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Housing wealth and monetary policy
transmission: cross-country evidence



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Challenges for Monetary Policy Transmission in a Changing World Network (ChaMP)

This paper contains research conducted within the network “Challenges for Monetary Policy Transmission in a Changing World Network” (ChaMP). It consists of economists from the European Central Bank (ECB) and the national central banks (NCBs) of the European System of Central Banks (ESCB).

ChaMP is coordinated by a team chaired by Philipp Hartmann (ECB), and consisting of Diana Bonfim (Banco de Portugal), Margherita Bottero (Banca d’Italia), Emmanuel Dhyne (Nationale Bank van België/Banque Nationale de Belgique) and Maria T. Valderrama (Oesterreichische Nationalbank), who are supported by Melina Papoutsi and Gonzalo Paz-Pardo (both ECB), 7 central bank advisers and 8 academic consultants.

ChaMP seeks to revisit our knowledge of monetary transmission channels in the euro area in the context of unprecedented shocks, multiple ongoing structural changes and the extension of the monetary policy toolkit over the last decade and a half as well as the recent steep inflation wave and its reversal. More information is provided on its [website](#).

Abstract

This paper quantifies the role of housing wealth in the transmission of monetary policy to consumption in 20 advanced economies. Using Bayesian VAR models we identify structural shocks with a novel combination of sign and maximum forecast error variance restrictions, isolating the housing wealth channel through counterfactual impulse responses. We find that the housing wealth multiplier — the sensitivity of consumption to exogenous house price changes — is strongly correlated with outright homeownership rates and is higher for durable consumption. Cross-country differences in the monetary policy transmission to consumption are largely driven by the cash-flow channel.

JEL classification: E21, E52, E44, R31, C32.

Keywords: consumption; cash-flow channel;
structural BVAR; local projections.

Non-technical summary

Housing is crucial in the balance sheets of households and banks. Therefore, changes in house prices can significantly affect the real economy and the magnitude of these effects depends on the drivers of house valuations' changes. For example, the substantial rise in real house prices during the Covid-19 pandemic was largely driven by changes in housing demand, which contributed positively to aggregate consumption. Subsequently, amid global monetary policy tightening, real estate price growth started to decelerate and even reverse, dampening consumption as well. In both episodes, these effects were highly heterogeneous across countries, reflecting a number of structural housing and mortgage market features.

This paper analyses the transmission of monetary policy to consumption via the housing and mortgage market, leveraging the cross-country heterogeneity in structural characteristics to understand the role of the housing wealth and cash-flow effects. Given the comparable dataset and a novel modelling strategy, we are able to estimate the housing wealth effect and analyse the transmission of monetary policy to consumption via housing and mortgage markets in a consistent way for 20 advanced economies. We have three main findings. First, we show that not only the peak response of consumption but also the peak response of house prices to the monetary policy shock are heterogeneous across countries and related to the differences in the housing and mortgage market characteristics, namely the share of homeowners, the level of household debt over GDP and the share of adjustable-rate mortgages. Second, the housing wealth multiplier — the sensitivity of consumption to exogenous house price changes — is strongly correlated with the share of outright homeowners and is higher for durable consumption. Third, after controlling for the housing wealth effect, the key channel that explains the heterogeneous transmission of monetary policy to consumption turns out to be the cash-flow channel.

Empirical insights from this cross-country analysis can be linked to underlying theories of monetary policy transmission via housing, and are also complementary to the literature that relies on micro-level data to estimate housing wealth effects. Furthermore, our findings have relevant implications from the policy perspective. Structural changes in the housing and mortgage markets, such as the increasing levels of indebted homeowners or declining shares of adjustable-rate mortgage loans, may have affected the strength of the transmission of monetary policy to consumption via the housing market.

1 Introduction

Housing plays a crucial role in household and bank balance sheets and therefore changes in house valuations significantly affect the real economy. House price changes may have various drivers and, consequently, different implications for the real outcomes. For example, the substantial rise in real house prices during the Covid-19 pandemic (Figure 1, blue bars) was largely associated with changes in housing demand, that contributed positively to aggregate consumption.¹ Afterwards, amid the global monetary policy tightening, real estate prices started to decelerate and even reversed (Figure 1, yellow bars), and consumption was dampened as well. In both episodes, these effects were highly heterogeneous across countries, related to a number of structural housing and mortgage market features. These structural differences may contribute significantly to the cross-country heterogeneity in the relationship between changes in house prices and changes in consumption after monetary policy shocks. Correspondingly, the role of the housing market in the transmission of monetary policy has appeared prominently in central bank communication.² Motivated by recent developments and the related policy discussions, this paper analyses the transmission of monetary policy to consumption via the housing and mortgage market, leveraging the cross-country heterogeneity in structural characteristics to understand the role of the housing wealth and cash-flow channels.

The analysis relies on structural Bayesian vector autoregression (BVAR) models for 20 advanced economies, combined with local projection analysis. We identify structural shocks using a novel combination of the sign and maximum forecast error variance (FEV) approach. This strategy allows us to identify both housing demand and mortgage supply shocks, separately from monetary policy, aggregate demand and aggregate supply shocks. Given the comparable dataset and a novel modelling strategy, we are able to estimate the housing wealth effect and analyse the transmission of monetary policy to consumption via housing and mortgage markets in a consistent way for a broad sample of advanced economies. We leverage the cross-country heterogeneity of consumption sensitivity to structural shocks to better understand the role of housing wealth and cash-flow channels in the transmission of monetary policy. We see this, along with our new estimation approach and the resulting models, as key contributions of our paper to the literature.

Seminal papers by Iacoviello (2005) and Iacoviello and Neri (2010) have highlighted the crucial

¹For a broader context, see, for example: Battistini et al. (2023), Biljanovska (2023a, 2023b), Di Casola et al. (2022), European Systemic Risk Board (2022a, 2022b), Igan et al. (2022), Battistini et al. (2021), as well as Lo Duca et al. (2021), highlighting risks in housing market developments after the pandemic.

²For example, see Sveriges Riksbank (2022) and Bank of England (2023). Apart from central banks, the topic has also been discussed by other institutions, see for example International Monetary Fund (2024).

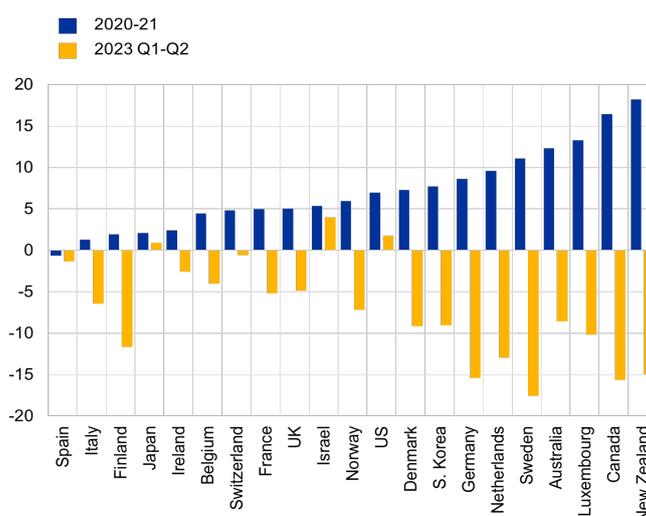


Figure 1: Real house price growth across countries

Note: The figure shows the annual percentage change in real house prices for each country over the respective period. Source: Federal Reserve Bank of Dallas, authors' calculations.

role of the housing market for monetary policy transmission, using two-agent New Keynesian (TANK) models. In these papers, housing is an asset on the balance sheet of so-called impatient households, who borrow from patient households against collateral. House price changes, for example resulting from monetary policy or housing demand shocks, affect the value of collateral, which contributes to changes of borrowing constraints and thus affects the transmission of these shocks to consumption through the collateral, or housing wealth, channel. At the same time, monetary policy transmits to consumption via housing also through the cash-flow channel, since the interest rate cost of mortgage loans changes. To compare these exogenous effects of house prices on consumption across countries, we introduce a metric labelled "housing wealth multiplier", defined as the ratio between the peak cumulative effect on consumption and the peak cumulative effect on house prices of a housing demand shock in the same country. Counterfactual impulse responses allow us to isolate the role of the cash-flow channel versus the housing wealth channel in the transmission of monetary policy to consumption.

We have three main findings. First, we show that not only the peak response of consumption but also the peak response of house prices to the monetary policy shock are heterogeneous across countries and related to the differences in the housing and mortgage market characteristics, namely the share of homeowners, the level of household debt over GDP and the share of adjustable-rate mortgages. Second, the housing wealth multiplier is correlated with the share of outright homeowners and is higher for durable consumption. Third, after controlling for the housing wealth effect, the key channel that explains the heterogeneous transmission of monetary policy to consumption turns out to be the cash-flow channel.

The insights from our structural models have relevant implications from the policy perspective. They point to the crucial role of housing and mortgage market characteristics in the strength of monetary policy transmission to consumption and housing wealth effects. They also allow us to draw implications for their evolution over time. In particular, our findings suggest that structural changes in the housing and mortgage markets, like increasing levels of indebted homeowners or declining shares of adjustable-rate mortgage loans, may have affected the strength of the transmission of monetary policy to consumption via the housing market (see, for example, Di Casola (2023), Stockhammar et al. (2022), and Sveriges Riksbank (2022), as well as International Monetary Fund (2024)).

Our work relates to the literature analysing the cross-country heterogeneous response of consumption or economic activity to monetary policy shocks (e.g., Calza et al. (2013), Nocera and Roma (2017); Slacalek et al. (2020); Corsetti et al. (2022), Battistini et al. (2025), Pica (2023) and De Stefani and Mano (2025)).³ For the largest four euro area countries, Slacalek et al. (2020) point to the role of the housing wealth effect in explaining cross-country differences in consumption response to conventional monetary policy.⁴ Methodologically, we combine insights from Nocera and Roma (2017), Gambetti and Musso (2017) and Furlanetto et al. (2017) to identify housing demand from mortgage supply and monetary policy shocks in structural BVAR models with sign restrictions, to which we add forecast error variance restrictions proposed in Uhlig (2003). Consequently, our work contributes to the literature by proposing a new identification strategy for BVARs with housing variables. Thanks to the consistent and parsimonious identification strategy, we are able to assess the heterogeneity of consumption sensitivity to monetary policy for a broad sample of countries, relate it to housing market characteristics, and – using counterfactual analysis – draw implications for the role of cash-flow and housing wealth in monetary policy transmission.

Our paper provides also an analysis of the sensitivity of consumption to exogenous house price changes via the housing wealth multiplier for a large set of countries. In this sense, it is complementary to the literature that relies on micro-level data to estimate housing wealth effects following exogenous changes to house prices (e.g., Anenberg and Ringo (2024); Böjeryd et al. (2026); Graham and Makridis (2023); Guren et al. (2021); Aladangady (2017); Kartashova and Tomlin (2017); Campbell and Cocco (2007)). For example, Cloyne et al. (2019) show that the aggregate response of consumption to interest rate changes is driven by households with a mortgage. Christelis et al. (2021) highlights the role of

³See Altavilla et al. (2020) for an analysis of the heterogeneous pass-through of monetary policy to lending rates across euro area banks.

⁴From a broader perspective, our paper is also related to the literature on monetary policy transmission and household indebtedness (e.g., Committee on the Global Financial System (2024), Almgren et al. (2022), Eichenbaum et al. (2022), Alpanda et al. (2021), Gelos et al. (2019), Alpanda and Zubairy (2018), as well as Albuquerque (2018)).

households' liquidity conditions for the size of the housing wealth effect.

The remainder of the paper is structured as follows. Section 2 describes the BVAR modelling approach, including an overview of the data and the identification strategy. Section 3 discusses the estimation results, starting with detailed results for the US, continuing with the findings on the heterogeneous responses to monetary policy shocks, defining the housing wealth multiplier and disentangling the housing wealth channel of monetary policy. Section 4 discusses the robustness of results and section 5 illustrates the theoretical underpinnings for understanding the role of financial constraints for the transmission of monetary policy to the economy. Section 6 concludes.

2 Model

This section discusses the data and the modelling approach, highlighting that our empirical set-up for BVARs with housing variables delivers a set of country-specific monetary policy, housing demand, mortgage supply, aggregate demand and supply shocks, based on comparable data across 20 advanced economies.

2.1 Data

We develop country-specific Bayesian vector autoregression (BVAR) models for 20 countries at quarterly frequency from 1995Q1 to 2023Q4. The countries analysed are: Australia, Belgium, Canada, Germany, Denmark, Spain, Finland, France, Great Britain, Ireland, Israel, Italy, Japan, Korea, Netherlands, Norway, New Zealand, Portugal, Sweden, and the United States.⁵ The models include the following domestic variables: real consumption, consumer prices, real credit to households, real house prices, interest rate, and, for most countries, nominal effective exchange rate (or the excess bond premium for the US). Details on the data sources are available in the Appendix A. Our approach does not rely on mortgage rates, which are often available to a constrained number of countries for a short sample period and very difficult to compare across jurisdictions.

The sample of countries includes advanced economies, for which comparable house price data are available from the International House Price Database, described in Mack and Martínez-García (2011). For countries that conducted unconventional monetary policy we use the shadow rate computed by Krippner (2013) to account for the effects of asset purchases, which would not be captured by the policy rate.

⁵The sample period starts in 1999Q1 for EA countries, with the exception of Ireland, where the analysis starts in 2002Q1 due to data limitations.

A shadow rate corresponds to the (unobservable) nominal interest rate that would have prevailed if the zero lower bound had not been binding. The advantage of this data source is the comparability across a large number of currency areas, which enables us to account for various types of policy tools employed during the Global Financial Crisis and afterwards. The shadow rate estimated by Krippner (2013) is based on a model for the term structure of interest rates and has the advantage of being available for many of the countries of interest, but we also provide robustness with alternative shadow rates.⁶ The only countries for which the shadow rates are not available are Sweden, for which we use the short-term government bond rate, as well as Korea and Israel, for which we rely on the policy rate since the asset purchase programs were very short with respect to our sample period.⁷ Data on real consumption, real GDP and consumer prices are from OECD, while data on credit to households and nominal effective exchange rates are from BIS.⁸

For the US model, instead of the exchange rate we use the excess bond premium (EBP), a component of US corporate bond spreads that is not attributable to the expected default risk and thus provides an effective measure of investor sentiment in the US corporate bond market (Gilchrist and Zakrajšek, 2012). Given the importance of the corporate bond market for corporate funding in the US and for monetary policy transmission, we include this measure, also following earlier literature which has shown the importance of controlling for credit spreads to identify US monetary policy shocks (Caldara and Herbst, 2019).

In order to explore the cross-country heterogeneity in the relationships between consumption, house prices and monetary policy, we use several indicators related to the features of the housing and mortgage markets. In particular, we choose the indicators that can proxy for the share of borrowing-constrained households or the interest rate sensitivity in the economy, as long as the comparable data is available for most of the countries in our sample. We focus on (1) the share of homeowners, (2) household debt over GDP, and (3) the share of adjustable rate mortgage (ARM) loans. We use data on housing tenure and living arrangements from the OECD Affordable Housing Database between 2010 and 2020.⁹ Household debt over GDP is from BIS. Data on the shares of adjustable-rate mortgages over the total

⁶The underlying assumption when using the shadow rate is that the transmission of balance sheet measures at the lower bound is similar to the transmission of interest rate changes. In other words, the use of shadow rate assumes that there are no structural breaks when the policy rate reaches the lower bound and the central bank expands the balance sheet. This assumption is in line with the literature (Sims and Wu, 2020). In section 4 we discuss robustness checks with an alternative measure of the shadow rate.

⁷As the central banks of Norway and Denmark did not conduct asset purchase programs, we consider the policy rates for these countries.

⁸Nominal credit to households was deflated with the consumer price index.

⁹For New Zealand the data starts only in 2019.

volume of loans to households is from De Stefani and Mano (2025). For all these variables, we compute a country average over the sample period. We show in Table A2 in the Appendix that these variables are not very highly correlated with one another and thus there is a merit to analyse the relation of each of these characteristics to the heterogeneity of shock transmission to the economy.¹⁰ To explore the role of durable consumption in the transmission of monetary policy via the housing market, we also use the data on durable consumption from Eurostat and Haver.

2.2 Identification strategy

The purpose of our modelling approach is to identify structural shocks, in particular monetary policy and housing demand shocks. For this reason, we employ the structural vector autoregression framework. Although our main focus is on housing demand and monetary policy shocks, given that we rely on sign restrictions, the identification of other key shocks helps to disentangle them better and understand the drivers of economic developments more comprehensively (Paustian, 2007).

In addition to monetary policy and housing demand shocks, we identify mortgage supply, aggregate demand and aggregate supply shocks. We use a combination of short-run sign restrictions, applying them at the horizon of one quarter. We propose a novel combination of these restrictions with a maximum forecast error variance approach. Our identification approach extends the method by Nocera and Roma (2017) and builds on Gambetti and Musso (2017) and Furlanetto et al. (2017).¹¹

	Aggregate Demand	Aggregate Supply	Housing Demand	Mortgage Supply	Monetary Policy
Consumption	+	+	+		-
Consumer prices	+	-			-
Interest rate	+				+
Real house prices			+	+	-
Credit to households				+	-
EBP					+
Real house prices	MaxFEV				
Credit to households	MaxFEV				

Table 1: Identifying restrictions for the model of the US economy

Note: The sign restrictions are imposed for 1 period. MaxFEV denotes the maximum forecast error variance restriction.

¹⁰For robustness purposes, we also consider household debt over disposable income from OECD, and find that it is strongly correlated with household debt over GDP.

¹¹Nocera and Roma (2017) had in turn developed the identification of such BVARs further, as compared to seminal papers using Choleski identification (Musso et al., 2011; Calza et al., 2013).

	Aggregate Demand	Aggregate Supply	Housing Demand	Mortgage Supply	Monetary Policy
Consumption	+	+	+		-
Consumer prices	+	-			-
Interest rate	+				+
Real house prices			+	+	-
Credit to households				+	-
NEER					+
Foreign interest rate					
Foreign GDP					
Foreign consumer prices					
Real house prices			MaxFEV		
Credit to households				MaxFEV	

Table 2: Identifying restrictions for the model of a small open economy

Note: The sign restrictions are imposed for 1 period. MaxFEV denotes the maximum forecast error variance restriction. The model is used for non-euro area countries and large euro area countries.

The identifying restrictions for the US model are summarised in Table 1, while those for the rest of the countries are presented in Table 2. Aggregate demand and aggregate supply shocks are distinguished by the standard assumption that the former generate comovement between consumption and house prices, while the latter induces opposite-sign responses. In addition, aggregate demand shocks induce a same-sign response from the policy rate. Positive monetary policy shocks are assumed to negatively affect consumption and consumer prices. This assumption distinguishes monetary policy shocks from aggregate demand shocks. Monetary policy tightening, i.e., an increase in interest rates, also generates a drop in house prices and credit to households in the same quarter, in line with theoretical models Iacoviello (2005); Iacoviello and Neri (2010). Moreover, the monetary policy shock generates comovement between interest rates and the excess bond premium (EBP), as highlighted in Caldara and Herbst (2019). With our approach, we are able to account for the period of lower bound and for non-standard policy measures, as well as not be restricted in the cross-country coverage by the availability of high-frequency identified monetary policy shocks.¹²

We now turn to the identification of the housing demand and mortgage supply shocks. Housing demand shocks may reflect shifts in household preferences, which result in house price adjustments without

¹²At the same time, using the US model, we verify that the US monetary policy shock identified in our BVAR model is highly positively correlated (with the coefficient above 0.7) with a shock identified in a proxy BVAR model with the same US variables, where we introduce the external instrument for monetary policy shock provided in Bu et al. (2021). We also cross-check that other shocks resulting from both models are highly positively correlated.

necessarily driving the credit cycle - for instance as observed during the Covid period.¹³ Mortgage supply shocks may reflect shifts in credit supply, for example related to changes in bank credit standards, which may be driven by changes banks' balance sheet conditions.¹⁴ We assume that both shocks affect consumption and consumer prices with a lag of one quarter, as for the monetary policy shock and as also done in Cesa-Bianchi (2013). We assume that mortgage supply shocks generate comovement between house prices and credit to households, as in Nocera and Roma (2017) and Furlanetto et al. (2017), while this is not necessarily the case for housing demand shocks. However, these restrictions are not enough to distinguish housing demand and mortgage supply shocks from the rest of the shocks. For this reason, we introduce the maximum forecast error variance (FEV) approach.¹⁵ This approach was first proposed in Uhlig (2003) and has been extensively used in the business cycle literature.¹⁶ In our setting, housing demand shocks are assumed to be the main driver of the forecast error variance of house prices in the short run, while mortgage supply shocks are the main driver of the forecast error variance of credit in the short run. These assumptions are also in line with results from estimated DSGE models with housing in Iacoviello (2005) as well as Iacoviello and Neri (2010). Our identification implies that mortgage supply shocks are relatively less important drivers of house prices than of household debt, in line with the identification strategy used in Furlanetto et al. (2017).¹⁷

All countries except the US are treated as small open economies and thus we include the nominal effective exchange rate and a foreign block modeled as block exogenous (Table 2). The importance of accounting for the foreign block in VAR models of small open economies is shown, among others, in Forbes et al. (2018) and Corbo and Di Casola (2022). Depending on the trade linkages, the foreign block consists of the real GDP, consumer prices and interest rate of the US and/or the euro area.¹⁸ This

¹³In DSGE models with housing markets, such as Iacoviello (2005); Iacoviello and Neri (2010), the housing demand shock is represented by a shock to the marginal utility for housing in the utility function of households purchasing a house and might represent cyclical variations in the availability of resources needed to purchase housing relative to other goods or other social and institutional changes that shift preferences.

¹⁴In DSGE models with housing markets and banking, such as Gerali et al. (2010), mortgage supply shocks are represented by shocks to loan-to-value ratios of borrowing agents or shocks to bank capital. See Altavilla et al. (2019) for an identification strategy for loan supply shocks based on bank-level information on credit standards from the euro area Bank Lending Survey (BLS).

¹⁵In the previous literature (e.g., in Nocera and Roma (2017)), the possibility of identifying both housing demand and mortgage supply shocks was predicated on the availability of comparable data on mortgage lending rates, which substantially constrains the cross-country coverage. Correspondingly, our identification strategy allows us to compare impacts of shocks across a large number of countries.

¹⁶See, for example, Barsky and Sims (2011), Caldara et al. (2016) and Ben Zeev and Pappa (2017).

¹⁷In Furlanetto et al. (2017) housing shocks and credit supply shocks are assumed to generate comovement between house prices and credit, but the housing shock has a larger impact on house prices than on credit, while the opposite has to hold for credit shocks. Our identification scheme, relying on sign restrictions and max FEV approach, delivers a similar result.

¹⁸In particular, we use only US variables for Australia, Canada, Israel, Japan, Korea, New Zealand, Germany, France, Spain and Italy. We use an average between euro area and US variables for Denmark, Great Britain, Norway and Sweden. We use only the euro area aggregates for the small euro area countries. We aim to keep the country BVARs as consistent as possible, and

is a standard assumption for models of small open economies. For the case of the small euro area countries (5 countries among the ones listed in Section 2.1), we further modify the model (see Table B1 in Appendix B).¹⁹ It would not be realistic to assume that the ECB reaction function can be well captured by including only these country-specific series of consumption and consumer prices. The ECB rate can thus be interpreted as a quasi-foreign interest rate, that can affect the small open economy but responds to developments in the whole euro area, not to domestic ones. Thus, we include the ECB rate alongside the euro area GDP and consumer prices as block-exogenous. The euro area monetary policy shock is exogenous to the domestic variables and, in addition to the effects on the local variables, it is assumed to lower the aggregate euro area GDP and prices.²⁰

All variables are included in the model in logarithmic form, with the exception of interest rates and the EBP. Some of the variables used in our models may contain unit roots, but we include them in log levels. If one suspects that there are common trends among the variables (cointegration) but the nature of those trends is uncertain, Hamilton (1994) suggests running the VAR in log levels because the trends would still be preserved, while taking the first difference takes away the trends. We follow this recommendation in our modelling approach. We use 4 lags (based on information criteria) and the Minnesota prior.²¹ We use 1000 draws for the simulation and additional 500 initial draws of burn-in.

3 Estimation results

This section first illustrates detailed results for the US model, since this allows us to connect with the ample literature on drivers of the US business cycle. In the sections that follow, we turn to the key results of the estimated sensitivity of consumption to monetary policy shocks across countries, exploring the factors behind the heterogeneity of monetary policy transmission via the housing and mortgage markets.

In particular, we define the housing wealth multiplier and conduct a counterfactual exercise, which allows

at the same time to account for the differences between small and larger economies, and between euro area and non-euro area countries. We find that this approach serves best to balance the trade-off between using a consistent modelling framework and accounting for country specific features. Having a country-by-country BVAR estimation allows us not to restrict the parameter estimates, as it would be the case when using a panel BVAR framework for the considered countries.

¹⁹For the case of big euro area Member States – France, Germany, Italy and Spain – their series of consumption and consumer prices are highly positively correlated with the euro area aggregates. Consequently, it is sufficient to include country-specific series in the model and check that the resulting monetary policy shock is consistent across countries and we do not include any foreign block.

²⁰Since the foreign monetary policy shock could confound foreign demand and foreign supply shocks, we further distinguish it by isolating also the foreign aggregate demand and supply shocks. We check that the monetary policy shocks identified for euro area countries are highly positively correlated across the nine euro area Member States, with the correlation varying between 0.65 and 0.92, depending on the pair of countries.

²¹Estimations are carried out by employing the BEAR toolbox developed by Dieppe et al. (2016).

us to draw conclusions on the respective role of housing wealth and cash-flow channels. We also present local projection analysis to uncover the role of durable consumption for our results.

3.1 US Model

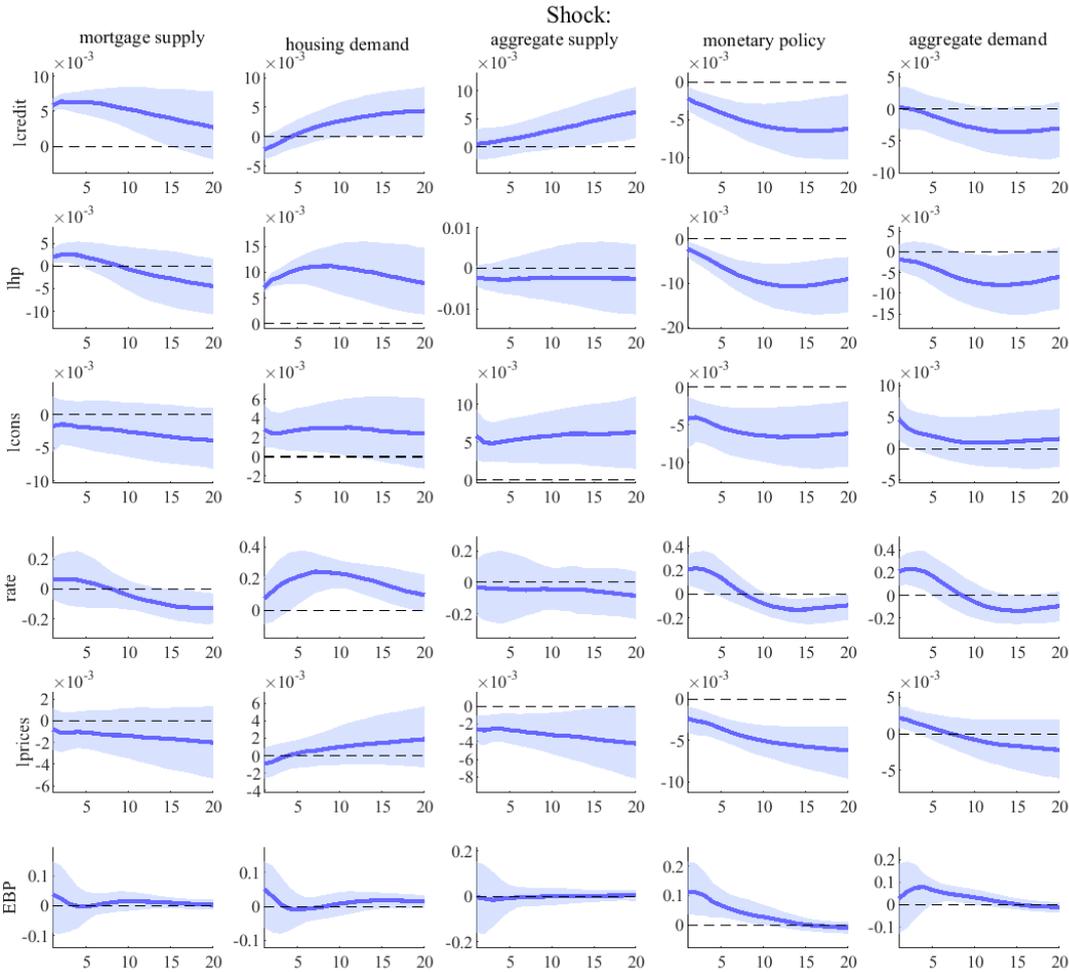


Figure 2: Impulse response functions for the US BVAR model with housing

Note: The figure shows the estimated impulse response functions of variables included in the US BVAR model (from top to bottom: log consumption, log house price, interest rate, log credit, log consumer price, excess bond premium) to structural shocks equal to one standard deviation (from left to right: monetary policy, housing demand, mortgage supply, aggregate demand and aggregate supply). X-axis denotes the horizon in quarters. All variables are in log terms, except for the interest rate and the excess bond premium (EBP), which are in percentage points.

We introduce the results of our analysis by discussing impulse response functions to identified shocks from the estimated models, with the focus on the US model as illustrated in Figure 2. The responses of consumption and consumer prices to monetary policy shocks are broadly standard and in line with the macroeconomic literature (Ramey, 2016; Bu et al., 2021). A contractionary monetary policy shock, calibrated to an increase in the interest rate by one standard deviation, causes a significant fall in con-

sumption, consumer prices, house prices and credit, well beyond the first quarter, where the effect is imposed by assumption.

Housing demand and monetary policy shocks induce a comovement between house prices and consumption for few quarters, in line with the theoretical prediction of the DSGE models with housing by Iacoviello (2005) as well as Iacoviello and Neri (2010) (Figure 10). The comovement pattern implies that the effect of monetary policy on consumption might be - at least to some extent - amplified by housing wealth effects stemming from house price dynamics. The mechanism behind this amplification is related to housing being the collateral on households' balance sheets, and housing loans being a significant liability, as explained by the theoretical work on DSGE models with housing (see Section 5).

Figure 3 reports the decomposition of the annual change in house prices into the most important structural shocks to illustrate an example of the respective role of structural drivers from the historical perspective. Model results show that housing demand, together with mortgage supply and monetary policy shocks, supported the run up in housing values before the Great Financial Crisis, i.e. during 2002-2006. The model points to the prominent role of housing demand in this period, which can speak to the debate after the Great Financial Crisis around how much the boom in the US housing market had been fuelled by expansionary monetary policy in the Greenspan era, following the recession of 2001.²² Furthermore, negative housing demand shocks were as important as negative mortgage supply shocks in driving the housing bust of 2007-2009. The prominent role of housing preference shocks to explain the boom-bust cycle of the Great Recession is also in line with the recent literature. For example, Kaplan et al. (2020) argue that shifts in beliefs about future demand were the key drivers of movements in house prices and rents. Finally, the strong pick up in house prices during the pandemic can be attributed to both housing demand and monetary policy shocks.

3.2 Heterogeneity of monetary policy transmission to consumption

The results of our BVAR models for 20 advanced economies allow us to explore the cross-country heterogeneity in the reaction of consumption to structural shocks, and in particular to monetary policy.

A cross-country comparison of key impulse response functions of interest, i.e. impulse responses of house prices, consumption and interest rate to monetary policy and housing demand shocks is shown in Figure 4. The direction of responses to these two shocks is broadly similar across countries, but the strength of the responses tends to vary. Looking across shocks, we can see that monetary policy and housing demand shocks generate comovement between house prices and consumption, behind the initial

²²Among many references to this debate, see for example Bernanke (2010) and Taylor (2010).

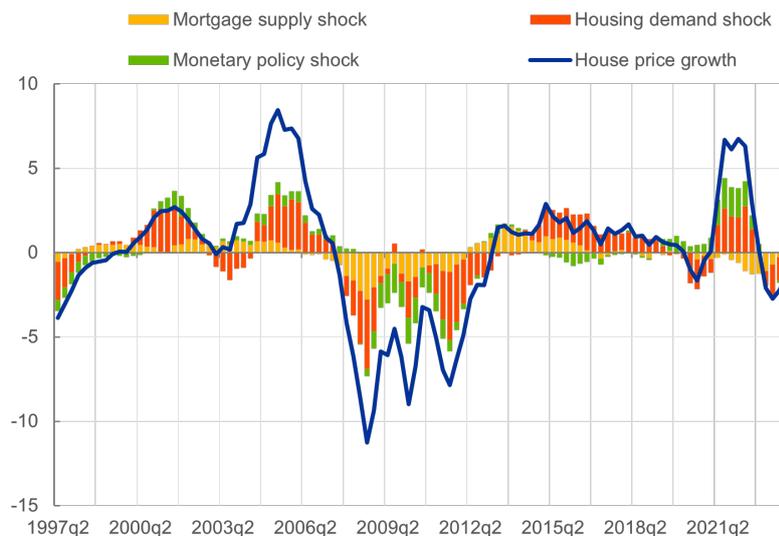


Figure 3: Historical decomposition of US house price growth, deviation from baseline

Note: The figure shows the historical decomposition of year-on-year US house price growth, in deviation from baseline. The three main shocks of interest are shown: housing demand in red, monetary policy in green and mortgage supply in yellow. The other shocks identified in the model as described in Table 1 are not shown for simplicity reasons.

quarter where the sign restriction is imposed and in line with estimated DSGE models with housing,²³. However, the response of interest rates differs across the two shocks. For the case of a housing demand shock, the interest rate comoves with consumption, since the policy rate reacts to the shock hitting the economy.

Figure 5 shows the heterogeneity in the peak effect of consumption and its relation to the cross-country differences in housing market and mortgage market characteristics, that proxy for the severity of the debt burden or the sensitivity to changes in the cost of debt. The effect of monetary policy on consumption is stronger in countries with a higher share of: 1) homeowners, 2) household debt over GDP and 3) share of adjustable-rate mortgages. For example, in countries like Spain and Ireland, where the share of homeowners is above 70%, the effects of monetary policy on consumption are significantly higher than in Germany or France, where this share is lower. The same is true if we consider the level of household debt over GDP. These findings are in line with the literature, e.g. in Di Casola and Iversen (2019), Corsetti et al. (2022) or Battistini et al. (2025).

The relationship between the peak effect of monetary policy and the share of adjustable-rate mortgages is also in line with findings in Corsetti et al. (2022) and De Stefani and Mano (2025). Adjustable rate mortgages adjust earlier to changes in the policy rates, thus a higher share of households with these mortgages implies a higher share that is very responsive to changes in the policy rate.

²³See impulse responses from Iacoviello and Neri (2010) in Figure 10.

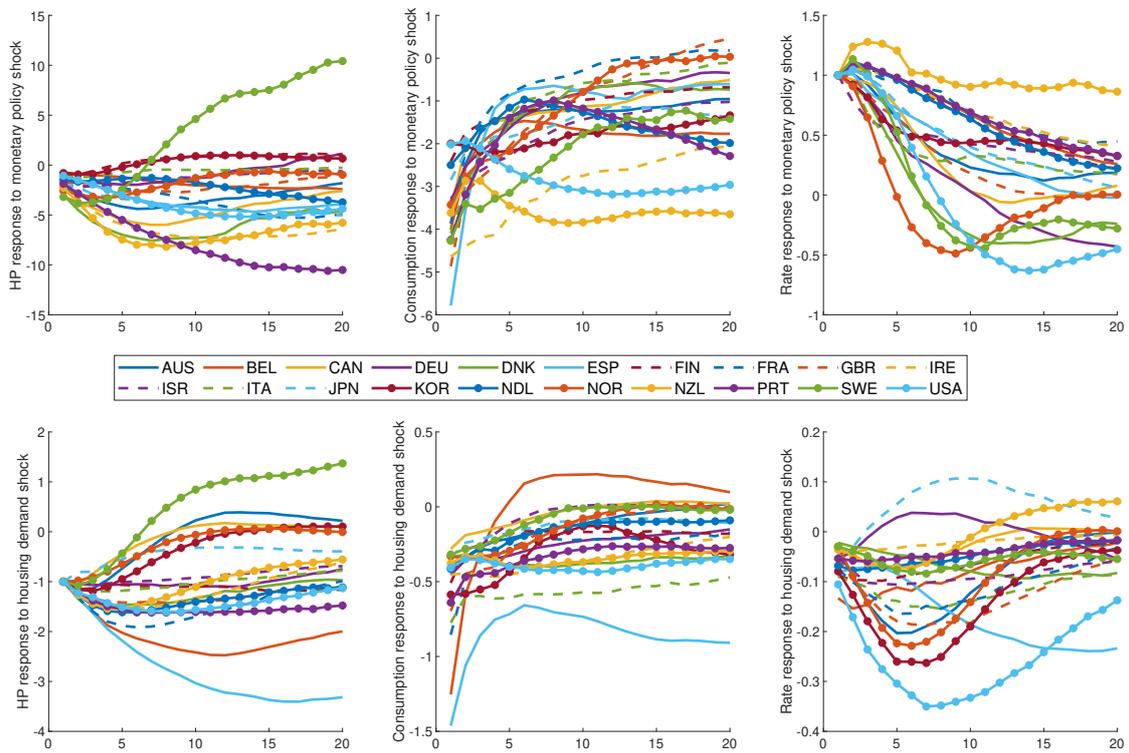


Figure 4: Estimated impulse response functions of house prices, consumption and policy rates to monetary policy (top panel) and housing demand shocks (bottom panel)

Note: Median responses of house prices (left graphs), consumption (middle graphs) and policy rates (right graphs) are in percentage terms. Monetary policy shock (upper panel) is normalized to a 1 percentage point increase of interest rates on impact. Housing demand shock (lower panel) is normalized to a 1% drop of house prices on impact.

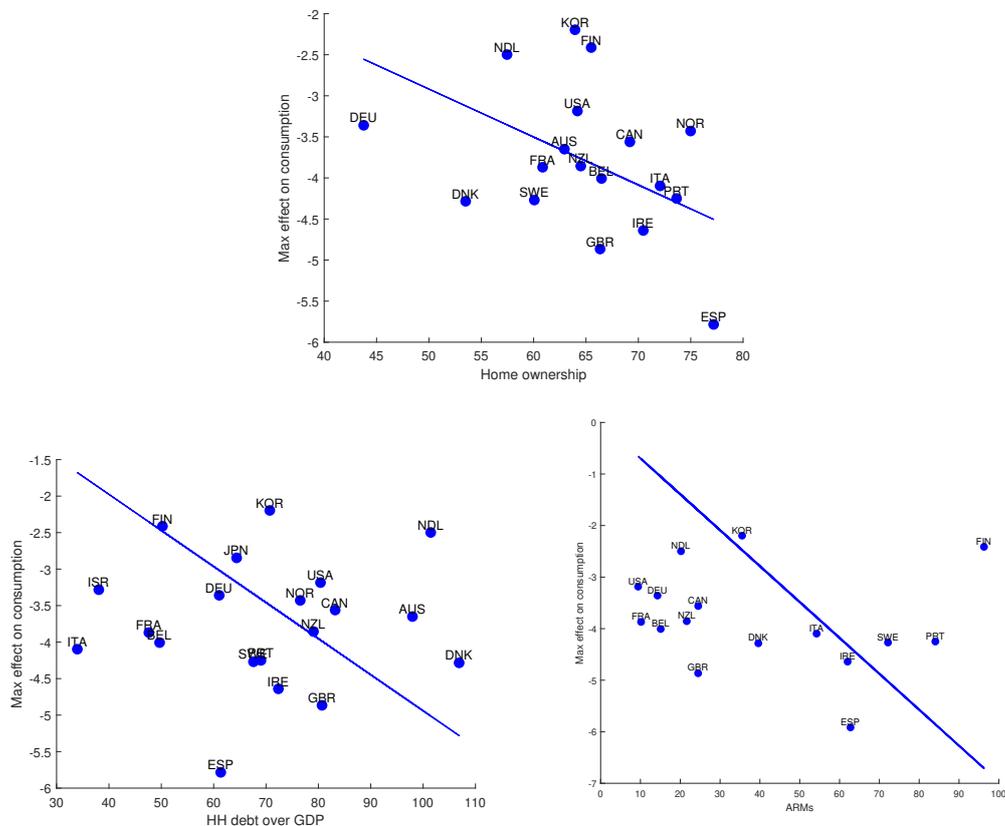


Figure 5: Maximum effect of monetary policy shock equal to 1 percentage point interest rate increase on consumption and characteristics of housing markets across countries

Note: The blue dots represent the maximum effect of monetary policy shock on consumption (y-axis), with the characteristics of housing and mortgage markets across countries (x-axis, the share of homeowners in the top graph, as well as the household debt to GDP ratio in the bottom left graph and the share of adjustable-rate mortgages in the bottom right graph).

When comparing the heterogeneous responses of consumption to monetary policy, one should keep in mind that house price responses to the same shock are heterogeneous as well. Indeed, we find some correlation also between the peak effect of monetary policy shocks on house prices and housing market characteristics (Figure 6). The close relationship between the sensitivity of consumption to monetary policy and the share of ARMs in a country is also in line with findings in Hedlund et al. (2025).

In order to characterise the role of house prices for the responses of consumption to monetary policy, in the next section we derive the housing wealth multiplier.

3.3 Housing wealth multiplier

In this section, we introduce a metric to assess the sensitivity of consumption to exogenous house price changes. We focus on the housing demand shocks, that are the main drivers of house price changes. Housing demand shocks are not highly correlated across countries, being local shocks. However, looking

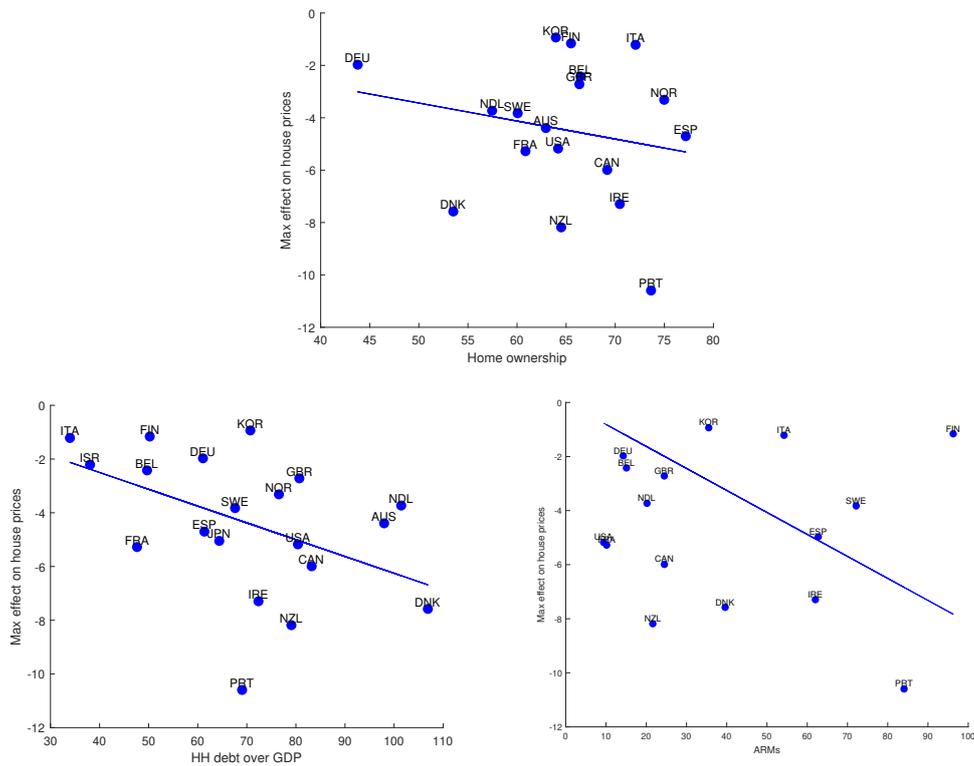


Figure 6: Maximum effect of monetary policy shock equal to 1 percentage point interest rate increase on house prices and characteristics of housing markets across countries

Note: The blue dots represent the maximum effect of monetary policy shock on house prices (y-axis), with the characteristics of housing and mortgage markets across countries (x-axis, the share of homeowners in the top graph, as well as the household debt to GDP ratio in the bottom left graph and the share of adjustable-rate mortgages in the bottom right graph).

at the correlation of housing demand shocks over time, we can see that it peaks significantly around the Covid pandemic (Figure C1). This result aligns with the common nature of the Covid pandemic, which induced teleworking and a shift in housing preferences, whereas in other times, there is no global housing cycle. It can be also verified by looking at the historical contribution of housing demand shocks to consumption across countries (Figure C2): the Global Financial Crisis and the Covid pandemic are exceptional cases of synchronization across countries, where these shocks played a prominent role.

We define the housing wealth multiplier (HWM) as the ratio between the cumulative responses of consumption and house prices, following the housing demand shock in country i .

$$HWM_i = \frac{\text{Cumulative response of consumption in country } i \text{ to HD shock}}{\text{Cumulative response of house price in country } i \text{ to HD shock}} \tag{1}$$

We measure the cumulative responses at peak to capture the maximum effects well, but also tested for

other specifications, for example taking a specific horizon. This multiplier represents the sensitivity of non-housing consumption to the housing wealth.²⁴ This definition allows us to account for differences in the timing of the effects of shocks across countries or housing market characteristics. We use the concept of 'multiplier' similarly to the literature on fiscal spending, where multipliers are computed as ratios of cumulative responses of output and public expenditure to quantify the impact of fiscal shocks (see Cloyne et al. (2020) and Ghassibe and Zanetti (2022)).²⁵

Figure 7 shows an overview of the housing wealth multiplier across countries. The first important insight is that the housing wealth multipliers substantially differ across countries. The HWM ranges from 0.26 in the Netherlands and New Zealand to 0.51 in Belgium and 0.65 in Italy.

Our approach is complementary to micro-level studies, since it allows to derive a measure of housing wealth effects - the HWM - in a consistent and comparable way for 20 advanced economies. The second insight is that it is highly correlated with the share of households who own a house without a mortgage. These households perceive the benefits of an increasing value of their house, since they do not have a debt or a rent to repay and translate the change in the value of their property into a consumption choice.

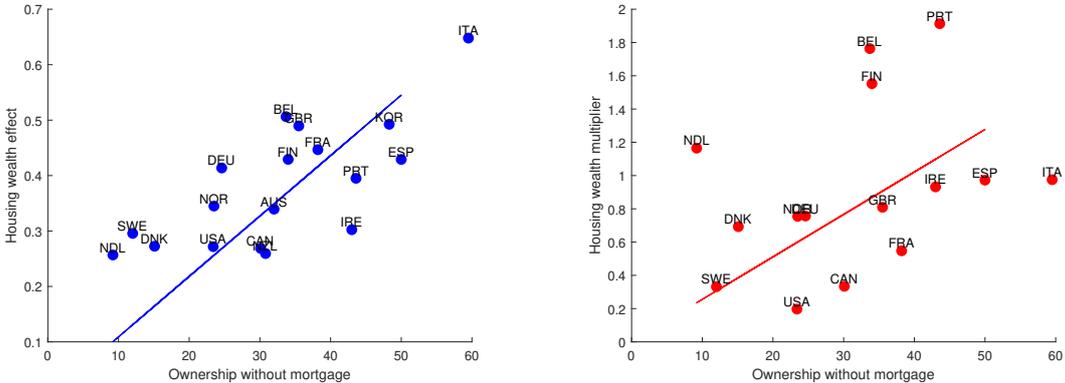


Figure 7: Housing wealth multiplier across countries for overall non-housing consumption (left graph) and durable consumption (right graph)

Note: The Figure presents the housing wealth multiplier (HWM), computed as in equation 1, for overall non-housing consumption (left graph, blue dots) and for durable consumption (right graph, red dots), across the share of households which are homeowners without a mortgage. Impulse response functions for the overall consumption (left graph) are computed from the BVARs, impulse response functions for the durable consumption (right graph) are computed from the local projections as in equation 2.

There is ample literature showing that the housing wealth effect relates to durable consumption. Similarly to housing, durable goods provide utility over multiple periods and can be purchased using credit. We verify whether our results are driven by the response of durable consumption. For this purpose, we rely on local projection analysis (Jordá, Óscar, 2005), projecting the impact of monetary

²⁴This definition also relies on the assumption that the housing stock is not reacting to the shock, given that the aggregate stock of housing in an economy is slow-moving and does not respond to business cycle shocks within few quarters.

²⁵Also recent literature on monetary policy uses a related approach, as for example in Alessandri et al. (2025).

policy shocks identified in the BVAR models on durable consumption:²⁶

$$dc_{t+h,i} - dc_{t,i} = \alpha_{h,i} + \beta_{h,i}\varepsilon_{t,i} + \gamma'_h X_{t,i} + \eta_{t,h,i}, \quad h = 1, \dots, p \quad (2)$$

where $dc_{t+h,i}$ represents the h-quarters-ahead measure of (durable) consumption by country, α_h is a country-specific constant, $\varepsilon_{t,i}$ is the country-specific housing shock identified with the BVAR models, $X_{t,i}$ is a vector of control variables, including the lag of the dependent variable and a Covid dummy. The coefficients $\beta_{h,i}$ contain the estimates of the impulse responses. From the impulse responses we extract the peak effect of monetary policy shocks on durable consumption with respect to the peak effect on consumption. Figure 7 shows that durable consumption is not only more responsive to housing demand shocks, giving rise to higher housing wealth multiplier, but is also highly correlated with the share of outright homeowners.

3.4 Counterfactual exercise: the housing wealth channel of monetary policy

In this final part of the analysis, we show the role of the housing wealth channel of monetary policy, by deriving the effects of monetary policy shocks in each of the 20 economies analysed, once we keep house prices fixed. We control for house prices by using the housing demand shock to counteract the effect of monetary policy on house prices. In this way, the remaining effect of interest rate changes on consumption is due to other channels. Looking at the correlation with some housing market characteristics, we conclude how prominent is the cash-flow channel.

In order to construct these counterfactual impulse responses, we use the methodology proposed by Sims and Zha (2006) and report the results in Figure 8. We can see that, while the peak effect remains similar once we keep house prices fixed, in some countries the response of consumption converges towards zero faster. This is the case especially for Australia, Canada, Denmark, Ireland, Norway, New Zealand and Portugal. This suggests that in these countries, the collateral channel of monetary policy is particularly strong. To further explore how the predominant channel of monetary policy is related to housing market characteristics, we analyse how the maximum effect of monetary policy, conditional on unchanged house prices, correlates with key housing market features.

Figure 9 confirms that the relationship between the peak effect of monetary policy on consumption is

²⁶We consider a smaller set of countries due to data availability. We do not have data for Australia, New Zealand, Japan, Korea and Israel.

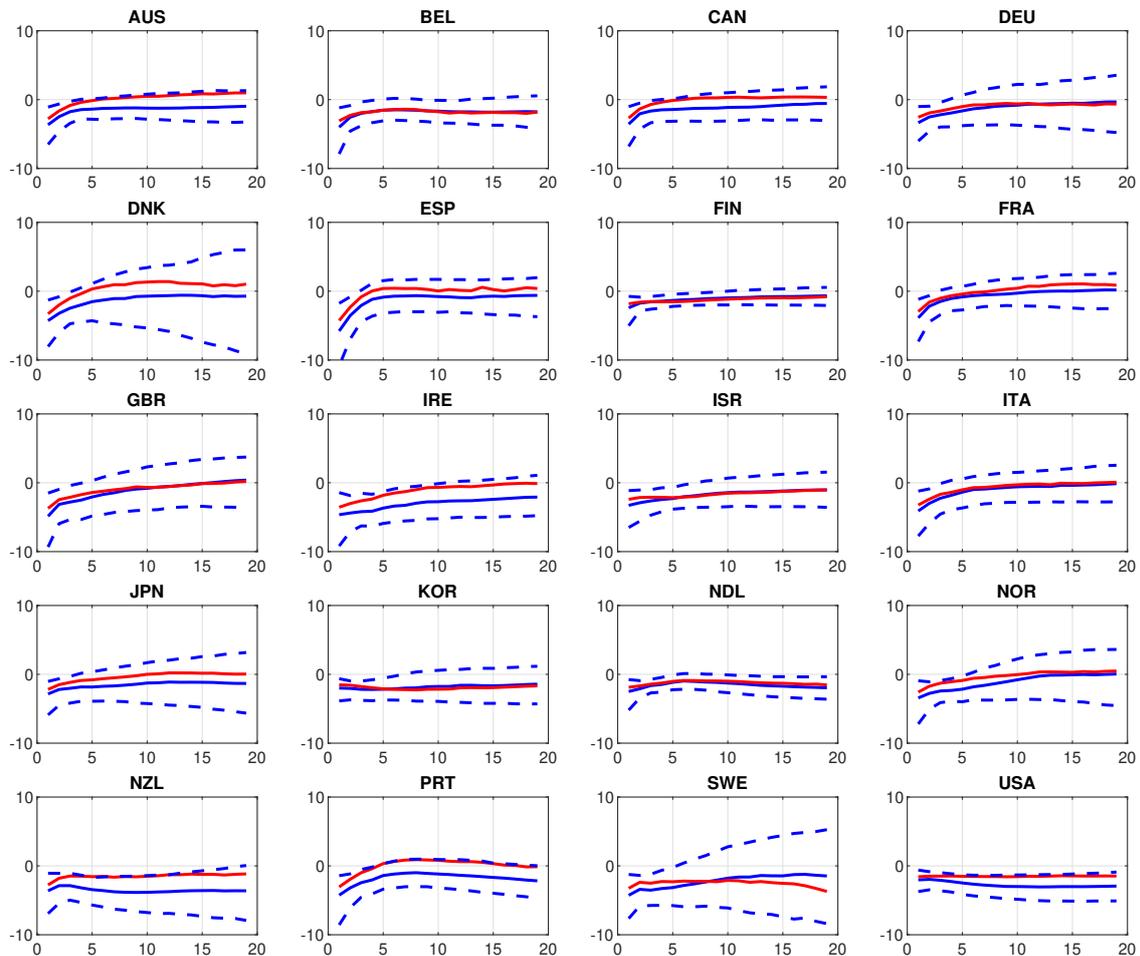


Figure 8: Impulse responses of consumption to monetary policy shocks across countries with counterfactual.

Note: The Figure shows the estimated impulse response functions of consumption to monetary policy shocks across the countries of interest (blue line, with confidence intervals shown with blue dashed lines) and the counterfactual when house prices are kept fixed with housing demand shocks (red line). Effects are in percentage terms.

correlated with housing market characteristics that proxy for the severity of debt burden or the sensitivity to changes in the cost of debt, even after controlling for the change in house prices. Consequently, the cash-flow channel of monetary policy is key to rationalising the cross-country differences in the effectiveness of monetary policy on consumption.²⁷

²⁷This does not mean, however, that the cash-flow channel is the only one at play after controlling for house prices.

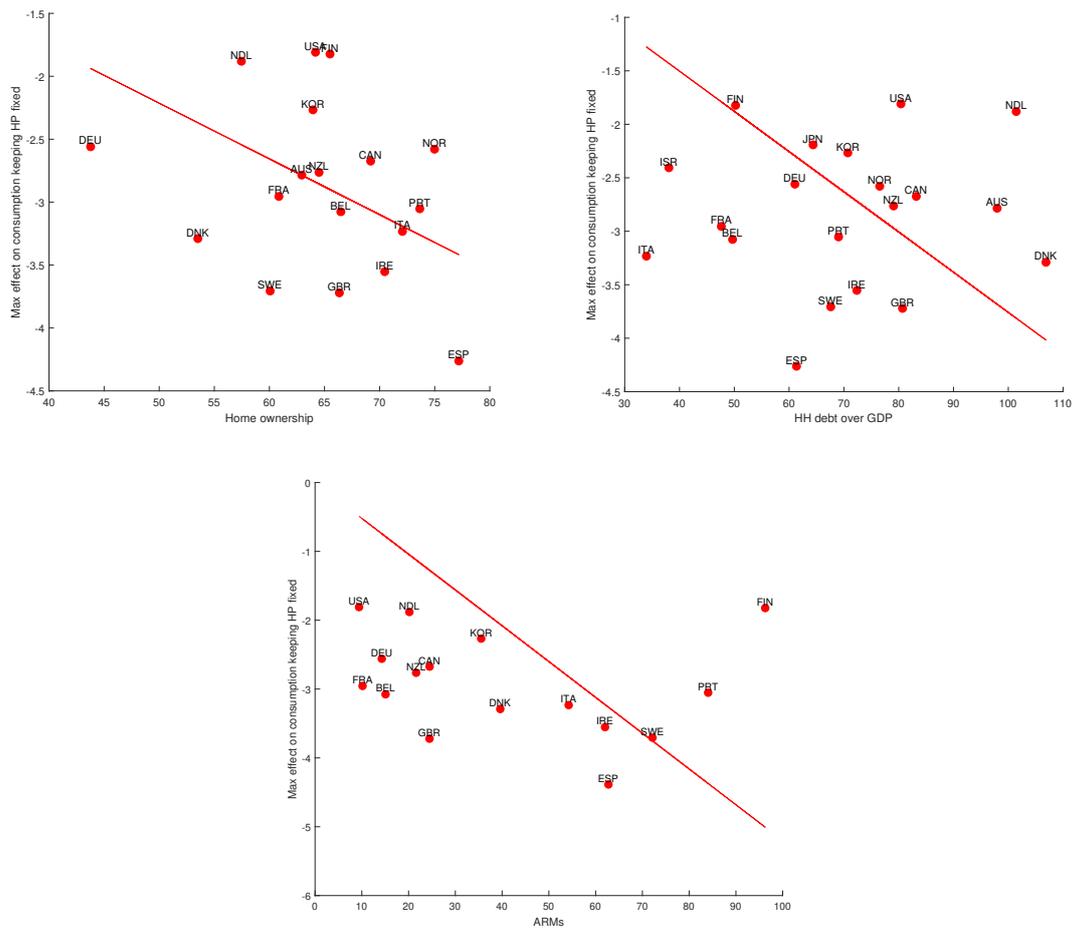


Figure 9: Maximum effect of monetary policy shock equal to 1 percentage point interest rate increase on consumption once house prices are kept fixed and characteristics of housing markets across countries

Note: The dots represent the maximum effect of monetary policy shock on consumption, once we use housing demand shocks to keep house prices fixed.

4 Robustness of results

To illustrate the robustness of our results, this section describes a number of checks that we have conducted in terms of model specification, included variables, model identification, as well as the indicators determining the strength of housing wealth response to monetary policy and housing demand shocks.

For the largest euro area countries (Germany, France, Italy and Spain), we have used the identification of the EA monetary policy shock in a larger version of a model, where EA aggregates for price levels and GDP are added as endogenous variables. The shocks identified in this specification are very similar to the specification with EA aggregates.

In terms of variables included in the models, we have also considered the specification with mortgage

rates for the US model. The results are relatively similar and the mortgage rate is found to increase after a positive housing demand shock and a positive monetary policy shock, as in Nocera and Roma (2017). This suggests that the specification without mortgage rates which we propose in this paper can be a useful solution, since comparable mortgage rate data is not available across many countries.

In addition, we have replaced the shadow rates computed by Krippner with the one computed in Wu and Xia (2016) and the MP shocks are highly correlated (0.7).

We have also checked whether the results are sensitive to alternative definitions of the housing wealth multiplier, for example one that considers in the denominator house prices in country i at the same time as the peak effect on consumption occurs. The findings reported in this paper are robust to these alternative specifications.

Finally, we have controlled for the role of commodity prices for countries that are large commodity exporters, such as Australia, Canada and Norway and results are basically unchanged.

5 Theoretical underpinning: TANK model with housing

A modelling reference for our empirical analysis is the two-agent New Keynesian (TANK) model proposed in Iacoviello (2005) as well as Iacoviello and Neri (2010). The introduction of housing on households' balance sheets in these models enriches the transmission of monetary policy beyond the standard intertemporal substitution channel. Housing is introduced as an asset on the balance sheets of so-called impatient households, who need to borrow from patient households, i.e. savers, against collateral. House prices affect households' borrowing constraints, since they affect the value of the collateral asset - the housing wealth - giving rise to a financial accelerator mechanism. Hence, an important transmission channel introduced in these models is the *housing wealth (collateral) channel*, which links the changes in house prices to the tightness of borrowing constraints: falling house prices, which underpin collateral for household borrowing, make these constraints more binding (and vice versa).²⁸ In addition, the *cash-flow channel* operates through the change in the cost of the mortgage for homeowners. Overall, the tighter are the constraints in the economy, the stronger is the effect of monetary policy on consumption through these channels. This can be shown by increasing the share of borrowing-constrained households in a DSGE model with a housing channel, such as Iacoviello and Neri (2010). However, house prices are

²⁸Note that Iacoviello and Neri (2010) refer to this channel as "collateral channel", while Calza et al. (2013) refers to it as "asset-price effect" of collateral. Calza et al. (2013) refer also to another channel, the "collateral-constraint effect", where monetary policy tightening induces a rise in the shadow value of borrowing and a fall in borrower's equity, which is similar to the "intertemporal substitution" channel.

also affected in a different way across the different parametrizations.

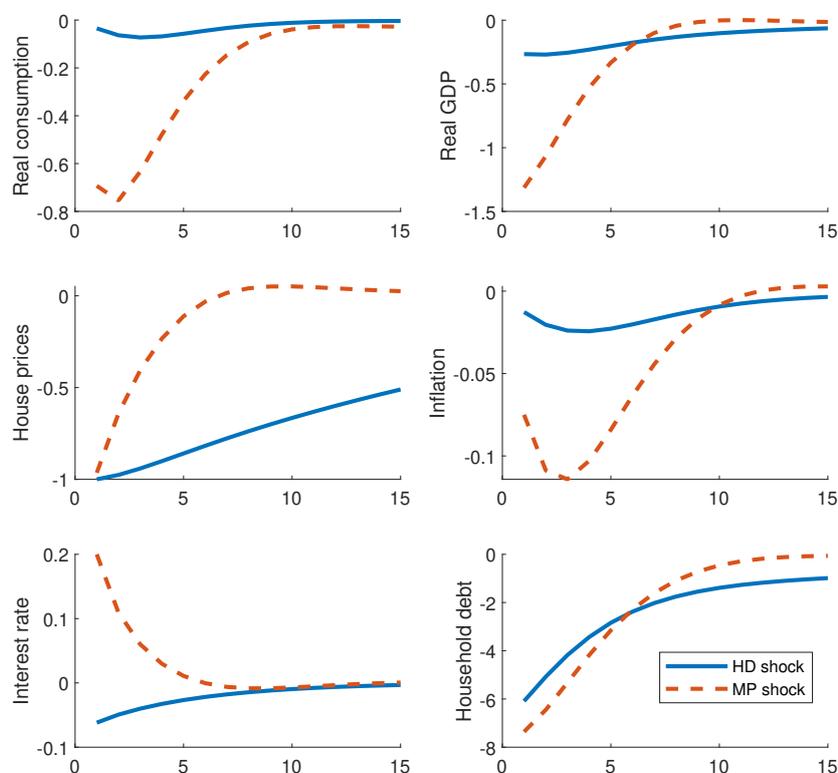


Figure 10: Impulse response functions to housing demand and monetary policy shocks

Note: Housing demand and monetary policy shocks are based on the model by Iacoviello and Neri (2010). The shocks are calibrated to the same unit response in the house price at impact. Responses are in percentage terms, except for the interest rate.

The introduction of housing as collateral generates a comovement between house prices and consumption both after a monetary policy shock and a housing demand shock, ie. a housing preference shock that is found to be the main driver of house price dynamics in estimated DSGE models. This is illustrated in Figure 10 and was obtained also in our BVAR models (Figure 5).

6 Conclusion

This paper analyses the transmission of monetary policy to consumption via the housing and mortgage market, focusing on understanding the role of housing wealth and cash-flow effects. It leverages the heterogeneity in monetary policy and housing markets across 20 advanced economies. The results of the analysis allow to draw implications for the transmission channels of monetary policy depending on the structure of the housing and mortgage markets.

Thanks to a comparable dataset, as well as a new, parsimonious identification strategy, we are able to estimate the sensitivity of consumption to monetary policy and housing demand shocks, in a consistent way across 20 advanced economies. First, we show that not only the peak response of consumption but also the peak response of house prices to the monetary policy shock are heterogeneous across countries and related to the differences in the housing and mortgage market characteristics. Second, the housing wealth multiplier is found to be correlated with the share of outright homeowners and be driven by durable consumption. Third, after controlling for the housing wealth effect, the key channel of monetary policy transmission to consumption turns out to be the cash-flow channel.

These findings have important implications from the monetary policy perspective, both in terms of the changing patterns of monetary policy transmission over time, as well as the heterogeneity of monetary policy effectiveness across countries. For example, the shares of homeowners with mortgages in the euro area and the levels of household indebtedness are higher now than 15 years ago in many countries. At the same time, the share of adjustable-rate mortgage loans has declined in the last decade, especially in countries where these shares had previously been high. Consequently, monetary policy transmission through the housing channel might be somewhat different across countries more recently, as compared to earlier monetary policy.

Our results and methodology constitute a consistent and parsimonious analysis of the housing market developments across countries, including understanding the structural drivers behind the episodes of house price booms and busts. Further avenues of research employing our models could include, for example, exploring the impact of structural shocks on indebted consumption or analysing some specific episodes in the history of monetary policy and housing markets in more detail. We leave these extensions for future research.

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Appendix A Details on the underlying data

Table A1: Sources of cross-country data series

Variable	Frequency	Source
Real consumption	Q	OECD
Real durable consumption	Q	Haver and Eurostat
Consumer price index	Q	OECD
Credit to household	Q	BIS
Real house prices	Q	International House Price Database, Fed Dallas
Nominal effective exchange rate	Q	BIS
Policy rate	Q	Haver
Shadow rate	Q	Krippner (2013)
Excess bond premium	Q	Gilchrist and Zakrajšek (2012)
% households with mortgage	Y	OECD
% household debt over GDP	Y	BIS
% ARMs	Y	De Stefani and Mano (2025)

Table A2: Table of cross-country correlation of housing market features

	% Owners with mortgage	HH debt over GDP	HH debt over disp. income	% ARMs
% Owners with mortgage	1	0.57	0.54	0.22
HH debt over GDP	0.57	1	0.85	-0.06
HH debt over disp. income	0.54	0.85	1	0.08
% ARMs	0.22	-0.06	0.08	1

Appendix B Additional details on BVAR identification

	Aggregate Demand	Aggregate Supply	Housing Demand	Mortgage Supply	EA Monetary Policy	EA Aggregate Demand	EA Aggregate Supply
Consumption	+	+	+		-		
Consumer prices	+	-			-		
Real house prices			+	+	-		
Credit to households				+	-		
NEER					+		
EA Interest rate					+	+	
EA GDP					-	+	+
EA consumer prices					-	+	-
Real house prices			MaxFEV				
Credit to households				MaxFEV			

Table B1: Identifying restrictions for the baseline model of a small open economy in euro area

Note: The sign restrictions are imposed for 1 period. MaxFEV denotes the maximum forecast error variance restriction.

Appendix C Additional results

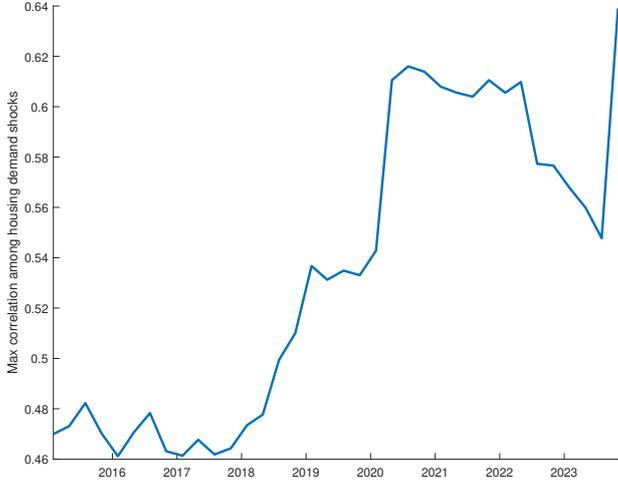


Figure C1: Maximum correlation of housing demand shocks across countries over time
Note: The Figure presents the maximum correlation across countries of housing demand shocks, using a rolling window of 15 years, based on estimated impulse response functions in country BVAR models.

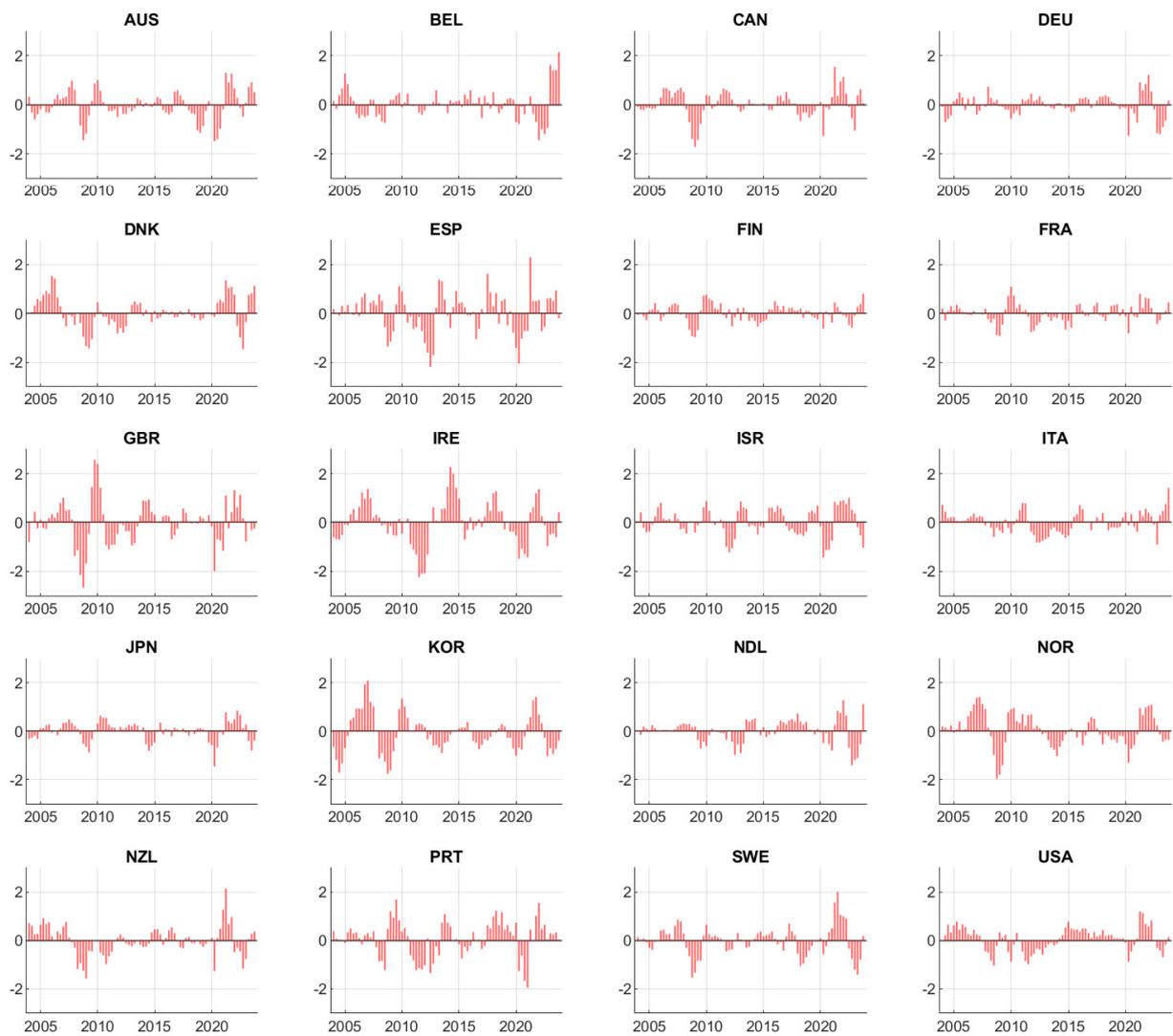


Figure C2: Contribution of housing demand shocks to consumption

Note: The Figure presents the contribution of housing demand shocks to consumption growth, expressed as annual percentage change, based on estimated impulse response functions in country BVAR models.

Consumption of durable goods is usually found to be the most responsive to monetary policy shocks (Erceg and Levin, 2006; Monacelli, 2009; Sterk and Tenreyro, 2018), despite accounting only for a small fraction of total private consumption. Similarly to housing, durable goods provides utility over multiple periods and can be purchased using credit. We verify that this holds also with our identified shocks, using the local projection analysis in Equation 2 with the monetary policy shocks identified in the BVAR models.

Figure C3 reports the ratio of the maximum effect of monetary policy shocks on durable consumption with the one on consumption. In line with earlier literature, we find that durable consumption is the most responsive component of consumption, but the ratio varies significantly across countries.

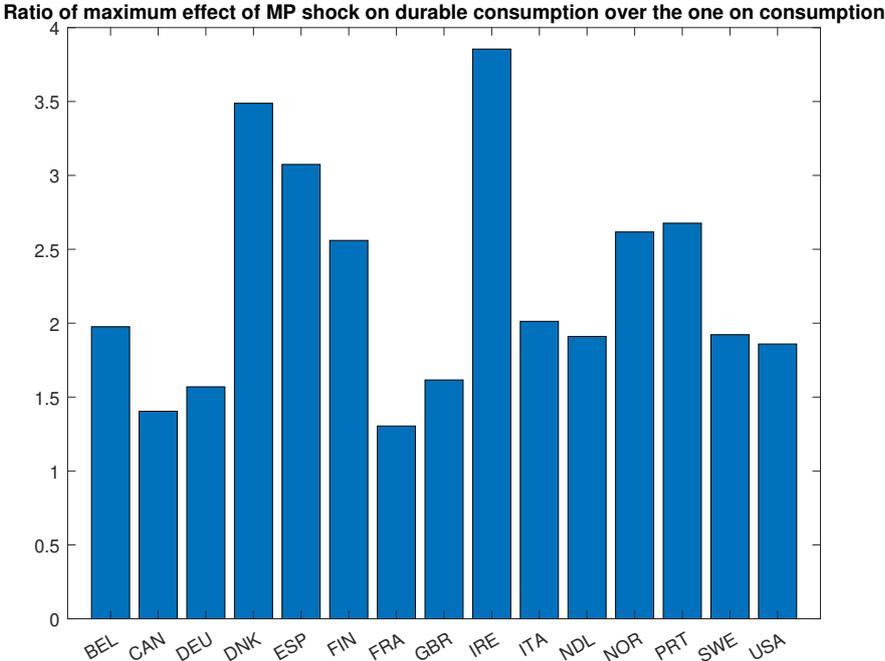


Figure C3: Ratio of peak effects

Note: The ratio is calculated with local projections, using the monetary policy shock per each country identified in the BVAR models.

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