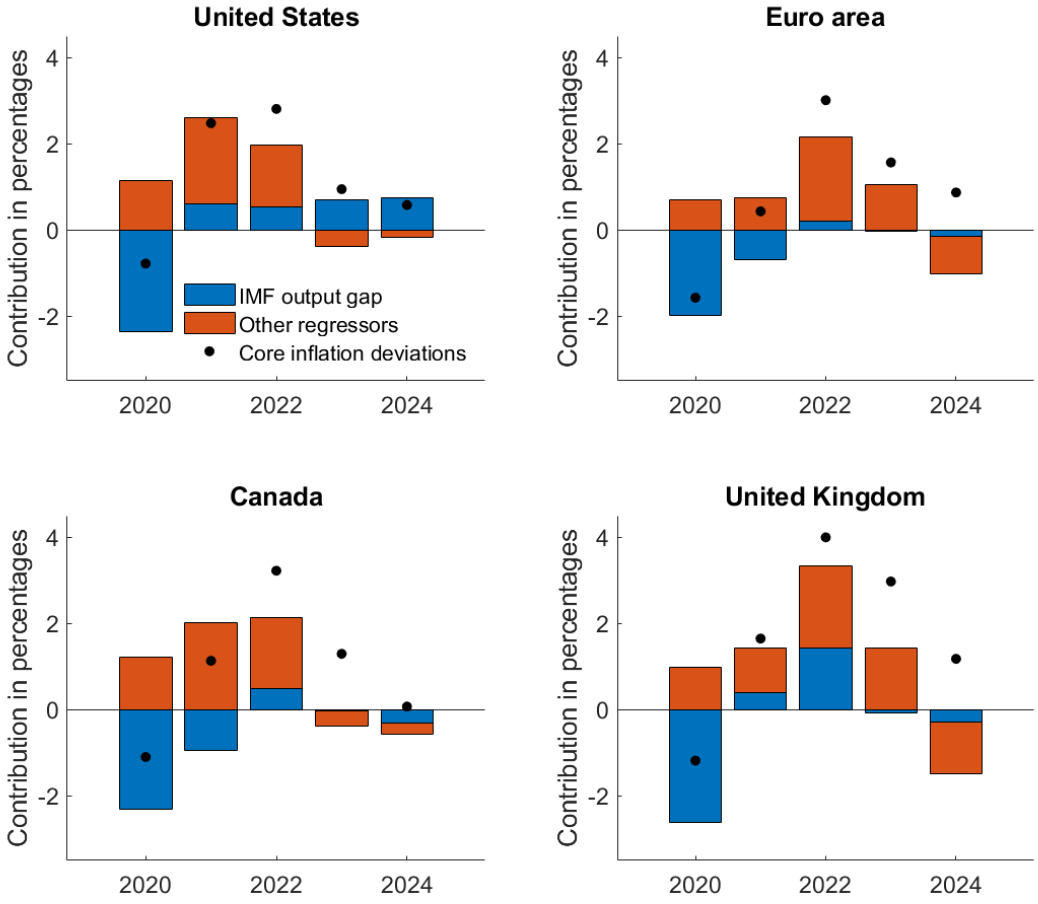
Table A.2: Estimation results with hours gap

U.S.			
Sample	Hours gap	GSCPI	Energy inflation (lagged 4 quarters)
1997:Q1–2020:Q1	.01 (.46)	.88 (.00)	. . .
2020:Q1–2024:Q4	.11 (.00)	.68 (.00)	. . .
Euro area			
Sample	Hours gap	GSCPI	Energy inflation (lagged 4 quarters)
2003:Q1–2020:Q1	.04 (.04)	.28 (.19)	.01 (.82)
2020:Q1–2024:Q3	.09 (.00)	.32 (.06)	.22 (.00)
Canada			
Sample	Hours gap	GSCPI	Energy inflation (lagged 4 quarters)
1997:Q3–2020:Q1	.02 (.45)	.31 (.09)	.00 (.92)
2020:Q1–2024:Q3	.08 (.00)	.63 (.00)	.06 (.15)
U.K.			
Sample	Hours gap	GSCPI	Energy inflation (lagged 4 quarters)
2004:Q3–2020:Q1	-.02 (.07)	.72 (.00)	-.06 (.09)
2020:Q1–2024:Q3	.12 (.00)	.90 (.00)	.23 (.00)

Note: Numbers in brackets are standard p-values. GSCPI is Global Supply Chain Pressure Index.
. . . Not applicable.
Source: Authors' calculations based on estimation of equation (1).

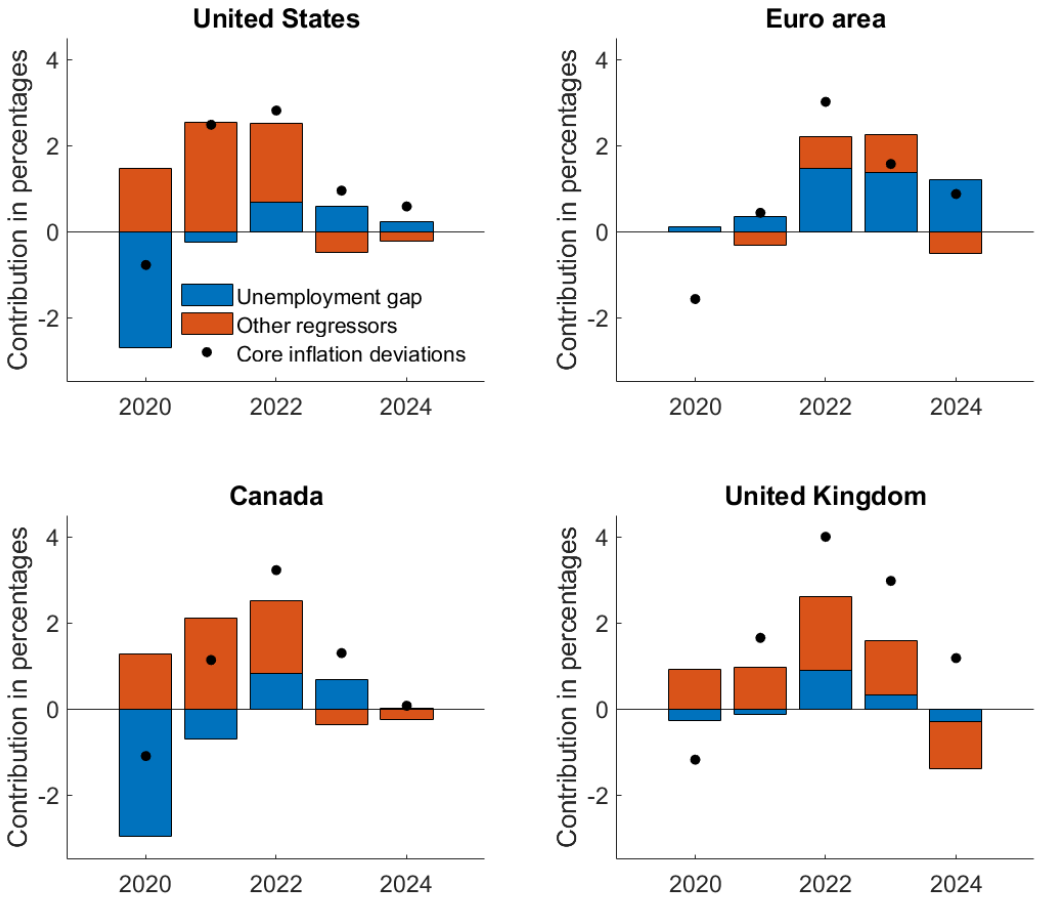
Additional model results based on alternative measures of slack: Output gap, unemployment gap, and vacancies-to-unemployment gap

Figure A.2: Historical decomposition of core inflation: IMF output gap and other factors



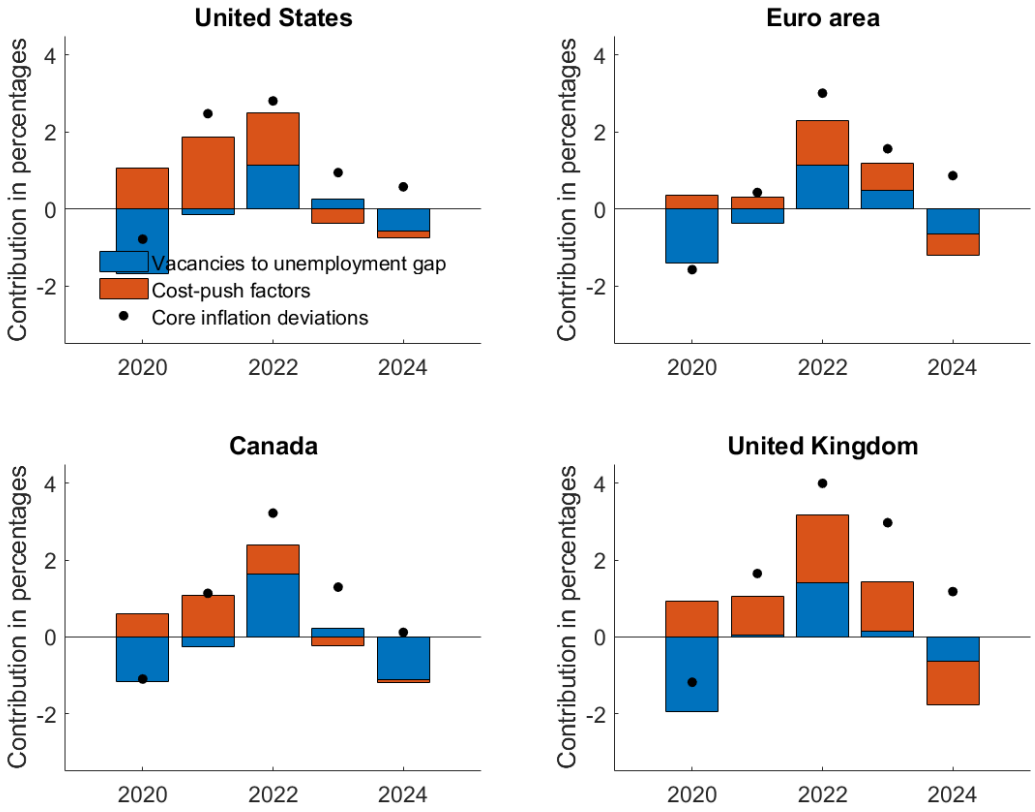
Note: IMF is International Monetary Fund.
Source: Authors' calculations based on estimation of equation (1). Slack is the IMF output gap measure.

Figure A.3 Historical decomposition of core inflation: unemployment gap and other factors



Source: Authors' calculations based on estimation of equation (1). Slack is measured as unemployment gap (Hodrick-Prescott filtered with λ=250,000).

Figure A.4: Historical decomposition of core inflation: vacancies-to-unemployment gap and other factors



Source: Authors' calculations based on estimation of equation (1). Slack is measured as vacancies-to-unemployment gap (Hodrick-Prescott filtered with λ=250,000).