Macroprudential Policy and Housing Wealth Inequality: Evidence from the Euro Area*

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Abstract

We estimate the impact of macroprudential policy on housing wealth inequality among euro area households. We begin by employing narrative-identified macroprudential policy shocks within a local projection framework to identify the aggregate causal effects of these policies on credit and house prices in Germany, France, Italy, and Spain. Next, we distribute the aggregate effects across households through a reduced-form simulation using micro-level data from individual households. Our analysis evaluates three counterfactual scenarios following a policy shock: (i) households excluded from the housing market due to limited mortgage access, (ii) households affected by house price changes triggered by the policy shock, and (iii) a scenario that combines both mechanisms. Comparing net housing wealth across income quintiles against a baseline without regulation, we find that macroprudential policy reduces net housing wealth across income groups. Households in the middle income quintile experience the largest reductions, followed by bottom-income households and, finally, those in the top quintile, thereby increasing housing wealth inequality. We validate the simulation results using time-series measures of housing wealth inequality, highlighting the role of macroprudential policies in influencing wealth distribution.

Key Words: Macroprudential Policy Shocks; Local Projections; Housing Wealth Inequality.
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1 Introduction

Macroprudential policy has become a key tool for policymakers in addressing vulnerabilities within the financial system. Aimed at fostering economic and financial stability, it has proven effective in lowering the likelihood of financial crises (Fernandez-Gallardo, 2023), reducing the severity of such crises (Jordà et al., 2021), and, more broadly, mitigating systemic and tail risks in the economy (Aikman et al., 2019; Franta and Gambacorta, 2020; Fernández-Gallardo et al., 2023; Galán, 2024). However, despite the substantial body of research examining the role of these policies in enhancing financial stability, their distributional effects—particularly on housing wealth inequality—remain largely unexplored.

In this paper, we estimate the impact of macroprudential policy on housing wealth inequality among euro area households.[1] We begin by employing narrative-identified macroprudential policy shocks within a local projection framework to estimate the aggregate effects of a tightening macroprudential policy on household credit and house prices in the four largest euro area economies: France, Germany, Italy, and Spain. Next, we construct counterfactual scenarios using microdata and a reduced-form simulation across individual euro area households, mapping the aggregate effects of macroprudential policy onto the household level.

We follow a two-step approach. First, we examine potential cross-country differences by estimating the aggregate causal impact of macroprudential policy on household credit and house prices, using time-series local projections for the four largest economies in the euro area.[2] Our results reveal broadly similar effects across the four countries, with only minor differences in magnitude. In all cases, a tightening of macroprudential policy leads to a gradual decline in both credit and house prices over the short and medium term.[3]

In the second step, we conduct a reduced-form simulation that evaluates three counterfactual

[1] We focus on housing wealth inequality for several key reasons. First, housing is typically the largest component of household wealth, making it central to long-term wealth accumulation (Badarinza et al., 2016). This trend is especially evident in the four largest countries in the euro area, where housing wealth constitutes a significant portion of total household assets (see Figure A.2.3 in Appendix A.2). The share is particularly high among low- and middle-income households, with housing accounting for around 70% of their total assets. Second, housing wealth is a major driver of overall wealth inequality. It not only accounts for the majority of returns on aggregate wealth (Jordà et al., 2019) but also significantly contributes to disparities across households (Paz-Pardo, 2022; Daysal et al., 2023). Lastly, our focus aligns with the existing, albeit limited, theoretical literature, which frequently explores how macroprudential policies influence inequality through the housing market (Colciago et al., 2019). In line with this, Richter et al. (2019) finds that while macroprudential policy has an insignificant effect on the stock market, it consistently exerts a negative significant impact on house prices across both advanced and emerging economies.

[2] We identify macroprudential policy shocks using narrative methods, specifically drawing on the shock series from Fernández-Gallardo et al. (2023) for the four countries of interest. These shocks capture macroprudential policy actions that are not driven by short-term economic fluctuations, as they exclude actions with a specific countercyclical design.

[3] The only exception is the response of house prices in Germany.

scenarios following a macroprudential policy shock: (i) a scenario where some households are excluded from the housing market due to limited access to mortgages, (ii) a scenario where households experience house price changes resulting from the policy shock, and (iii) a scenario that combines both channels simultaneously.

We focus on three parts of the distribution: the bottom 20%, the middle (measured by the third quintile), and the top 20%. For each counterfactual scenario, we compare net housing wealth across income groups to a baseline scenario with no regulation.[4] Our findings reveal that macroprudential policy consistently reduces net housing wealth, though the magnitude of the effect varies across income quintiles, thereby influencing the overall distribution of housing wealth.

In Spain, Italy, and France, households at the bottom of the income distribution experience only moderate declines in net housing wealth, while those in the top 20% remain largely unaffected. In contrast, middle-income households incur the largest losses, primarily due to reduced access to mortgage credit following the tightening shock. This reflects both a decline in housing asset values—driven by falling house prices, which affects households across the income distribution similarly—and a sharp contraction in mortgage availability, which disproportionately impacts the middle class. Since most mortgage borrowers are concentrated in the middle of the income distribution, these households are especially sensitive to credit constraints and bear a disproportionate share of the adjustment burden under tighter macroprudential policy.

In Germany, the pattern diverges from that observed in the other countries: while middle- and high-income households are largely unaffected, the bottom 20% experiences a significant decline in net housing wealth following macroprudential tightening. Unlike in Spain, Italy, and France—where middle-income households are most affected—Germany's lower-income households bear the greatest burden. These households face restricted access to the mortgage market after the shock, leading to a decline in net housing wealth comparable in magnitude to that seen in Spain and France. This contrasting outcome reflects a key difference in household debt structure: in Germany, lower-income households are less indebted than middle-income ones, reversing the pattern observed elsewhere. Overall, these findings suggest that such policy mea-

[4]In our baseline analysis, we group households by income levels, following standard practice in inequality research, where income groups are commonly used to assess inequality. This approach also reflects the structure of some macroprudential policies—such as Loan-to-Income (LTI) limits—which affect credit access across income levels. Consistent with this, our reduced-form probit model shows that income is the most powerful predictor of mortgage holding, as it yields the highest Area Under the Curve (AUC) across all country-specific estimations. As a robustness check, we also classify households by their position in the net total wealth distribution and confirm that macroprudential tightening unambiguously increases housing wealth inequality.

sures disproportionately affect lower- and middle-income households, potentially exacerbating wealth inequality.

Regarding transmission channels, our findings indicate that the decline in house prices following a tightening shock results in a broadly similar reduction in net housing wealth across income groups. This uniform impact implies that house price dynamics, while reducing overall housing wealth, contribute relatively little to changes in housing wealth inequality. In contrast, the asymmetric effects we observe—both across countries and within income distributions—are primarily driven by the uneven contraction in mortgage credit triggered by macroprudential policy. The tightening disproportionately restricts access to new mortgage borrowing for lower- and middle-income households, who are more likely to be credit-constrained and more reliant on debt-financed home purchases. As a result, some of the households in these groups are excluded from the housing market, leading to sharper declines in their net housing wealth compared to higher-income households. Thus, it is the differential exposure to credit constraints—rather than uniform asset price movements—that emerges as the primary driver of housing wealth inequality in response to macroprudential tightening.

Finally, we complement our reduced-form simulation with a time-series analysis using a local projection framework to estimate the dynamic response of housing wealth ratios to a macroprudential policy shock. This approach allows us to assess the actual dynamic effects of macroprudential policies on various housing wealth ratios, providing a valuable counterpart to our simulation analysis. Using data from the Distributional Wealth Accounts (DWA) to construct these ratios, we find that macroprudential tightening increases housing wealth inequality in the short to medium term.

Taken together these empirical results underscore a broader point: while the primary objective of macroprudential policies is to reduce systemic risk—and they appear effective in doing so—our findings suggest that their distributional consequences are not negligible. Given that housing is the main source of wealth for most households, restrictions on mortgage credit access may have important equity implications. These results point to a potential role for complementary housing-related policies that could help mitigate the adverse effects of mortgage market exclusion, particularly for lower- and middle-income households.[5]

[5]In this paper, we examine the direct effects of macroprudential policy on households' net housing wealth through two primary channels: its influence on house prices and its role in restricting mortgage access for certain households. Additionally, we provide empirical evidence on the aggregate causal effects of these policies on various measures of housing wealth inequality. However, we do not make welfare claims, as a comprehensive assessment would require accounting for all channels through which macroprudential policy affects household income and wealth over the long term. This includes its role in preventing financial crises and stabilizing the financial

Related Literature. Our paper contributes to two main strands of literature. First, we add to the growing body of research that examines the effects of macroprudential policy. This literature has expanded rapidly in recent years, driven by the availability of new databases offering detailed information on macroprudential measures. A key finding in previous studies is that tighter macroprudential policy effectively curbs rapid credit growth (Claessens et al., 2013; Cerutti et al., 2017; Alam et al., 2019; Forbes, 2021; Acharya et al., 2022), and that slower credit growth is linked to lower probabilities of financial crises and reduced tail risk (Belkhir et al., 2022; Franta and Gambacorta, 2020; Fernandez-Gallardo, 2023; Fernández-Gallardo et al., 2023; Galán, 2024).[6]

While most previous studies have used panel data to explore the effects of macroprudential policies on the macroeconomy through the financial system, this paper investigates the potential heterogeneous effects of these policies by estimating time-series local projections for the four largest countries in the euro area. Specifically, we assess whether macroprudential policy can have varying impacts on wealth inequality across households by influencing aggregate household credit and house prices differently in each country.

Our findings show that, with the exception of house prices in Germany, macroprudential policy affects aggregate credit and house prices similarly across the countries studied. This suggests that the varying effects of macroprudential policies on housing wealth inequality across countries are not due to differences in their impact on aggregate financial variables. Rather, these disparities arise from varying effects on households across different income levels in the euro area.

Second, our work builds on studies that use household-level microdata to examine the determinants of wealth inequality. A growing body of literature has explored the impact of monetary policy on wealth inequality through various channels, yielding mixed findings.[7]

On one hand, several studies suggest that unconventional monetary policy has a limited effect on overall wealth inequality (Bivens, 2015; Adam and Tzamourani, 2016; O'Farrell and Rawdanowicz, 2017; Bunn et al., 2018; Lenza and Slacalek, 2024). While acknowledging that monetary policy can widen wealth disparities by increasing returns on financial assets such

system—factors that likely generate positive long-term effects on income and wealth across different household groups.

[6] Recent theoretical work by Gatt (2024) shows that the initial wealth distribution is an important factor to quantify the effects of macroprudential policy on homeownership rates, house prices, and housing wealth inequality.

[7] While much of the literature examines the effects of monetary policy on different components of wealth—such as housing, financial, physical, and pension wealth—other studies emphasize additional mechanisms, including savings redistribution, inflation, and household interest rate exposure. For a comprehensive review of the literature on monetary policy and wealth inequality, see Colciago et al. (2019).

as bonds and equities—both of which are largely held by wealthier households—these studies highlight its positive impact on house prices. Since homeownership is more broadly distributed across the population, rising house prices may counterbalance the inequality-enhancing effects of monetary policy. As a result, these studies argue that the net effect of monetary policy on wealth inequality is either neutral or minimal.

On the other hand, a contrasting strand of literature contends that expansionary monetary policy shocks exacerbate wealth inequality and have been a key driver of its fluctuations (Inui et al., 2017; Casiraghi et al., 2018; Mumtaz and Theophilopoulou, 2020; Albert et al., 2020; De Luigi et al., 2023). In this paper, we build on the existing empirical literature by examining the impact of additional central bank policy tools, specifically macroprudential policy, on wealth inequality. Our findings indicate that these policies contribute to increasing overall housing wealth inequality by particular harming the middle of the income distribution.

To the best of our knowledge, empirical evidence on the distributional effects of macroprudential policies remains limited. Only a few studies have explored the distributional implications of specific one-off macroprudential policy interventions. For instance, Peydró et al. (2024) investigate the impact of a 2014 regulation in the UK that imposed a 15% cap on high loan-to-income (LTI) mortgages issued by lenders. They find that the policy led to a reduction in overall credit for low-income borrowers and slower house price growth in affected areas. Similarly, Acharya et al. (2022) examine the introduction of loan-to-value (LTV) and loan-to-income (LTI) limits for residential mortgages issued by Irish banks in 2015. Their results show that mortgage credit was reallocated from low- to high-income borrowers and from urban to rural areas.

While those studies have focused on the distributional impact of one-off borrowing-based tools, such as LTV or LTI caps, our paper extends the existing evidence by examining the impact of all macroprudential policies implemented over the past 30 years in the four largest euro area economies on housing wealth inequality. By combining reduced-form simulations with time-series evidence, we identify the causal effects of macroprudential policies on wealth inequality and quantify the key mechanisms at work. Our findings indicate that these policies contribute to increased housing wealth inequality through two main channels: (i) an unequal reduction in mortgage credit across households and (ii) a decline in house prices following the implementation of a macroprudential policy. Our results are therefore consistent with Castellanos et al. (2024), who build a life-cycle model informed by empirical evidence from the introduction of loan-to-value (LTV) and loan-to-income (LTI) limits in Ireland in 2015. Their analysis shows

that macroprudential tightening delays homeownership for middle-income households, who must accumulate greater savings to meet higher down payment requirements under stricter LTV constraints imposed by financial institutions.

Outline. The remainder of this paper is structured as follows. Section 2 outlines our empirical methodology and identification strategy. Section 3 presents the baseline results, including the aggregate effects of macroprudential policy and the outcomes of the reduced-form simulation using micro-level household data. Section 4 provides additional insights from a time-series analysis. Finally, Section 5 concludes.

2 Empirical Methodology

We estimate the impact of macroprudential policy on the net housing wealth of individual households across the euro area through a two-step approach. First, we estimate the potential heterogeneous aggregate effects of macroprudential policy on household credit and house prices for each of the four countries individually. Second, we conduct a reduced-form simulation using micro-level household data to distribute the aggregate effects of macroprudential policy on credit and housing prices, ensuring alignment with the estimated aggregate responses. This section provides a detailed description of both steps.

2.1 Empirical Specification for Macroeconomic Variables

We begin by estimating the heterogeneous causal effects of macroprudential policy on household credit and house prices using aggregate data for Spain, Italy, France, and Germany individually. Specifically, we analyze the response of real household credit and real house prices to a macroprudential policy shock by estimating the following local projections (Jordà, 2005):[8]

$$\Delta^h y_{t+h} = \alpha_h + \beta_h \Delta MaPP_t^{shock} + \sum_{l=0}^{L} \Gamma_{h,l} X_{t-l} + \varepsilon_{t+h}. \tag{1}$$

To account for time-varying macro-financial conditions, we include the following controls: annual growth in real GDP, annual growth in real household credit, annual growth in real house

[8]To estimate the aggregate model, we use household credit instead of mortgage credit due to data availability. Household credit data is available from 1990Q1 to 2017Q4, matching the time span of our macroprudential policy shocks, whereas mortgage credit data is only available from 2003Q1 onwards. Using mortgage credit would result in the loss of over half the shocks in our sample. For the period when both measures are available, we note that the correlation between household credit and mortgage credit is very high, ranging from 0.7 to 0.9, depending on the country, with the exception of Germany, where the two variables appear uncorrelated.

prices, annual growth in the general CPI, contemporaneous and lagged values of the dependent variable, and forecasted GDP growth for the next two quarters. Both the contemporaneous values and the first lags of each control variable are included in the model.

We identify macroprudential policy shocks using a narrative approach. Specifically, we draw on the series of $MaPP_t^{shock}$ for our four countries of interest from Fernández-Gallardo et al. (2023). Their identification of macroprudential policy shocks is based on the underlying motivations behind each policy announcement, using narrative information from the Macroprudential Policy Evaluation Database (MaPPED).[9]

They use the narrative information in MaPPED to ensure that $MaPP_t^{shock}$ captures only the "non-systematic" component of macroprudential policy—an essential step for identifying causal effects. Building on this, they perform two additional analyses. First, they supplement the narrative data from MaPPED with real-time policy documents that provide detailed descriptions of the motivations behind the largest macroprudential policy shocks in their sample. This approach offers a more granular perspective, allowing them to pinpoint the precise motivations behind key macroprudential policy actions that were exogenous, closely following the methodology of Romer and Romer (2010). Additionally, they account for policy implementation lags and eliminate policy-anticipation effects by incorporating information on the announcement and enforcement dates of policy actions (e.g., Mertens and Ravn, 2012).

Second, to further validate that their narrative approach effectively isolates changes in macroprudential policy from prevailing economic conditions, they demonstrate that the policy shocks identified through this method—which are the same shocks we use in this paper—are not predictable based on a set of variables capturing current and expected economic, financial, and monetary conditions at the time of policy implementation.

As a result, they identify macroprudential policy shocks by excluding policy actions designed with a countercyclical approach, as such interventions primarily aim at short- to medium-term stabilization rather than addressing structural vulnerabilities within the financial system. In our framework, we define the non-systematic component of policy actions—those that do not consistently respond to short- to medium-term economic fluctuations—as macroprudential policy shocks.[10] We plot the series of shocks for Spain, Italy, France, and Germany in Appendix A.2.

[9]MaPPED provides detailed information on macroprudential policy actions across advanced European economies (Budnik and Kleibl, 2018). This dataset includes comprehensive narrative descriptions of each policy action and indicates whether the action has a countercyclical motivation or design—i.e., whether it is implemented in response to current or expected changes in the macroeconomic environment.

[10]The $MaPP^{shock}t$ variable encompasses up to 11 categories of macroprudential policy instruments, including capital requirements, capital buffers, risk weights, leverage ratios, provisioning systems, lending standards restric-

To facilitate the interpretation of results, we standardize the $MaPP_t^{shock}$. The coefficient β_h represents the impulse response functions (IRFs) of household credit and house prices at horizon h in response to a +1 standard deviation (sd) increase in the macroprudential policy index. We estimate the model using data from 1990Q1 to 2017Q4,[11] with a maximum horizon of $h = 16$. For inference, we adopt the lag-augmentation approach proposed by Montiel Olea and Plagborg-Møller (2021), augmenting the controls with additional lags and calculating heteroskedasticity-robust standard errors.[12]

2.2 The Reduced-Form Simulation on Household-Level Housing Wealth

We then distribute the aggregate impulse responses of household credit and house prices, following a macroprudential policy shock, across individual households based on their specific characteristics. To do this, we use the 2010 wave of the Household Finance and Consumption Survey (HFCS), a comprehensive cross-country survey conducted by the European Central Bank (ECB) and national central banks. The HFCS collects micro-level data on the financial situation and consumption behavior of households in the euro area, covering key aspects of household balance sheets, including assets, liabilities, income, consumption, and socio-demographic characteristics.[13]

We use the 2010 wave because it is particularly well-suited for constructing our baseline household portfolio scenario, enabling us to simulate the impact of macroprudential policies on mortgage credit and house prices. Notably, the 2010 wave offers a reliable representation of households largely unaffected by such policies, as very few measures were implemented between 2000 and 2010.[14] This ensures that households in this wave were not exposed to any major policy interventions in the preceding decade.[15] For our analysis, we use household-level data from the four largest euro area countries: Germany, France, Italy, and Spain.

tions, limits on credit growth, taxes on financial activities, limits on large exposures, liquidity requirements, and limits on currency and maturity mismatches, among others. Fernández-Gallardo et al. (2023) further demonstrates that (i) $MaPP^{shock}t$ primarily captures lender-based macroprudential policy instruments and (ii) both lender-based and borrower-based macroprudential policy shocks yield similar effects across the GDP distribution.

[11]The sample period is determined by the availability of narrative-based macroprudential policy series.

[12]Lag augmentation has been explicitly recommended by Jordà and Taylor (2024) and Olea et al. (2025) for applied use in the local projection framework. For a detailed discussion on inference within the local projection framework, see Jordà and Taylor (2024).

[13]For detailed information on the 2010 wave of the HFCS, see Eurosystem Household Finance and Consumption Network (2013).

[14]France and Germany each reflect only a minor adjustment to an existing measure over this period. In Italy, three changes occurred between 2000 and 2010, indicating the implementation of new measures. Spain, on the other hand, had no macroprudential policies during this time.

[15]Later waves are unsuitable because they include households likely affected by Basel III and related policies introduced in advanced economies from 2011 onward.

To distribute the aggregate impulse responses of credit at the household level, we follow a reduced-form micro-simulation approach in the spirit of Lenza and Slacalek (2024).[16] For each country, we estimate the following probit model for household's i mortgage status C:

$$Pr(C_i = 1|X_i = x_i) = \Phi(x_i'\beta) \tag{2}$$

where X represents a vector of household characteristics, including income, marital status, educational dummies, number of children, age, total wealth, a dummy variable indicating whether the household owns other real estate properties, employment status, and a dummy variable indicating if the household reference person is self-employed or not. $\Phi(\cdot)$ represents the normal Cumulative Distribution Function (CDF). This approach accounts for the fact that the likelihood of obtaining a mortgage depends on a household's socio-demographic characteristics.

For each household i, we estimate the probability of having a mortgage, $\hat{C}_i$, which we use to simulate which households would be denied mortgage credit following a tightening macroprudential policy shock.[17] Specifically, mortgage-holding households with the lowest values of $\hat{C}_i$ are the first to be excluded from the mortgage market, as they are the most vulnerable to credit restrictions. For each country, the number of mortgage-holding households excluded from the mortgage credit market is calibrated to match the aggregate decline in household credit observed in the local projection impulse responses.[18] In simulating the mortgage channel, we restrict the sample to households that obtained a mortgage between 2000 and 2010, conditional on having a mortgage. This restriction allows for a clear interpretation of our results: we estimate the change in net housing wealth for households that would not have obtained a mortgage had a macroprudential policy been in place during that period.

We therefore assume that the decline in aggregate credit following a macroprudential policy

[16] Bartscher et al. (2022) also employs a micro-simulation to assess the impact of monetary policy on racial wealth inequality. They estimate the effects of identified monetary policy shocks on employment and asset prices, and then link these asset price changes to the portfolio gains of Black and White households using granular data from the U.S. Survey of Consumer Finances.

[17] We note that this approach differs slightly from Lenza and Slacalek (2024), as we do not include a stochastic component. In their framework, the simulation is used to compute the probability of becoming unemployed after a monetary policy shock, assuming that unemployment is determined by both observable characteristics and a stochastic component. In contrast, our model estimates the probability of obtaining a mortgage based solely on household characteristics. This reflects the fact that financial institutions make mortgage decisions primarily based on observable factors.

[18] In practice, we rank household mortgagors based on their $\hat{C}_i$ values in ascending order. Those with the lowest values lose their mortgage credit until the total reduction aligns with the aggregate impulse response in household credit. As part of our approach, we do not exclude the top 20% of households from the mortgage market, regardless of their $\hat{C}_i$ values. However, this assumption has no impact on Germany, as no household in the top 20% has a $\hat{C}_i$ low enough to lose mortgage access in our counterfactual analysis. In France, Italy, and Spain, only a negligible fraction of top 20% households would be affected even if this restriction were not imposed.

shock is primarily driven by a reduction in mortgage lending in the short to medium run. In principle, this decline could be attributed to two main mechanisms: the exclusion of some households from the mortgage market and the restriction of others to loans with lower loan-to-value (LTV) ratios. In the short to medium term, it is reasonable to assume that households need time to adjust their savings behavior in response to tighter credit conditions. As a result, reduced mortgage issuance is likely to explain most of the observed decline in aggregate credit over this horizon. This assumption is consistent with the theoretical findings of Castellanos et al. (2024), who show that macroprudential policies can slow wealth accumulation among middle-income households by delaying their entry into homeownership. The delay stems from the need to extend the saving period in order to meet higher down payment requirements. This rationale underpins our modeling approach, in which we simulate a reduction in housing wealth through limited access to mortgage financing, thereby capturing the exclusionary effects of macroprudential tightening.

To allocate the aggregate impulse response of house prices among households within each country, we calculate the reduction in housing assets for each homeowner consistent with the country-specific impulse response function of house prices following a macroprudential policy shock. While our mortgage credit simulation incorporates household-level heterogeneity in response to policy changes, we assume that all households within the same country experience an identical proportional decline in house prices after the shock. We provide support for this assumption in subsection 3.3, where we use detailed provincial-level house price data from Spain to show that macroprudential policies have a similar impact on house prices across all price segments.[19]

We utilize this simulation to evaluate changes in the values and liabilities associated with all of households' residential properties under various counterfactual scenarios. For the mortgage channel, however, we allow households to lose their primary residence following a reduction in mortgage credit after the policy shock. This reflects the fact that macroprudential policies predominantly affect financing conditions for the purchase of primary residences, whereas households acquiring additional properties typically leverage existing real estate assets as collateral and are therefore less likely to be affected by financial regulation. Moreover, the proportion of households owning more than one property is very small.

[19] We use Spanish data for this analysis because Spain is the only country in our sample for which sufficiently detailed and long-span provincial-level time series data on house prices are available.

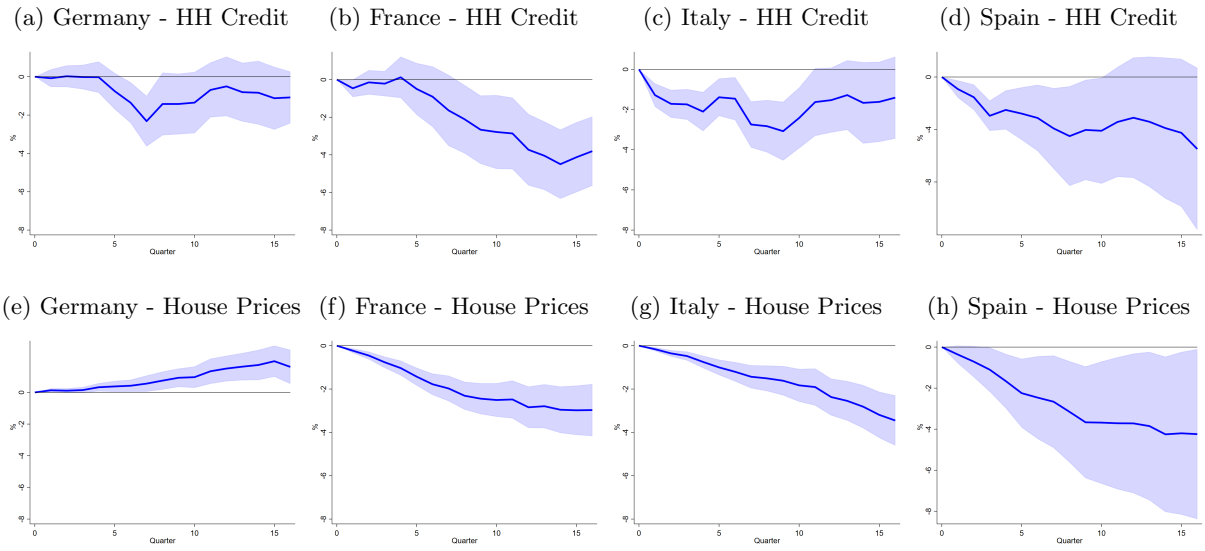
3 Empirical Results

In this section, using our narratively-identified macroprudential policy shocks and the empirical framework outlined in Section 2, we present results that summarize the causal relationship between macroprudential policy, household credit, and house prices for Spain, Italy, France, and Germany individually. In the second step, we examine the effects of macroprudential policy on net housing wealth through the reduced-form simulation described in subsection 2.2.

3.1 Aggregate Effects of Macroprudential Policy Shocks

Figure 1 displays the impulse responses of household credit and house prices to changes in our narrative macroprudential policy index across various horizons h.

Figure 1: Dynamic Response of Household Credit and House Prices to Macroprudential Policy Tightenings



Notes: Estimated cumulative changes in house prices and household credit growth at horizons $h = 1, 2, ..., 16$, following the activation of a tightening macroprudential policy. 'HH Credit' refers to household credit. The sample period is 1990Q1–2017Q4. Shaded area denotes the 68% confidence interval, based on robust standard errors.

A comparison of Panels (a), (b), (c), and (d) in Figure 1 reveals that tighter macroprudential policies consistently reduce household credit across all horizons and countries, although the magnitude of this effect varies. The largest reduction in household credit occurs in Spain, followed by France, while the smallest impacts are observed in Italy and Germany. Generally, the peak impact emerges around 3–4 years following policy tightening. This timing aligns with prior research indicating that the effects of macroprudential policies on credit tend to accumulate

gradually and peak in the medium term (e.g., Richter et al., 2019; Fernández-Gallardo et al., 2023). Despite minor differences in the magnitude of responses, the overall consistency in results suggests similar transmission mechanisms for macroprudential policy across the four largest euro area economies.

Panels (e), (f), (g), and (h) of Figure 1 illustrate the aggregate effects of macroprudential policies on house prices. In all cases except Germany, a tightening shock leads to a decline in house prices over time, with this effect gradually intensifying. However, the impulse response functions (IRFs) for Germany present puzzling results, showing a slight increase in house prices 3–4 years following the shock. This counterintuitive finding may partially reflect the limited sensitivity of German house prices to economic shocks or central bank policies. For instance, Corsetti et al. (2022) finds that, unlike in other euro area economies, house prices in Germany show little response to monetary policy tightening. Similarly, Kajuth (2020) finds that house prices in Germany are unresponsive to changes in housing supply dynamics and notes that both house prices and residential investments require several years to adjust to shocks. Additionally, Kuhn and Grabka (2018) highlights structural characteristics of the German housing market—including historically low homeownership rates, a highly developed rental market, and stringent mortgage lending conditions (restricted credit access and high down-payment requirements)—as key factors limiting price responsiveness to shocks. In line with these findings, our micro-simulation explicitly assumes that macroprudential policies have no measurable impact on German house prices.[20]

Overall, these results highlight that, with the exception of Germany, the effects of macroprudential policies on house prices are relatively uniform across the euro area. The evidence suggests that macroprudential policies negatively impact house prices in three of the four largest euro area economies, while having no effect in the remaining one.

In the next step, we distribute the aggregate effects of macroprudential policy on house prices and household credit across individual households within these economies. Specifically, we use the average effect of macroprudential policy over horizons 8 to 16 to allocate the aggregate decline in household credit and house prices in each country to individual households. We focus on the medium-term impact of these policies because, as our results demonstrate—and as consistently shown in the macroprudential policy literature—tightening measures take time

[20] An additional possible explanation for this counterintuitive result lies in the structure of the German housing market itself. Germany's historically low homeownership rate (approximately 46% in 2010), a well-developed rental market with robust rent controls, and conservative mortgage lending conditions collectively reduce the sensitivity of house prices to macroprudential policy shocks.

to affect the economy. Table B.2.1 in Appendix B.2 provides the average shocks used in the reduced-form simulation.

3.2 Micro-simulation: Effects of Macroprudential Policy on Net Housing Wealth

We present estimates of the effects on individual households' net housing wealth using a series of figures that illustrate the "micro" impulse responses derived from the micro-simulation described in Section 2.2. For each counterfactual scenario, we measure changes in net housing wealth across income groups relative to a baseline scenario, where net housing wealth is calculated using the 2010 HFCS survey. We then simulate the impact of the shock and compute the mean net housing wealth within each income group. Our analysis focuses on three parts of the income distribution: the bottom 20%, the middle (represented by the third quintile), and the top 20%. For each country, we estimate the responses using three counterfactual scenarios within our reduced-form micro-simulation framework.

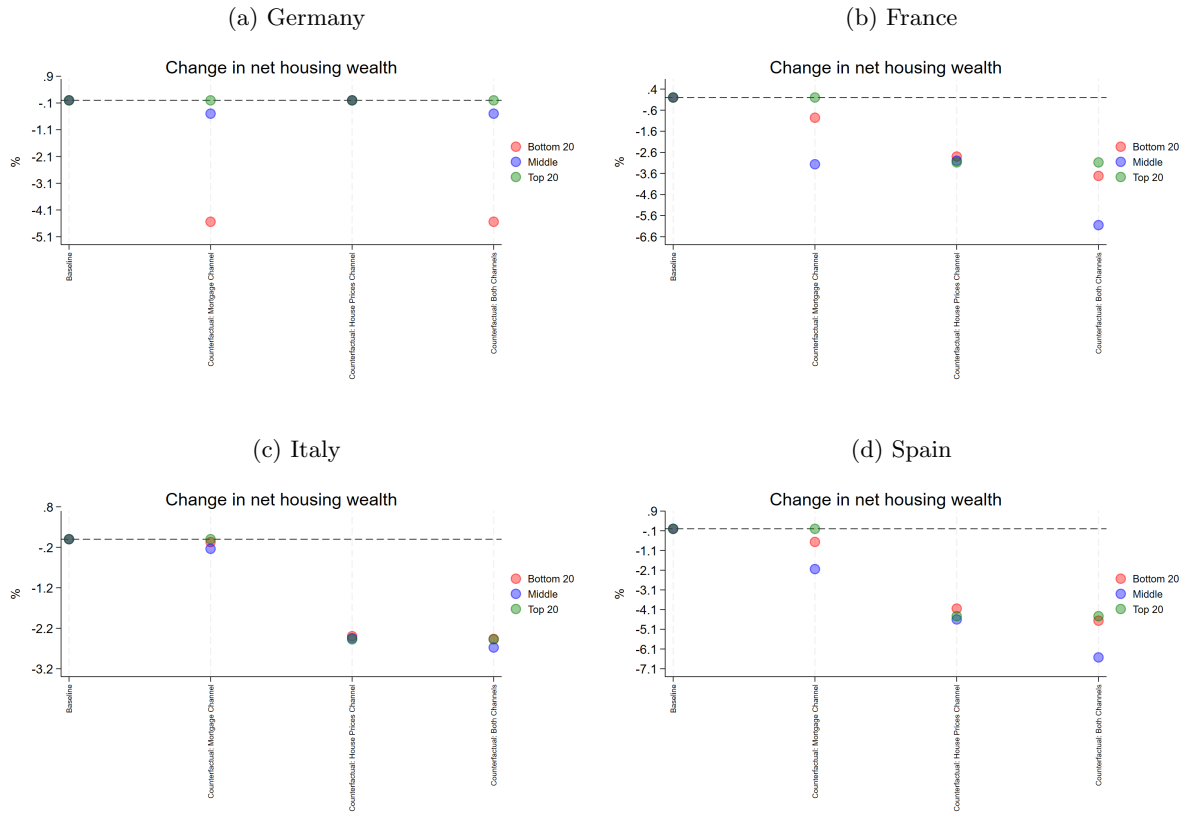
In the first counterfactual, we impose a reduction in mortgage credit following the shock, aligning with the aggregate IRFs estimated in the previous section. In this scenario, house prices are held constant, allowing us to isolate the estimated loss in housing wealth due to a heterogeneous decline in mortgage credit across income groups.[21] In the second counterfactual, we take the opposite approach: mortgage status remains unchanged across households, while those with housing wealth experience a decline in the value of their homes. This decline is calibrated to match the aggregate response of house prices in each country, as reflected in the aggregate IRFs. Finally, in the third counterfactual, both channels are active. We first impose a reduction in mortgage availability and housing assets for affected households, followed by a decline in house prices after the shock.[22]

Panels (a)–(d) of Figure 2 illustrate the estimated changes in net housing wealth following the implementation of a tightening macroprudential policy in Spain, Italy, France, and Germany. Focusing on the third counterfactual, where both channels are at play, we observe a broadly consistent pattern across all four countries: the largest reduction in net housing wealth tends to occur in the middle quintile of the income distribution, followed by the bottom 20%, and finally the top 20%. Germany is the exception, where the bottom 20% experiences the sharpest decline.

[21] If a household loses access to a mortgage in this scenario, we recalculate its net housing wealth by setting both the assets and liabilities associated with its primary residence to zero.

[22] In this scenario, households that lose access to a mortgage are not affected by the subsequent decline in house prices.

Figure 2: Response of Net Housing Wealth to Macroprudential Policy Tightenings



Notes: Estimated changes in net housing wealth following the implementation of a tightening macroprudential policy. Each counterfactual represents the change in net housing wealth across income groups relative to a baseline scenario, where net housing wealth is calculated using survey weights. For each counterfactual and income group, we simulate the impact of the shock and compute the mean net housing wealth within that group. *Source*: Household Finance and Consumption Survey, wave 2010.

The magnitude of the reduction varies considerably across countries. The most pronounced declines occur in France and Spain, where net housing wealth for the middle-income group falls by approximately 6% and 7%, respectively. In contrast, the reductions are more modest in Italy and Germany, with the largest losses reaching around 2.5% and 4%, respectively.

The house price channel does lead to a broadly similar reduction in net housing wealth across the income distribution, though there are some differences in magnitude across income groups. The largest declines tend to occur in the income quintiles where mortgage liabilities represent a larger proportion of housing value.[23] This pattern is evident in all countries except Germany. In Spain, the middle-income group experiences the largest decline, followed by the top and bottom quintiles—a distribution consistent with the observed debt-to-asset ratios, where the middle

[23]We report in Table A.2.3 the debt-to-asset ratio, calculated as the proportion of total housing liabilities over total housing assets.

quintile holds the highest leverage. In Italy and France, the pattern is broadly similar: losses are largest in the top quintile, followed by the middle and then the bottom. These results align with the intuition that higher leverage amplifies the impact of macroprudential tightening, even though the differences in losses across quintiles are relatively modest. In Germany, however, the lack of house price response to macroprudential policy implies that net housing wealth remains unaffected through this channel.

The assymetric decline in net housing wealth across countries and income groups is primarily driven by the heterogeneous reduction in mortgage credit among households. In Spain, Italy, and France, the pattern is strikingly similar: the top 20% remains unaffected by the reduction in mortgage credit following the shock, and as a result, their net housing wealth does not change. In contrast, the bottom of the distribution experiences some exposure to restricted mortgage access, leading to a decline in net housing wealth, though the extent of the drop varies across countries. Compared to Italy, Spain and France show the largest declines in net housing wealth for households at the bottom of the income distribution. However, these losses are still notably smaller than those experienced by middle-income households in the same countries.[24]

Overall, in Spain, Italy, and France, the mortgage credit channel has the strongest effect on middle-income households, followed by those in the bottom 20%, while the top 20% remains largely unaffected.

As in the other countries, the top 20% of households in Germany is not affected by the reduction in mortgage credit following a macroprudential shock, leaving their net housing wealth unchanged. However, the pattern differs from the other countries in one important respect: while the middle of the income distribution is only mildly affected, the bottom 20% bears the greatest burden. These households face restricted access to the mortgage market after the shock, leading to a decline in net housing wealth comparable in magnitude to that observed in Spain and France. The explanation for this result is provided in Table A.2.1 in Appendix A.2, which shows that households in the bottom income quintile in Germany tend to have relatively low initial loan-to-value (LTV) ratios. Consequently, losing both their mortgage and home in our simulation places a disproportionately high burden on their net housing wealth.

Overall, our reduced-form simulation shows that macroprudential policy leads to the largest reductions in housing wealth for middle-income households, followed by those in the bottom

[24]This pattern is consistent with our underlying intuition: lower-income households in Spain and France are more exposed to mortgage credit reductions than their counterparts in Italy. As shown in our reduced-form simulation, this heightened vulnerability reflects the greater prevalence of mortgagors among lower-income groups in Spain and France (see Figure B.2.1 in Appendix B.2).

income quintile, while the top 20% is least affected. This pattern implies an increase in housing wealth inequality, mostly driven by the uneven restriction of mortgage access across euro-area households. The result is consistent with the estimated responses of net housing wealth ratios and Gini coefficients—a standard measure of inequality—shown in Figure B.2.2 and Table C.1.4 in Appendix B.2.

3.3 Robustness Analyses

Alternative Controls. We further assess the robustness of our aggregate findings on house prices and credit by exploring a range of alternative control specifications. First, we augment our model with the US VIX, which helps account for global factors influencing domestic household credit and house prices in each country. Our results remain qualitatively similar after controlling for the US VIX. Second, we introduce controls for monetary policy to account for potential interlinkages between monetary and macroprudential policies (e.g., Kim and Mehrotra, 2018; Altavilla et al., 2020; Coman and Lloyd, 2022). Specifically, we augment our baseline specification by incorporating short-term interest rates as an additional control. Even with this adjustment, our findings remain consistent with the baseline results.

Homogenous drop in house prices across income groups. In our reduced-form simulation, we assume a uniform decline in house prices across different income groups. To validate this assumption, we investigate whether the effects of macroprudential policies on house prices vary according to their initial price levels—specifically across the entire range of house prices. We conduct this analysis using detailed provincial-level house price data from Spain. First, we categorize house prices into quintiles based on the average house price observed throughout our sample period (1995–2017). We then estimate the following local projections:

$$\begin{aligned}\Delta^h y_{t+h} = \quad & \alpha_h + \beta_h \Delta MaPP_t^{shock} + \theta_h^{Q2}(\Delta MaPP_t^{shock} \times Q2) + \theta_h^{Q3}(\Delta MaPP_t^{shock} \times Q3) \\ & + \theta_h^{Q4}(\Delta MaPP_t^{shock} \times Q4) + \theta_h^{Q5}(\Delta MaPP_t^{shock} \times Q5) + \Gamma_h X_t + \varepsilon_{t+h},\end{aligned} \tag{3}$$

where y_{t+h} represents house prices, and $\Delta MaPP_t^{shock}$ corresponds to our narrative macroprudential policy shock. To investigate the heterogeneity in policy effects, we categorize Spanish provincial house prices into five quintiles ($Q1$–$Q5$) based on their average levels from 1995 to 2017. This approach enables us to assess differential responses across various segments of the

housing market, capturing potential variability in price reactions depending on initial price levels.

For clearer interpretation, we standardize the macroprudential policy shock, $MaPP_t^{shock}$. The coefficients θ_h^{Q1-Q5} represent the impulse response functions (IRFs) of house prices at horizon h, following a one standard deviation increase in the macroprudential policy index across the defined quintiles. We estimate our model over the period from 1995Q1 to 2017Q4, [25] with a maximum forecast horizon of $h = 16$. The control variables, X_t, include dummy indicators for quintiles $Q2$–$Q5$ to account for inherent differences in house price dynamics in non-shock periods.

Figure B.1.3 illustrates the impulse response functions of house prices across the five quintiles following a one standard deviation increase in the macroprudential policy index. The results show remarkable consistency in the estimated responses across all quintiles ($Q1$–$Q5$), indicating that macroprudential tightening impacts house prices uniformly, regardless of their initial price levels. The similarity in these responses validates our assumption of symmetric effects and supports our approach of imposing a homogeneous decline in house prices across income groups in our reduced-form simulation.

Household groups by net total wealth. In our baseline exercise, we group households according to the income distribution to examine changes in net housing wealth following the implementation of a macroprudential policy. To complement our main analysis and assess the robustness of our results, we also analyze how these policies affect households when grouped by their position in the net total wealth distribution. Detailed results from this analysis are presented in Appendix C.

Our main findings can be summarized as follows: In contrast to the income distribution, the assymetric decline in net housing wealth is primarily driven by the house price channel. Households in the bottom 20% experience the largest decline, followed by those in the middle and top quintiles. The different results regarding the main channel at work and which income group loss the most is explained by the fact that mortgage liabilities account for a significantly larger share of the housing value for the bottom 20% of the net wealth distribution relative to the middle and top quintiles.[26] For the credit channel, the unique exception is the bottom 20% net wealth quintile for Italy that remains unaffected. Overall, these patterns suggest that

[25] This period is chosen based on the availability of provincial-level house price data.
[26] We also report the debt-to-asset ratio in Table C.1.3.

macroprudential policy exacerbates housing wealth inequality and are therefore consistent with the findings based on the income distribution.

4 Aggregate Effects of Macroprudential Policy on Housing Wealth Inequality

In the previous section, we examined how macroprudential policy affects housing wealth inequality through two main channels: reduced mortgage access and a decline in house prices following a policy shock. While our reduced-form simulation using household-level data allows us to isolate these channels and assess their combined impact, it does not account for general equilibrium effects or behavioral household responses to a macroprudential policy shock. This assumption is reasonable in the short run but is less likely to remain valid over the long term.[27] To address this limitation, we now complement our reduced-form simulation with time-series data on housing wealth inequality.

We use data from the Distributional Wealth Accounts (DWA), recently developed by the European System of Central Banks (ESCB). The DWA integrates household-level information from the Household Finance and Consumption Survey (HFCS) with macroeconomic data from sector accounts, providing a more comprehensive view of household wealth distribution while ensuring consistency with sectoral aggregates. Compiled quarterly and published five months after each period, this dataset enhances existing household survey data. While the DWA allows us to directly estimate the causal effect of macroprudential policy shocks on housing wealth inequality, it has two limitations.

First, the dataset does not provide information on net housing wealth for deciles 10 to 50 of the distribution. As a result, we lack data on this measure for the bottom 10% or 20% of the distribution. To address this limitation, we measure housing wealth inequality using the ratio between the top 10% and the middle of the distribution, as well as the ratio between decile 9 and the middle of the distribution.[28] Second, the survey spans a relatively short time period, beginning in 2009, 2010, or 2011, depending on the country.[29] Since both the survey data and

[27] In any case, we interpret our results as capturing the short- to medium-term effects of macroprudential policy, where this assumption is likely to hold. Households typically need time to adjust their financial decisions—such as increasing savings—in response to a macroprudential shock.

[28] Since the dataset only includes net housing wealth data for deciles starting from the 60th percentile, we use the 60th percentile as a proxy for the middle of the distribution. Additionally, unlike our reduced-form simulation, this dataset defines distributional groups based on net wealth rather than gross income.

[29] Specifically, the first available observations are 2009Q4 for France, 2010Q4 for Italy, 2011Q1 for Germany, and 2011Q4 for Spain, resulting in an unbalanced panel spanning from 2009Q4 to 2017Q4.

our macroprudential policy shocks are measured quarterly, estimating local projections at the country level would be constrained by a limited number of observations.[30]

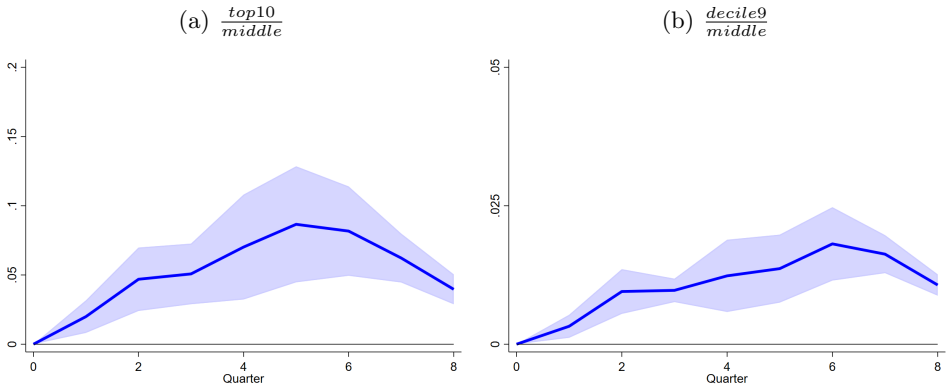
To mitigate this constraint, we employ a panel model that integrates data from all four countries. This approach enables us to utilize additional observations and compensate for the short time span by incorporating cross-sectional variation.[31]

Next, we estimate the following set of local projections:

$$\Delta^h y_{i,t+h} = \alpha_{i,h} + \beta_h \Delta MaPP_{i,t}^{shock} + \varepsilon_{i,t+h}, \tag{4}$$

where $\Delta^h y_{i,t+h}$ refers to the h-period change in the $\frac{top10}{middle}$ net housing wealth ratio and the $\frac{decile9}{middle}$ net housing wealth ratio, and $\alpha_{i,h}$ represents the country fixed effects. $\Delta MaPP_{i,t}^{shock}$ denotes the quarterly change in the narrative measure of the macroprudential policy index. As before, we standardize $MaPP_t^{shock}$ to facilitate the interpretation of results. Given the short time span of the dataset, the maximum horizon considered here is $h = 8$.[32]

Figure 3: Dynamic Response of Housing Wealth Inequality to Macroprudential Policy Tightenings



Notes: Estimated cumulative changes in the $\frac{top10}{middle}$ net housing wealth ratio and the $\frac{decile9}{middle}$ net housing wealth ratio at horizons $h = 1, 2, ..., 8$, following the activation of a tightening macroprudential policy. The sample period is 2009Q1–2017Q4. Shaded area denotes the 68% confidence interval, based on robust standard errors.

Panels (a) and (b) in Figure 3 present our main results, showing that a tightening macroprudential policy shock leads to an increase in housing wealth inequality across different horizons.

[30] Our shock series ends in 2017Q4.

[31] Based on the findings in Section 3, assuming a common slope across the four largest euro area countries seems reasonable.

[32] We estimate this model without controls. Due to the limited time span, estimating a larger set of coefficients would place excessive demands on the data. However, since $MaPP_t^{shock}$ is exogenous, controls primarily serve for inference rather than consistency. This is consistent with Fernández-Gallardo et al. (2023), who shows that the effects of macroprudential policy shocks on the distribution of GDP growth remain qualitatively similar regardless of the inclusion of controls.

This effect is consistent across both measures of housing wealth inequality—whether using the top 10% or decile 9 to represent the upper part of the distribution. These findings implies that macroprudential policy increases housing wealth inequality in the short to medium term, consistent with our results from the reduced-form micro simulation.

5 Conclusion

What are the effects of macroprudential policy on housing wealth inequality? This paper investigates this question by combining narrative-identified macroprudential policy shocks with a local projection framework to estimate the aggregate causal effects of these policies on credit and house prices in France, Germany, Italy, and Spain. We then distribute these aggregate effects across households through a reduced-form simulation using micro-level data.

Our analysis evaluates three counterfactual scenarios following a macroprudential policy shock: (i) households excluded from the housing market due to restricted mortgage access, (ii) households affected by house price changes induced by the policy shock, and (iii) a scenario incorporating both channels. By comparing net housing wealth across income quintiles to a no-regulation baseline, we find that macroprudential policy reduces wealth for lower-income households, widening housing wealth inequality.

We further validate our findings by incorporating time-series data on housing wealth inequality into the analysis. Taken together, the results underscore the influence of macroprudential policy on the distribution of housing wealth and its broader implications for overall wealth inequality. While macroprudential policies are primarily designed to safeguard financial stability—and our findings, consistent with existing literature, suggest they are effective in this regard—their distributional consequences should not be overlooked. Since housing is the main asset for most households, tighter access to mortgage credit can have substantial equity implications. These findings highlight the potential need for complementary housing policies to help offset the adverse effects of mortgage market exclusion, particularly for lower- and middle-income households.

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Appendix

A Data Sources and Summary Statistics

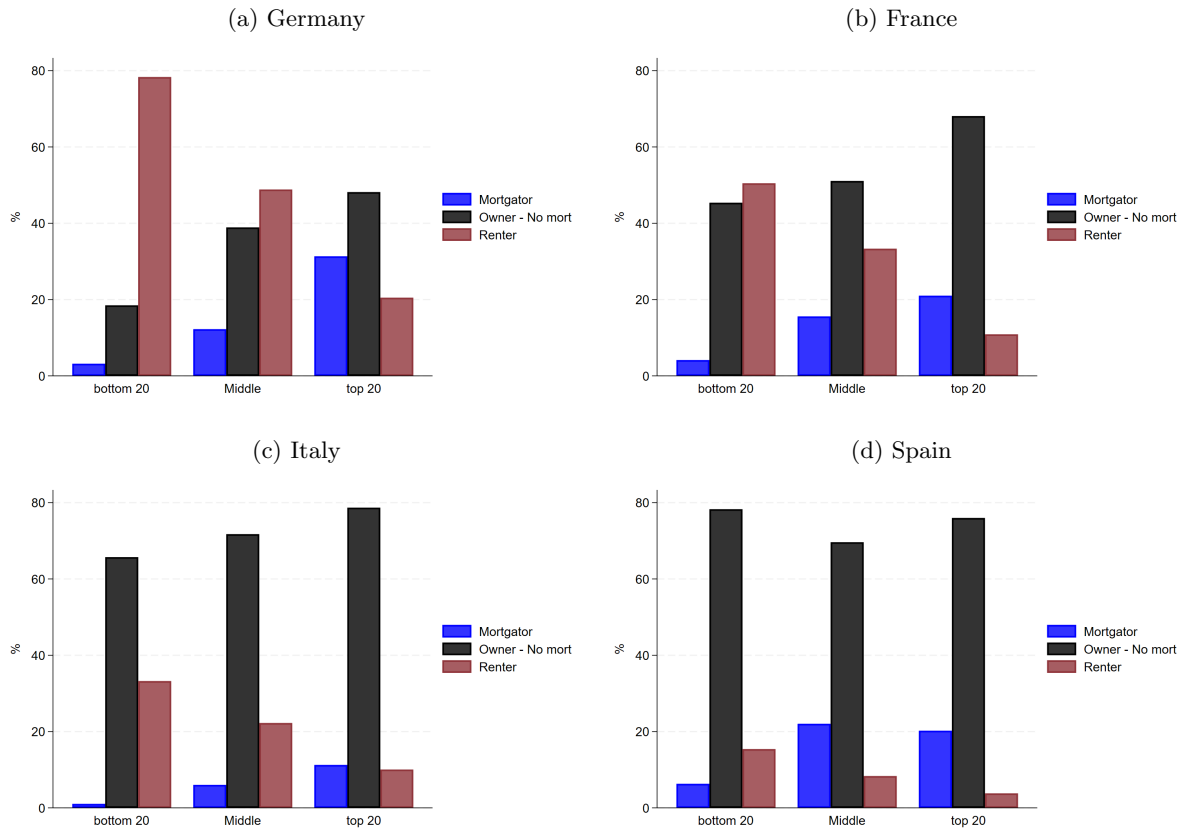
A.1 Data Sources

Table A.1.1: List of Data Sources

Variables	Source
Gross Domestic Product (GDP)	OECD database
Consumer Price Index (CPI)	Federal Bank Reserve of St.Louis (FRED)
Total Credit to Households	Bank for International Settlements (BIS)
House Prices	Bank for International Settlements (BIS)
VIX	Datastream
GDP forecast	OECD database
3-Month or 90-day Rates and Yields: Interbank Rates	IFS + FRED
Macroprudential Policy Index ($MaPP$)	Fernández-Gallardo et al. (2023)

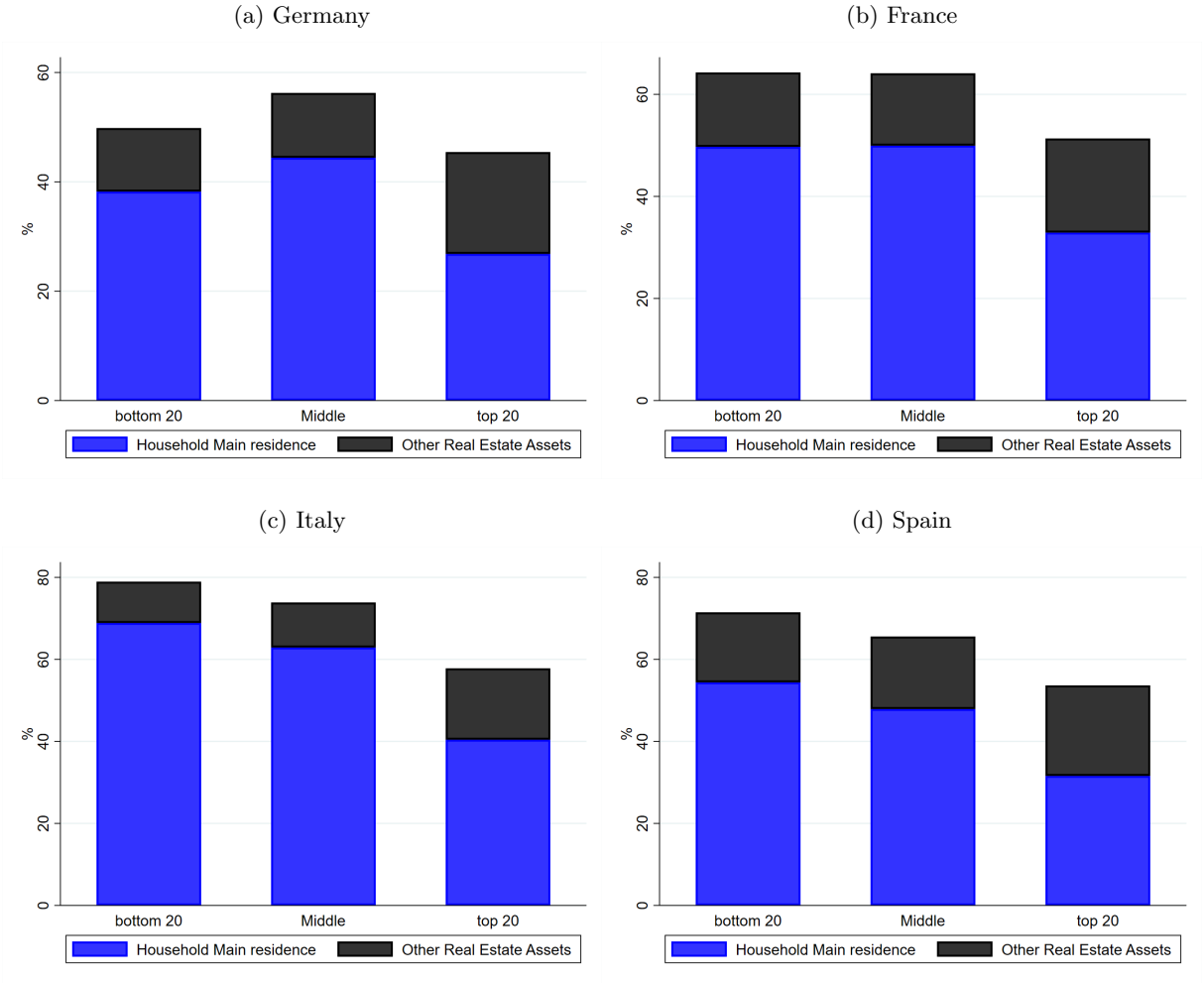
A.2 Summary Statistics and Additional Graphs

Figure A.2.1: Housing Tenure by Income Quintile.



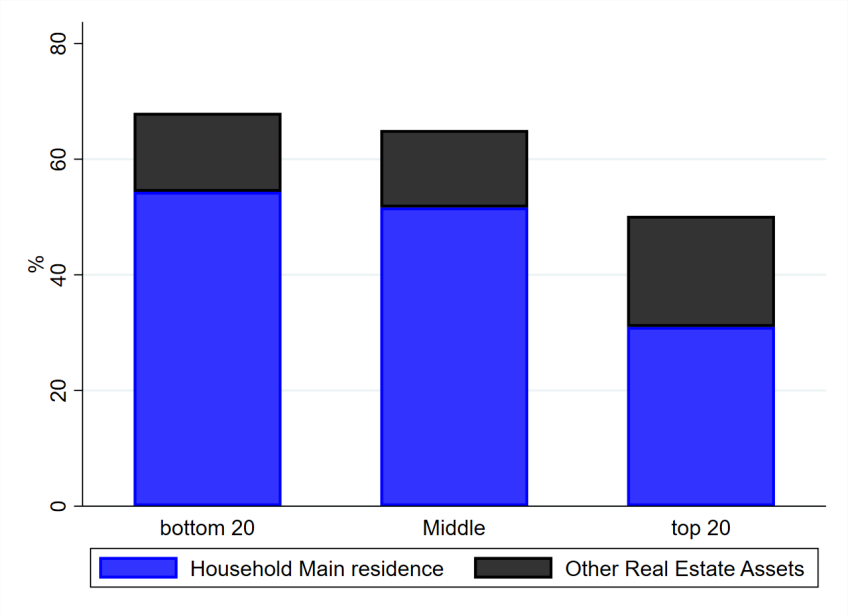
Notes: The figure illustrates housing tenure status across different income levels. Specifically, the "bottom 20%" refers to the first quintile, the "middle" represents the third quintile, and the "top 20%" corresponds to the fifth quintile. *Source*: Household Finance and Consumption Survey, wave 2010.

Figure A.2.2: Housing Wealth as a Share of Total Household Assets by Income Quintile.



Notes: The figure depicts the share of total housing assets as a percentage of total household wealth across the income distribution of homeowners. Specifically, the "bottom 20%" refers to the first quintile, the "middle" represents the third quintile, and the "top 20%" corresponds to the fifth quintile. *Source*: Household Finance and Consumption Survey, wave 2010.

Figure A.2.3: Housing Wealth as a Share of Total Household Assets by Income Quintile.



Notes: The figure depicts the share of total housing assets as a percentage of total household wealth across the income distribution of homeowners for the aggregate distribution of Germany, France, Italy, and Spain. Specifically, the "bottom 20%" refers to the first quintile, the "middle" represents the third quintile, and the "top 20%" corresponds to the fifth quintile. *Source*: Household Finance and Consumption Survey, wave 2010.

Table A.2.1: Mortgage Characteristics by Income Quintile and Country

Variable	**Income Quintile**	**Germany**	**Spain**	**France**	**Italy**
Loan-to-Value (%)	Bottom 20	52.26	96.51	45.46	84.89
	Middle	76.46	114.87	42.05	81.84
	Top 20	76.90	111.96	39.25	74.74
Amount Borrowed (€ thousand)	Bottom 20	1.03	0.86	0.76	0.63
	Middle	1.07	1.13	0.86	0.91
	Top 20	1.59	1.51	1.48	1.47
Mortgage Duration (Years)	Bottom 20	14.90	24.78	17.77	17.43
	Middle	15.83	26.31	18.24	20.24
	Top 20	14.54	24.91	16.97	20.49
HRP Age (Years)	Bottom 20	33.84	41.34	44.27	50.77
	Middle	49.19	39.83	42.06	42.94
	Top 20	45.77	43.04	41.19	44.52

Notes: The table reports average values of mortgage characteristics across three income quintiles (Bottom 20, Middle, Top 20) for mortgagors in Germany (DE), Spain (ES), France (FR), and Italy (IT). Loan-to-Value (LTV) indicates the initial LTV for the main residence at the time of acquisition, except for France, where it reflects the outstanding LTV due to the unavailability of data on the value of the main residence at the time of acquisition. Age refers to the average age of Household Reference Person (HRP). *Source*: Household Finance and Consumption Survey, wave 2010.

Table A.2.2: Housing Wealth Characteristics by Income Quintile and Country

Variable	Income Quintile	Germany	Spain	France	Italy
HMR Housing Assets (€ thousands)	Bottom 20	283.16	137.84	135.86	145.53
	Middle	135.61	157.65	185.92	200.90
	Top 20	255.43	238.10	300.18	316.20
HMR Housing Liabilities (€ thousands)	Bottom 20	77.87	70.07	60.00	50.45
	Middle	79.28	81.63	68.20	74.24
	Top 20	127.35	112.74	115.03	111.75
HMR Net Housing Wealth (€ thousands)	Bottom 20	205.29	67.77	75.26	95.08
	Middle	56.34	94.14	117.72	128.46
	Top 20	128.08	123.96	185.15	204.51
Total Housing Assets (€ thousands)	Bottom 20	284.94	142.33	162.05	158.18
	Middle	162.40	183.34	208.43	220.76
	Top 20	333.04	328.51	328.14	398.75
Total Housing Liabilities (€ thousands)	Bottom 20	80.83	70.75	64.56	50.45
	Middle	89.47	100.65	71.28	79.88
	Top 20	147.17	141.71	129.60	116.54
Net Housing Wealth (€ thousands)	Bottom 20	204.11	71.58	97.50	107.72
	Middle	72.92	82.69	137.14	140.88
	Top 20	185.87	186.80	198.54	282.21

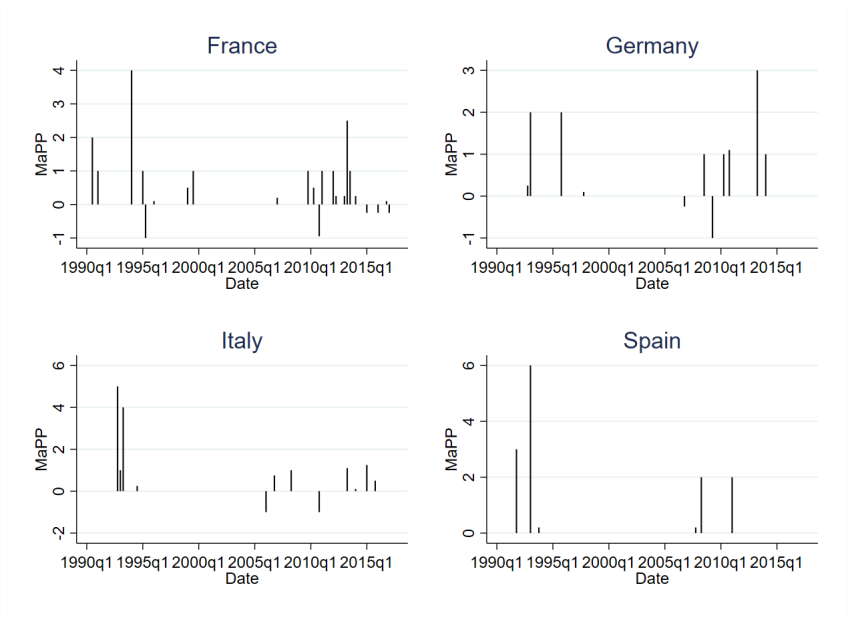
Notes: The table presents housing-related wealth indicators by income quintile (Bottom 20, Middle, Top 20) for mortgagors in Germany (DE), Spain (ES), France (FR), and Italy (IT). All values are expressed in thousands of euros. HMR refers to Household Main Residence. *Source*: Household Finance and Consumption Survey, wave 2010.

Table A.2.3: Debt to Asset Ratios and Homeownership Rate by Country and Income Quintile

Variable	Net Wealth Quintile	Germany	Spain	France	Italy
Debt to Assets (Total Housing) [%]	Bottom 20	5.98	6.17	4.15	1.08
	Middle	21.03	23.62	12.78	4.82
	Top 20	35.22	20.87	14.75	6.16
Homeownership Rate [%]	Bottom 20	22.23	80.78	48.41	59.18
	Middle	54.68	90.90	67.99	74.08
	Top 20	85.59	89.07	92.73	89.77

Notes: This table reports three types of debt to asset ratios and homeownership rates across income quintiles for Germany, Spain, France, and Italy for homeowners. All values are percentages. *Source*: Household Finance and Consumption Survey, wave 2010.

Figure A.2.4: Macroprudential Policy Shocks by Country.

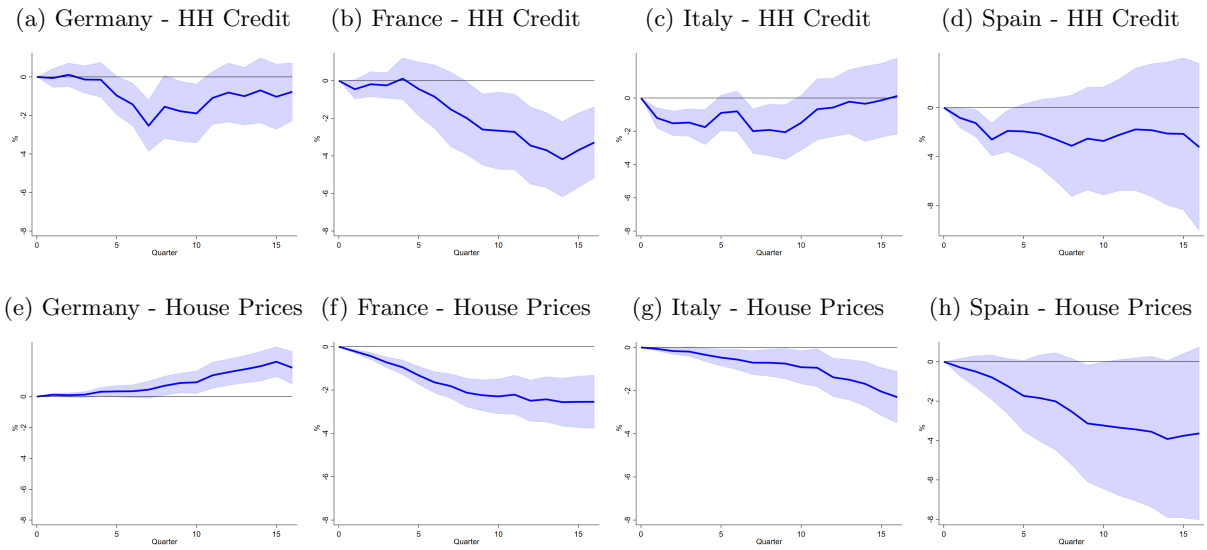


Notes: Plot of narrative-based $\Delta MaPP_{i,t}^{shock}$ over time for each country in our sample. Period is 1990Q1-2017Q4.

B Additional Results

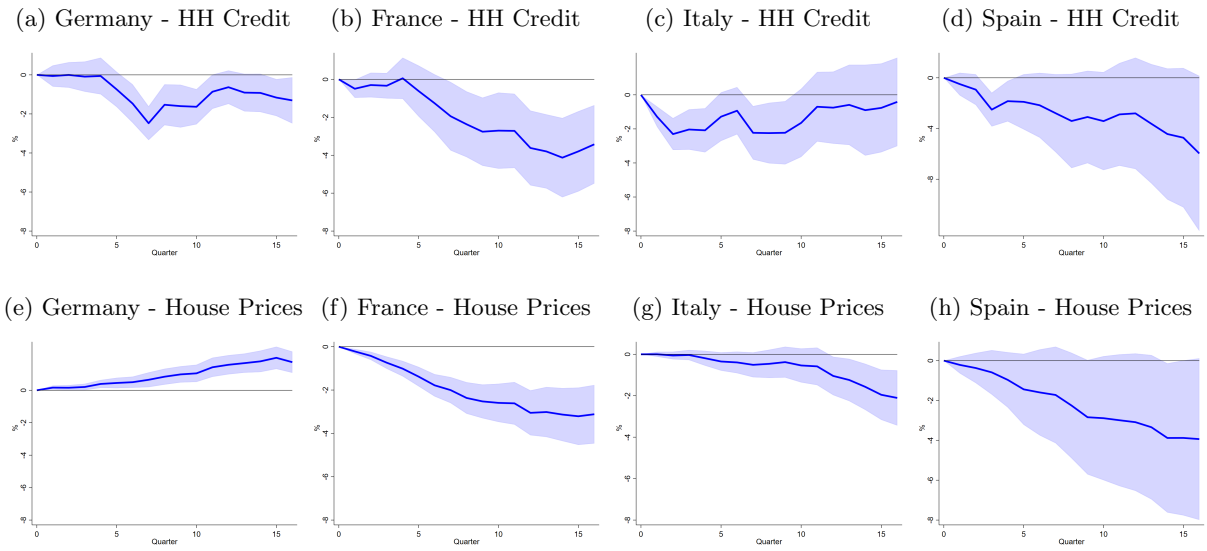
B.1 Aggregate Impulse Response Functions (IRFs)

Figure B.1.1: Additional control: US VIX



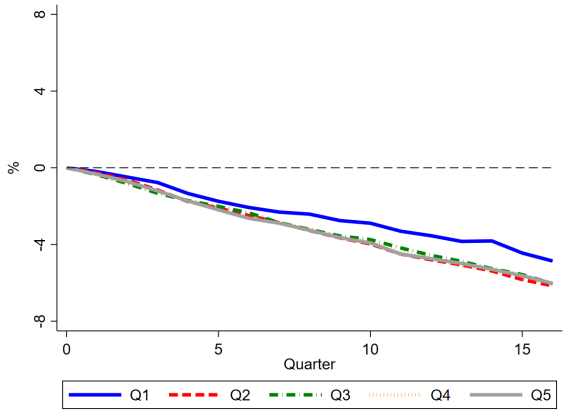
Notes: Estimated cumulative changes in house prices and household credit growth at horizons $h = 1, 2, ..., 16$, following the activation of a tightening macroprudential policy. 'HH Credit' refers to household credit. The sample period is 1990Q1–2017Q4. Shaded area denotes the 68% confidence interval, based on robust standard errors.

Figure B.1.2: Additional control: Interest Rate



Notes: Estimated cumulative changes in house prices and household credit growth at horizons $h = 1, 2, ..., 16$, following the activation of a tightening macroprudential policy. 'HH Credit' refers to household credit. The sample period is 1990Q1–2017Q4. Shaded area denotes the 68% confidence interval, based on robust standard errors.

Figure B.1.3: IRFs of House Prices by Quintile



Notes: Estimated cumulative changes in house prices across quintiles at horizons $h = 1, 2, \ldots, 16$ following a +1 standard deviation increase in the macroprudential policy index. House price responses are estimated for each quintile ($Q1$–$Q5$), as defined based on mean house prices across Spanish provinces from 1995 to 2017. The sample period is 1995Q1–2017Q4.

B.2 Reduced-form Simulation

Table B.2.1: Impulse Response Functions (IRF) for the Micro-Simulation Model

Country	**IRF Credit (%)**	**IRF Housing (%)**
France	-3.40	-2.70
Spain	-4.02	-3.83
Germany	-1.02	-0.00
Italy	-1.94	-2.36

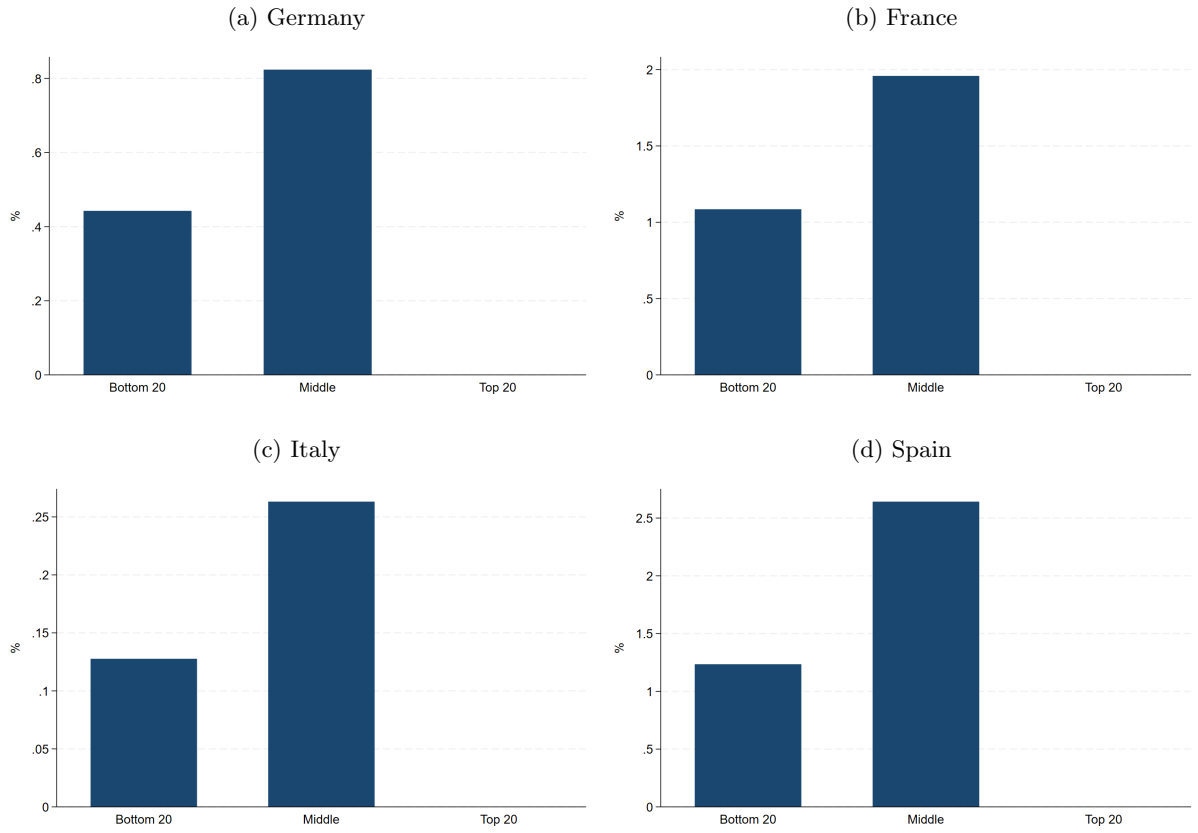
Note: IRFs represent the average effect of macroprudential policy on household credit and house prices over horizons 8 to 16. We use these estimates to simulate the impact in our reduced-form analysis, as detailed in Section 2.2.

Table B.2.2: Probit Estimation Results for Germany, France, Italy, and Spain

Dependent variable: Mortgage status				
Variable	Germany	France	Italy	Spain
Income	0.330***	0.206***	0.402***	0.204***
	(0.054)	*(0.028)*	*(0.055)*	*(0.036)*
Marital Status	0.491***	0.154***	0.221***	0.239***
	(0.070)	*(0.033)*	*(0.068)*	*(0.053)*
Highschool	0.117	0.156***	0.126**	-0.020
	(0.131)	*(0.040)*	*(0.059)*	*(0.064)*
College	0.153	0.176***	0.200**	-0.012
	(0.136)	*(0.045)*	*(0.081)*	*(0.059)*
Children	0.177***	0.193***	0.153***	0.209***
	(0.040)	*(0.016)*	*(0.035)*	*(0.033)*
Age	-0.006***	-0.018***	-0.022***	-0.039***
	(0.002)	*(0.001)*	*(0.002)*	*(0.002)*
Total Wealth	0.021	0.043***	-0.025*	-0.028**
	(0.019)	*(0.012)*	*(0.015)*	*(0.013)*
Other properties	-0.246***	-0.316***	-0.100	-0.277***
	(0.074)	*(0.045)*	*(0.071)*	*(0.061)*
Employed	0.505***	0.618***	0.291***	0.280***
	(0.076)	*(0.044)*	*(0.066)*	*(0.053)*
Self Employed	0.023	0.013	-0.270***	-0.222***
	(0.089)	*(0.041)*	*(0.077)*	*(0.065)*
Intercept	-5.162***	-3.426***	-4.760***	-0.787**
	(0.491)	*(0.244)*	*(0.501)*	*(0.327)*
Log-Likelihood	-1401.298	-4981.239	-1429.480	-2087.037
χ^2	376.675	1735.966	400.406	1039.725
AUC	0.766	0.805	0.808	0.840
Observations	3,495	14,706	7,793	5,984

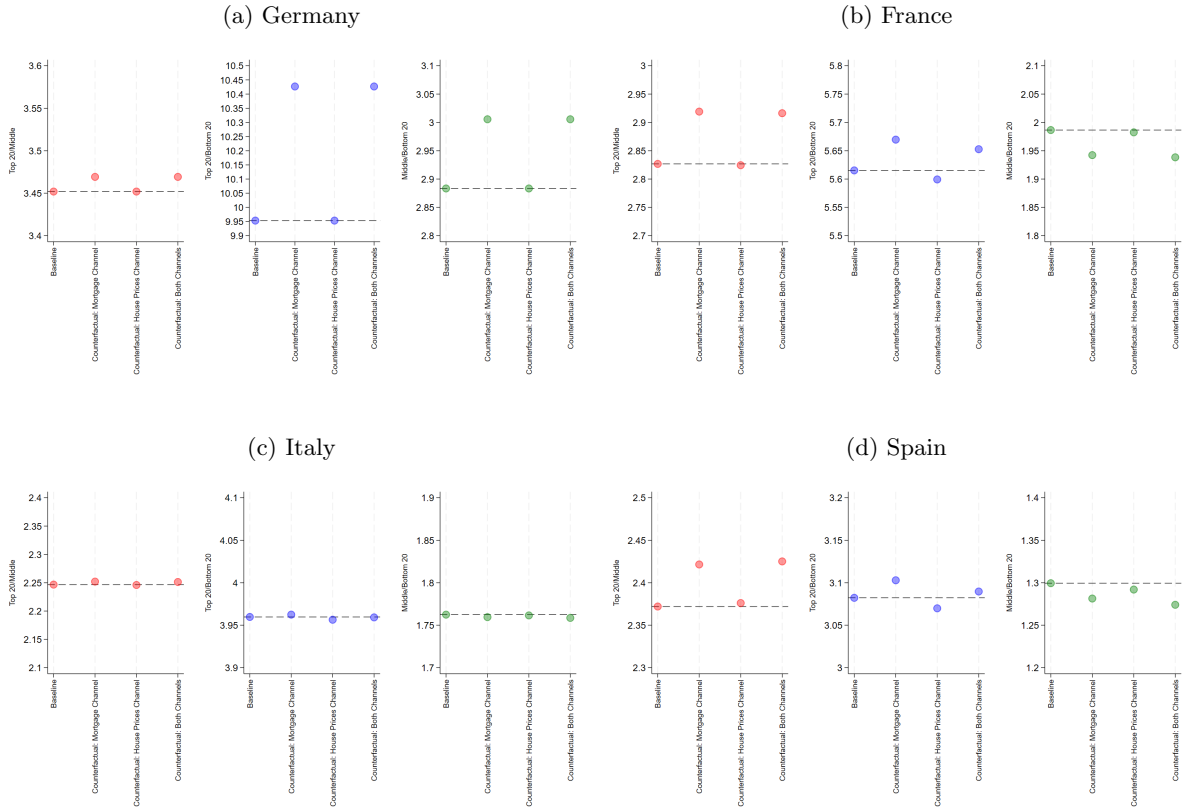
Notes: Probit estimation results for Germany, France, Italy, and Spain. The dependent variable is Mortgage status, which takes the value 1 if the household has a mortgage and 0 otherwise. Income is the logarithm of total gross income of the household. Marital Status is a dummy equal to 1 if the household reference person is married. Highschool and College are dummies equal to 1 if the household reference person has completed high school or college, respectively. Children refers to number of children aged from 0 to 13 years in the household. Age is the age of the household reference person. Total Wealth is the logarithm of total assets excluding the value of the main residence. Other properties is a dummy equal to 1 if the household owns additional real estate. Employed is a dummy equal to 1 if the household reference person is employed. Self Employed is a dummy equal to 1 if the household reference person is self-employed. Standard errors in italics.
*** p<0.01, ** p<0.05, * p<0.1. *Source*: Household Finance and Consumption Survey, wave 2010.

Figure B.2.1: Estimated loss of access to mortgages by income group



Notes: Estimated loss of mortgage access by country and income group following the implementation of a tightening macroprudential policy. The percentage indicates the share of households within each income group affected by credit restrictions after a macroprudential policy shock. *Source*: Household Finance and Consumption Survey, wave 2010.

Figure B.2.2: Response of Net Housing Wealth Ratios to Macroprudential Policy Tightenings



Notes: Estimated changes in net housing wealth ratios, following the activation of a tightening macroprudential policy. Each counterfactual represents the change in net housing wealth ratios relative to a baseline scenario, where net housing wealth ratios are calculated using survey weights. For each counterfactual, we first compute the mean net housing wealth within each income group and then calculate the corresponding ratio. *Source*: Household Finance and Consumption Survey, wave 2010.

Table B.2.3: Gini Coefficients for Net Housing Wealth by Country and Scenario

Country	**Baseline**	**Credit Channel**	**Price Channel**	**Both Channels**
Germany	0.812	0.814	0.812	0.814
Spain	0.583	0.586	0.587	0.590
France	0.677	0.681	0.678	0.682
Italy	0.619	0.619	0.619	0.619

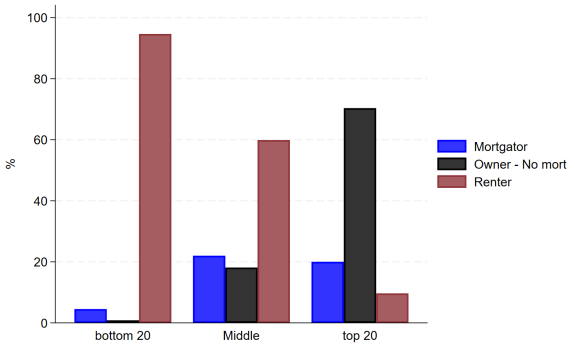
Notes: The table shows Gini coefficients for housing wealth inequality across countries. Each counterfactual represents the Gini coefficient of net housing wealth across income groups relative to a baseline scenario. For each counterfactual and income group, we simulate the impact of the shock and compute the Gini coefficient of net housing wealth over the whole distribution. *Source*: Household Finance and Consumption Survey, wave 2010.

C Results Based on the Distribution of Net Wealth

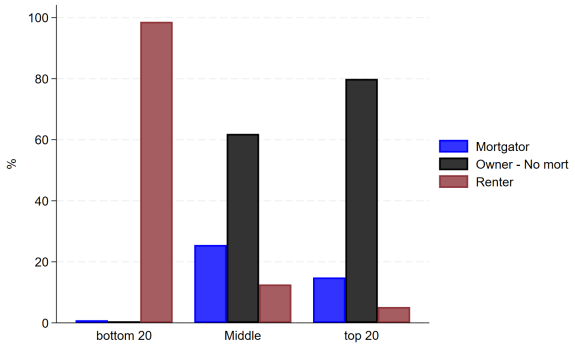
C.1 Summary Statistics

Figure C.1.1: Housing Tenure by Net Wealth Quintile.

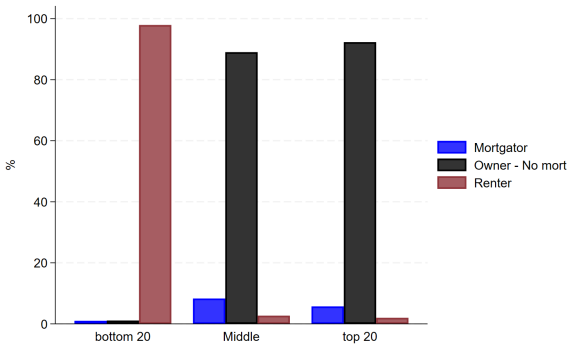
(a) Germany



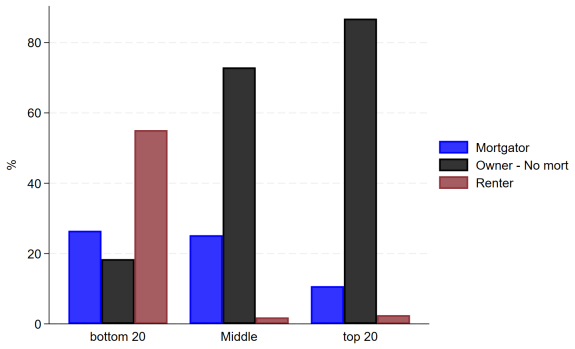
(b) France



(c) Italy



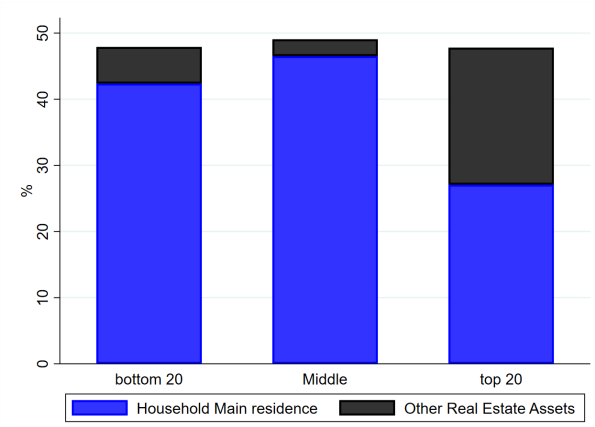
(d) Spain



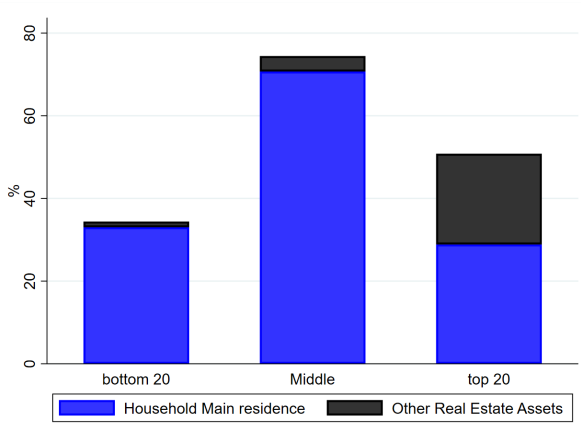
Notes: The figure illustrates housing tenure status across different net wealth levels. Specifically, the "bottom 20%" refers to the first quintile, the "middle" represents the third quintile, and the "top 20%" corresponds to the fifth quintile. *Source*: Household Finance and Consumption Survey, wave 2010.

Figure C.1.2: Housing Wealth as a Share of Total Housing Wealth by Net Wealth Quintile Quintile.

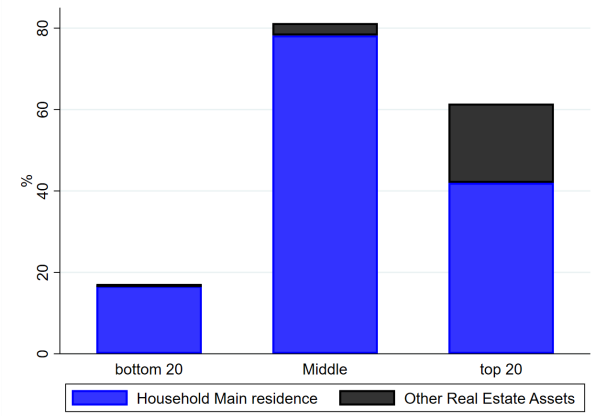
(a) Germany



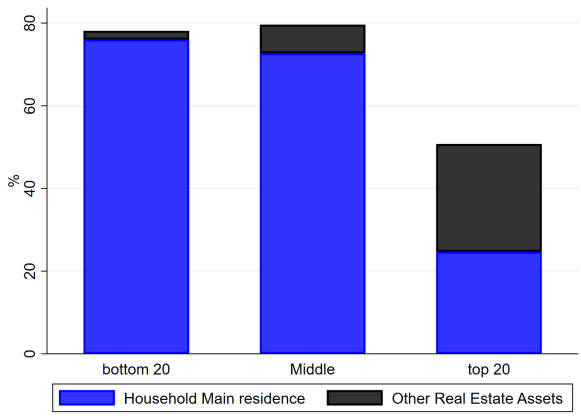
(b) France



(c) Italy



(d) Spain



Notes: The figure depicts the share of primary residence assets as a percentage of total household housing assets across the net wealth distribution of homeowners. Specifically, the "bottom 20%" refers to the first quintile, the "middle" represents the third quintile, and the "top 20%" corresponds to the fifth quintile. *Source*: Household Finance and Consumption Survey, wave 2010.

Table C.1.1: Mortgage Characteristics by Net Wealth Quintile and Country

Variable	Net Wealth Quintile	Germany	Spain	France	Italy
Loan-to-Value (%)	Bottom 20	93.22	112.37	116.71	124.43
	Middle	79.79	115.20	44.98	72.11
	Top 20	75.87	144.17	23.54	58.57
Amount Borrowed (€ thousand)	Bottom 20	190.77	137.83	137.03	169.43
	Middle	107.88	101.35	109.06	109.40
	Top 20	150.66	171.75	131.97	142.20
Mortgage Duration (Years)	Bottom 20	16.93	28.80	23.84	25.46
	Middle	15.24	24.64	18.96	18.52
	Top 20	12.23	22.89	15.16	20.71
HRP Age (Years)	Bottom 20	47.75	36.74	37.57	39.34
	Middle	45.19	41.14	39.82	41.51
	Top 20	50.10	46.81	44.85	48.32

Notes: The table reports average values of mortgage characteristics across three net wealth quintiles (Bottom 20, Middle, Top 20) for mortgagors in Germany (DE), Spain (ES), France (FR), and Italy (IT). Loan-to-Value (LTV) indicates the initial LTV for the main residence at the time of acquisition, except for France, where it reflects the outstanding LTV due to the unavailability of data on the value of the main residence at the time of acquisition. Age refers to the average age of Household Reference Person (HRP). *Source*: Household Finance and Consumption Survey, wave 2010.

Table C.1.2: Housing Wealth Characteristics by Net Wealth Quintile and Country

Variable	Net Wealth Quintile	Germany	Spain	France	Italy
HMR Housing Assets (€ thousands)	Bottom 20	113.16	123.93	112.01	150.24
	Middle	122.83	191.06	189.13	218.06
	Top 20	311.90	319.90	354.69	419.25
HMR Housing Liabilities (€ thousands)	Bottom 20	158.12	121.81	126.05	155.65
	Middle	85.25	74.83	88.44	81.40
	Top 20	115.54	121.66	94.33	107.84
HMR Net Housing Wealth (€ thousands)	Bottom 20	-4.45	2.12	-14.04	-5.40
	Middle	37.59	116.23	100.70	134.22
	Top 20	197.57	198.23	260.37	310.51
Total Housing Assets (€ thousands)	Bottom 20	114.23	125.18	124.41	150.24
	Middle	123.72	208.80	190.40	219.11
	Top 20	548.89	541.06	601.71	601.71
Total Housing Liabilities (€ thousands)	Bottom 20	160.68	123.84	135.29	155.65
	Middle	86.24	78.58	90.14	81.05
	Top 20	147.56	163.09	118.40	117.55
Net Housing Wealth (€ thousands)	Bottom 20	-46.46	1.34	-10.88	-5.40
	Middle	37.48	130.22	100.26	137.77
	Top 20	401.33	377.97	483.31	484.16

Notes: The table presents housing-related wealth indicators by net wealth quintile (Bottom 20, Middle, Top 20) for mortgagors in Germany (DE), Spain (ES), France (FR), and Italy (IT). All values are expressed in thousands of euros. HMR refers to Household Main Residence. *Source*: Household Finance and Consumption Survey, wave 2010.

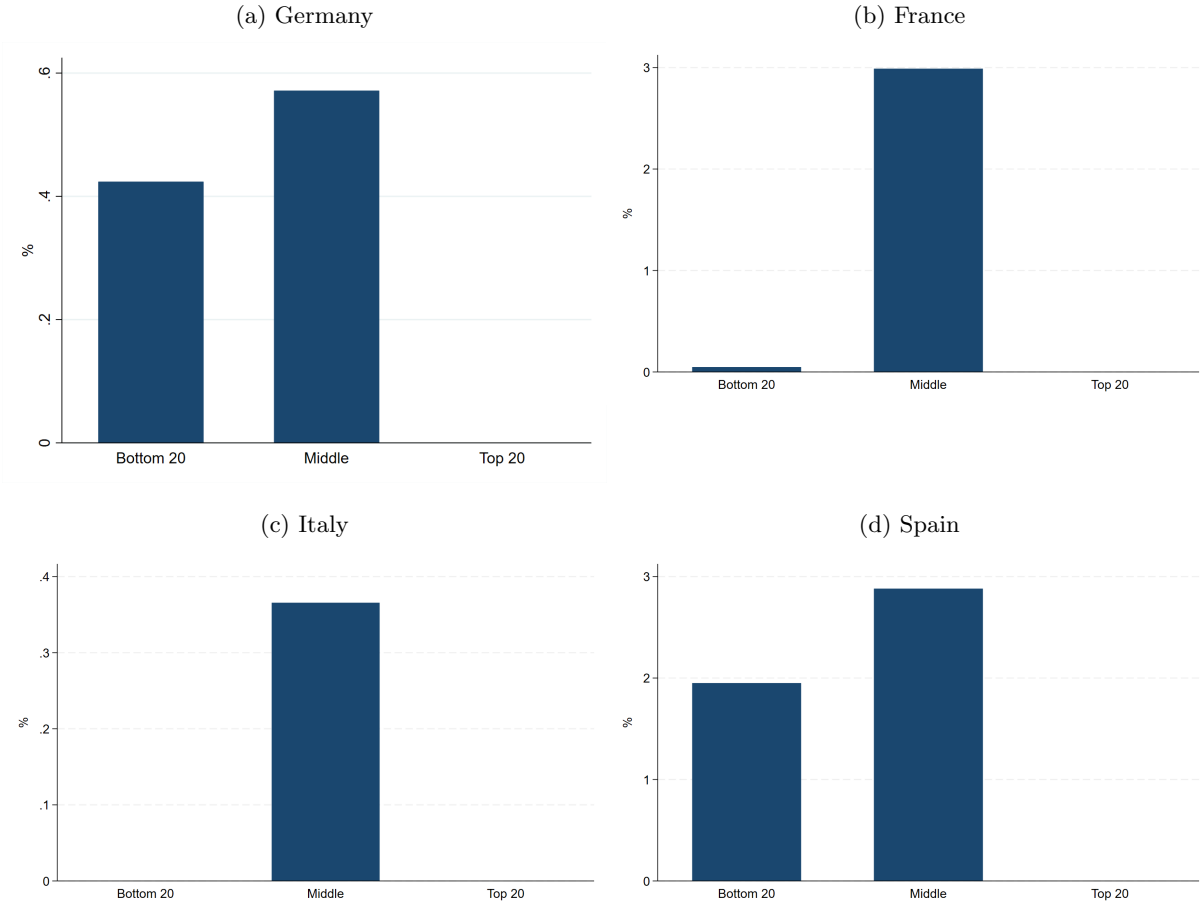
Table C.1.3: Debt to Asset Ratios and Homeownership Rate by Country and Net Wealth Quintile

Variable	Net Wealth Quintile	Germany	Spain	France	Italy
Debt to Assets (Total Housing) [%]	Bottom 20	255.77	79.71	114.17	38.95
	Middle	31.68	10.97	16.63	4.11
	Top 20	12.65	8.00	6.31	2.42
Homeownership Rate [%]	Bottom 20	6.58	38.41	1.67	1.98
	Middle	42.25	99.11	90.30	97.75
	Top 20	97.06	99.56	98.40	99.70

Notes: This table reports debt to asset ratios and homeownership rates across net wealth quintiles (Bottom 20, Middle, Top 20) for Germany, Spain, France, and Italy. All values are percentages. *Source*: Household Finance and Consumption Survey, wave 2010.

C.2 Reduced-form Simulation

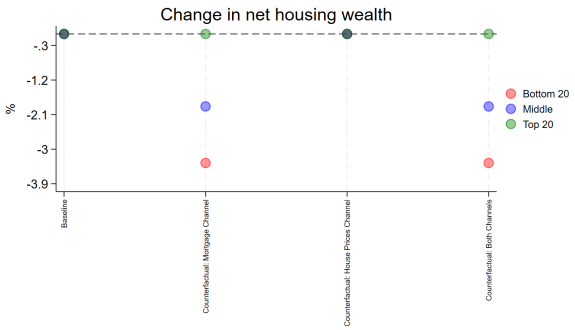
Figure C.1.3: Estimated loss of access to mortgages by net wealth group



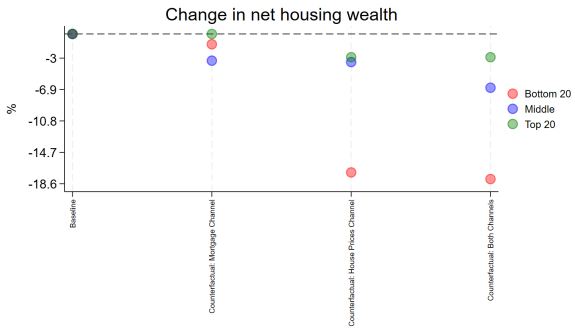
Notes: Estimated loss of mortgage access by country and net wealth group following the implementation of a tightening macroprudential policy. The percentage indicates the share of households within each income group affected by credit restrictions after a macroprudential policy shock. *Source*: Household Finance and Consumption Survey, wave 2010.

Figure C.1.4: Response of Net Housing Wealth to Macroprudential Policy Tightenings

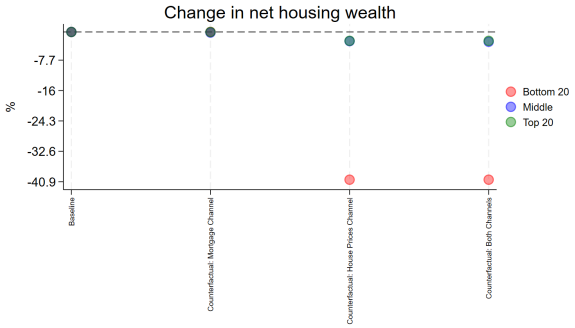
(a) Germany



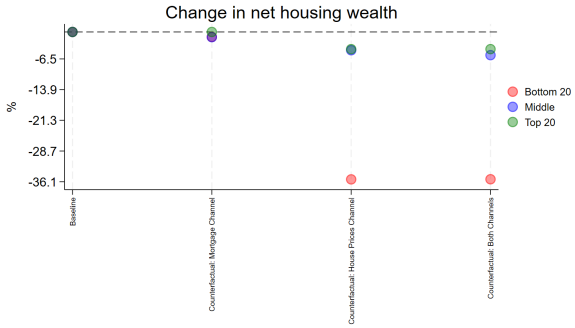
(b) France



(c) Italy



(d) Spain



Notes: Estimated changes in net housing wealth following the implementation of a tightening macroprudential policy. Each counterfactual represents the change in net housing wealth across net wealth groups relative to a baseline scenario, where net housing wealth is calculated using survey weights. For each counterfactual and net wealth group, we simulate the impact of the shock and compute the mean net housing wealth within that group. *Source*: Household Finance and Consumption Survey, wave 2010.

Table C.1.4: Gini Coefficients for Net Housing Wealth by Country and Scenario

Country	**Baseline**	**Credit Channel**	**Price Channel**	**Both Channels**
Germany	0.7970	0.7973	0.7970	0.7973
Spain	0.6334	0.6357	0.6373	0.6395
France	0.6753	0.6798	0.6749	0.6809
Italy	0.6362	0.6365	0.6366	0.6368

Notes: The table shows Gini coefficients for housing wealth inequality across countries. Each counterfactual represents the Gini coefficient of net housing wealth across net wealth groups relative to a baseline scenario. For each counterfactual and net wealth group, we simulate the impact of the shock and compute the Gini coefficient of net housing wealth over the whole distribution. *Source*: Household Finance and Consumption Survey, wave 2010.