

*Central banks around the world have raised policy rates significantly over the past two years. Many observers thought higher rates would lead to a slowdown or even a recession, but global growth has held steady. At the same time, some economies are in fact slowing down. Why are some feeling the pinch from higher rates and not others? This chapter investigates the effects of monetary policy across countries and over time through the lens of mortgage and housing markets. Monetary policy has greater effects where (1) fixed-rate mortgages are not common, (2) home buyers are more leveraged, (3) national household debt is high, (4) housing supply is more restricted, and (5) house prices have recently been overvalued. Because these characteristics vary significantly across countries, this chapter's main message is that the effects of monetary policy are strong in some countries and weak in others. Moreover, shifts in mortgage and housing markets since the global financial crisis and during the COVID-19 pandemic may have limited the drag of higher policy rates up to now in several countries. The risk that the cooling effects of past monetary tightening are yet to come should be taken seriously where fixed-rate mortgages have short fixation periods, especially if households are heavily indebted. The longer rates are kept high, the greater the likelihood that households will feel the pinch, even where they have so far been relatively sheltered.*

## Introduction

Since late 2021, in a bid to restore price stability, central banks around the world have raised policy interest rates at a speed, degree, and breadth unprecedented in at least 40 years. Reopening-related

The authors of this chapter are Mehdi Benatiya Andaloussi, Nina Biljanovska, Alessia De Stefani, and Rui Mano (lead), with support from Ariadne Checo de los Santos, Eduardo Espuny Diaz, Pedro Gagliardi, Gianluca Yong, and Jiaqi Zhao. Amir Kermani was an external consultant, and Jesper Lindé consulted on the modeling. The chapter benefited from comments by Stijn Van Nieuwerburgh and internal seminar participants and reviewers.

supply-chain disruptions and the war in Ukraine hit post-lockdown economies with a series of supply shocks. These shocks, combined with extraordinarily supportive fiscal and monetary policies during the pandemic, supercharged inflation to levels not seen in decades.<sup>1</sup> Given the sudden rise in interest rates, many observers predicted a sharp fall in growth for 2023.

In the end, global growth proved surprisingly resilient despite higher policy rates. Economic activity outpaced expectations in most countries, and employment, in particular, remained robust, even as inflation retreated significantly. Clearly good news, such as the partial reversal of the earlier supply shocks, materialized at the same time as rates were rising (Chapter 1).

What do we know about the macroeconomic effects of monetary policy, the so-called transmission of monetary policy, from the academic literature? First, transmission varies across countries, and macroeconomic effects take time (peak responses are often estimated to be about two years). Milton Friedman (1961) famously summarized these lags as being “long and variable.” Asset prices, including house prices, respond faster. Second, economists have found some support for asymmetric effects; that is, rising policy rates have larger effects than similar-sized declines. This may be either because unemployment responds more when rates increase, since—as argued by John Maynard Keynes (1936)—prices and wages are not typically adjusted down, or because of credit constraints, as argued by Ben Bernanke and coauthors in the 1990s.<sup>2</sup>

Resilient global growth could suggest that the historically strong transmission of rising rates has now weakened. However, in some countries, demand has in fact cooled noticeably, and households are

<sup>1</sup>China is on a different economic cycle, and monetary policy was eased recently, amid real estate market concerns (see Chapter 1).

<sup>2</sup>See Box 1.2 in the April 2023 *World Economic Outlook*, Bernanke and Kuttner (2005), and Gorea, Kryvtsov, and Kudlyak (2022).

clearly feeling the pinch of higher rates. Why in those countries and not others? The diversity of experiences offers an opportunity to learn about how monetary policy works.

This chapter investigates the transmission of monetary policy across countries and over time through the lens of mortgage and housing markets. The so-called housing channels of monetary policy transmission are known to be important. Mortgages are the largest liability of households, with housing often households' only significant form of wealth. Real estate accounts for a large share of consumption, investment, employment, and consumer prices in most economies. House prices, as a macrocritical asset price, can offer early clues as to where households are feeling the pinch of monetary policy. Finally, mortgage and housing markets vary significantly across countries, which helps in assessing the degree of variability in transmission.

To this end, the chapter addresses four main questions:

- **Where are real estate and mortgage markets now?** How have they evolved following the global financial crisis, the pandemic, and the recent monetary tightening?
- **Conceptually, what are the housing channels of monetary policy transmission?** How are housing channels tied to mortgage and housing market characteristics?
- **How do the housing channels vary across countries?**
- **Have the housing channels weakened in recent years?**

To answer these questions, the chapter offers a conceptual framework to guide the reader through the housing channels of monetary policy, linking them to mortgage and housing market characteristics. It applies empirical methods to a broader group of countries than in previous studies. And it does this by leveraging new data: (1) monetary policy surprises against analyst predictions, to identify exogenous changes in interest rates, and (2) the prevalence of fixed-rate mortgages across countries, through information collected from public sources and national authorities. A new regional data set of house prices and real activity is also used. Model simulations assess the joint effects of the prevalence of fixed-rate mortgages and regulatory loan-to-value (LTV) limits. The chapter builds

on earlier IMF work<sup>3</sup> and a long academic literature.<sup>4</sup> Methods follow Jordà (2005), Stock and Watson (2018), and Chen and others (2023).

The chapter's main findings are as follows:

- *Mortgage and real estate markets have undergone several shifts in the past few decades.* At the beginning of the recent hiking cycle and after a long period of low interest rates, mortgage interest payments were historically low, and the average maturity and share of mortgages subject to fixed rates were high in many countries. Low rates, together with structural changes prompted by the pandemic and associated lockdowns, led to rapid growth in house prices. Residential real estate prices are still well above prepandemic levels but have now stabilized and even declined in some economies in 2023. Country experiences vary widely.
- *The housing channels of monetary policy vary significantly across countries.* Mortgage market characteristics matter: the transmission of monetary policy is stronger in countries where (1) fixed-rate mortgages (FRMs) are less common, (2) home buyers are more leveraged on account of less-restrictive regulatory LTV limits, and (3) household debt is high. Moreover, model simulations suggest that these effects reinforce each other. Restrictive regulatory LTV limits and household debt may dampen transmission more in the short term, delaying transmission. Housing market characteristics also matter: the transmission of monetary policy is stronger in countries where (1) housing supply is more restricted and (2) house

<sup>3</sup>Complementarities include Chapter 3 of the April 2008 *World Economic Outlook* (WEO), on housing and monetary policy (the last in-depth coverage of these issues in the WEO); Chapter 3 of the April 2020 WEO and Chapter 2 of the April 2022 WEO, which covered debt, macroprudential, and monetary policy; and Deb and others (2022) on housing issues in Asia. Related issues not covered in the chapter include commercial real estate in Chapter 3 of the April 2021 *Global Financial Stability Report* (GFSR); bank lending channels in Chapter 2 of the October 2016 GFSR; and monetary policy calibration, covered in Chapter 3 of the October 2009 WEO and Chapter 2 of the April 2019 GFSR.

<sup>4</sup>Including some common findings for Europe (Calza, Monacelli, and Stracca 2013; Pica 2021; Corsetti, Duarte, and Mann 2022; Battistini and others 2022); recent findings on regional housing markets, mainly for the United States (Huang and Tang 2012; Aastveit and Anundsen 2022; Albuquerque, Iseringhausen, and Opitz 2024); and more generally findings on the housing channels of monetary policy (Flodén and others 2021; Beraja and others 2019; Bernanke and Gertler 1995; Cloyne, Ferreira, and Surico 2020; Di Maggio and others 2017; Kaplan, Mitman, and Violante 2020; Kuchler, Piazzesi, and Stroebel 2023; Mian, Rao, and Sufi 2013). These findings are cited in this chapter where relevant.

prices have recently been overvalued. The chapter finds some evidence that these two housing market characteristics strengthen transmission more when monetary policy is tightening than when it is loosening. In the other direction, a high prevalence of FRMs dampens transmission more in a tightening cycle. Because these characteristics vary significantly across countries, the effects of monetary policy vary too.

- *The housing channels have weakened in several countries recently.* Developments since the global financial crisis and during the pandemic have weakened the housing channels in many countries: the prevalence of fixed-rate mortgages has increased, regulatory LTV limits have been tightened, and population has shifted to less-supply-constrained areas. This is counterbalanced in some cases by increases in house prices in already-overvalued areas and in household debt, which would strengthen the effects of monetary policy.

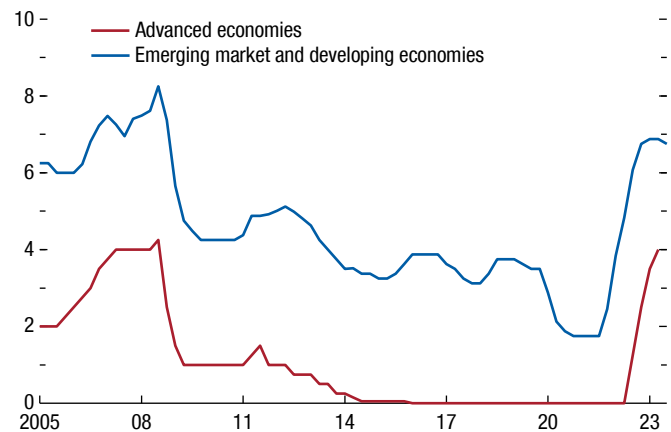
The chapter's analyses are subject to caveats. First, the empirical analyses are constrained by data availability, both across economies and over time. This lack of data, for example, precludes the study of rents. Second, the chapter focuses narrowly on the role of *residential* real estate and household mortgage characteristics, ignoring other channels of transmission. It therefore delves into whether households bear interest rate risk, while abstracting from whether banks or governments share that burden. Third, it is not technically feasible to gather all characteristics within the same framework, and thus the analyses may not capture general equilibrium effects.

The chapter begins by documenting trends in mortgage and housing markets. It then offers a conceptual framework that relates the effects of monetary policy to mortgage and housing market characteristics. Next, the chapter provides evidence that the effects of monetary policy vary significantly across countries because of those characteristics. The final section assesses whether the strength of the housing channels has changed over time and draws lessons for monetary and macroprudential policymakers.

### Monetary Tightening and Real Estate: Context and Stylized Facts

This section documents shifts in real estate and mortgage markets since the global financial crisis and during the pandemic and suggests that these shifts,

**Figure 2.1. Nominal Policy Rates in Advanced Economies and Emerging Markets**  
(Country group median, percent)



Sources: Haver Analytics; and IMF staff calculations.

together with the recent divergence of house prices across countries, may offer clues about the effectiveness of monetary policy.

### Real Estate Markets since the Global Financial Crisis and during the Pandemic

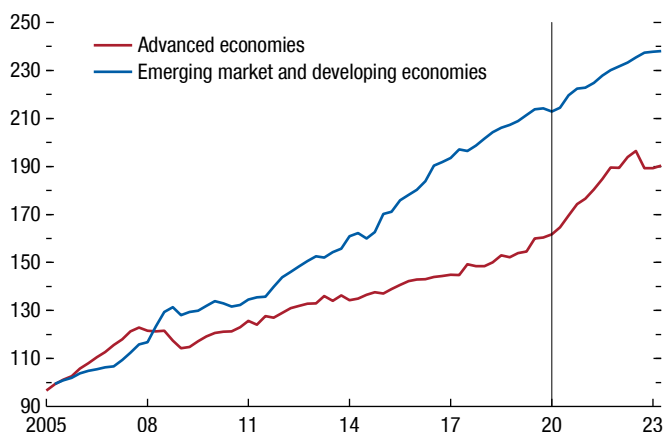
Postpandemic tightening followed an extended period of low interest rates (Figure 2.1). In the immediate aftermath of the global financial crisis, central banks slashed interest rates globally. Throughout the 2010s, policy rates were kept low and were brought close to zero in advanced economies amid weak economic growth and low inflation. In 2020, the pandemic prompted another round of policy rate cuts. Major central banks expanded the asset purchase programs they had initiated in 2008, and other central banks started new such programs. This helped keep long-term rates low.

Many households took advantage of low interest rates to secure low-cost mortgages. Consequently, at the start of the recent hiking cycle, effective mortgage rates had reached their lowest point in decades in many countries.<sup>5</sup> In some countries, this was accompanied

<sup>5</sup>For example, effective mortgage rates in France, Germany, and the United States reached 1.5, 1.7, and 3.3 percent, respectively, in early 2022 after declining from 4.0, 4.5, and 4.5 percent in 2011, respectively.

**Figure 2.2. Nominal House Prices in Advanced Economies and Emerging Markets**

(Country group median, index, 2005 = 100)



Sources: Bank for International Settlements; and IMF staff calculations. Note: The vertical line corresponds to 2020:Q1, the start of the pandemic.

by a shift to mortgages that allow for a period of fixed-interest payments, often driven by refinancing of old loans where that was possible: fixed-rate mortgages became more common (also see Figure 2.13 and discussion therein) and mortgages long-dated.

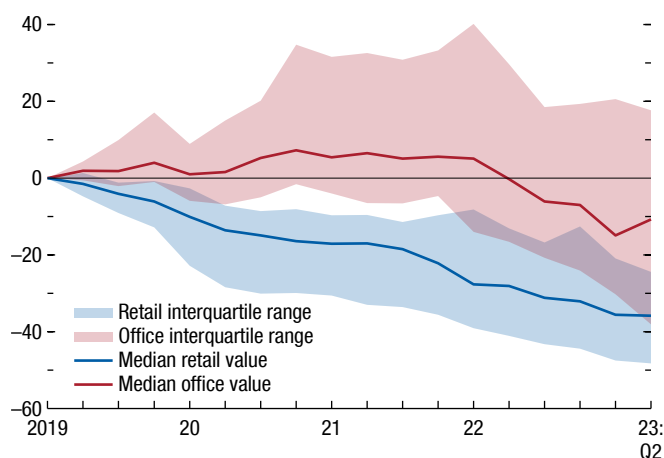
Separately, drawing lessons from the global financial crisis, many country authorities tightened macroprudential policies related to housing financing. This aimed to limit risky lending, which had been a major contributor to the global financial crisis, fueling boom-bust cycles in house prices in the mid-2000s in many countries. At the turn of the 2010s, these efforts had borne fruit: the average creditworthiness and leverage of households had generally improved.

During the pandemic and associated lockdowns, the combination of low rates and structural changes led to rapid growth in house prices globally, adding to already-elevated prepandemic levels in some countries (Figure 2.2). House prices often grew faster than income (Online Annex Figure 2.2.2),<sup>6</sup> lowering affordability and driving potential buyers to rent instead. This, combined with falling new construction, boosted rents in many countries. At the same time, the search for larger living space meant that in some countries (for example, the United States), house prices rose more in suburbs than in high-density urban core areas; in others (for example, Denmark, France, and the United Kingdom), prices in locations offering outdoor

<sup>6</sup>All online annexes are available at [www.imf.org/en/Publications/WEO](http://www.imf.org/en/Publications/WEO).

**Figure 2.3. Commercial Real Estate Prices**

(Percent change in city-level nominal CRE prices since 2019:Q1)



Sources: Morgan Stanley Capital International (MSCI); and IMF staff calculations. Note: Lines display the median capital value across 46 cities in 8 advanced economies for retail (in blue) and across 47 cities in 11 advanced economies for offices (in red). The shaded areas correspond to interquartile ranges. CRE = commercial real estate.

activities rose most, likely fueled by an increase in second-home purchases (Gupta and others 2022; Biljanovska and Dell’Ariccia 2023; Li and Su 2023).

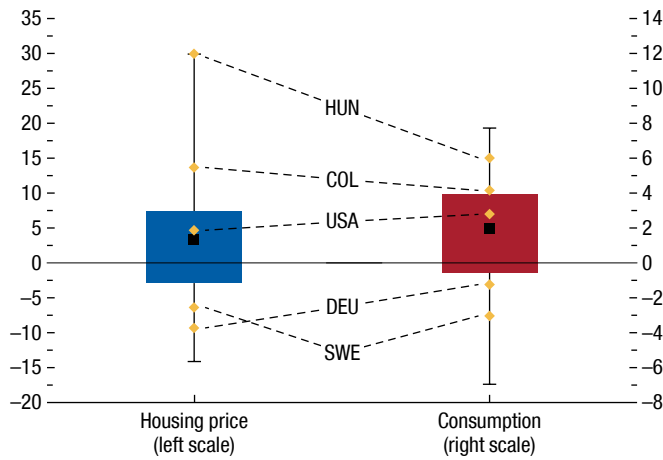
In parallel, pandemic-era changes in labor practices (such as remote work) created new headwinds to an already-challenged commercial real estate sector (Figure 2.3). Price drops, which were pronounced in the United States for offices, have persisted even since economies reopened, suggesting that remote work arrangements and shifts away from brick-and-mortar retail could linger. Even though these structural changes are not related to monetary policy, rising borrowing costs are generating additional strains because preexisting low-rate loans will need refinancing over time.<sup>7</sup>

### Real Estate Markets Offer Clues about the Diverging Effects of the Recent Tightening

In some ways, real estate markets reacted synchronously to the recent equally synchronous and broad-based monetary tightening. Rising borrowing costs cooled building activity in most countries, depressing supply, which was already insufficient following the global financial crisis (Online Annex Figure 2.2.3), just as high inflation, particularly in prices for raw

<sup>7</sup>See Figures 1.8–1.9 in the April 2024 *Global Financial Stability Report* (GFSR) for latest developments and discussion in Chapter 3 of the April 2021 GFSR.

**Figure 2.4. Evolution of House Prices and Consumption in the Postpandemic Tightening Cycle**  
(Percent change)



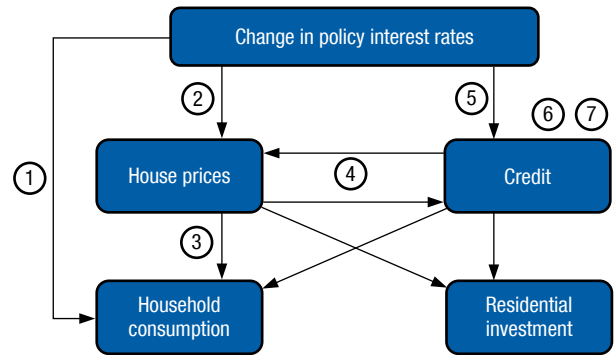
Sources: Bank for International Settlements; Haver Analytics; and IMF staff calculations.

Note: Whiskers indicate the minimum and the maximum; the bars show the 25th and the 75th percentiles; black squares within each box indicate the median. The left (right) box plot represents the distribution of country-level changes in nominal house prices (real consumption) between the quarter of the first country-level rate hike and 2023:Q2. Data labels in the figure use International Organization for Standardization (ISO) country codes.

materials, triggered a surge in construction costs (Online Annex Figure 2.2.5). Meanwhile, elevated rates on new mortgages contributed to a drying up of housing transactions in most economies—particularly in those in which homeowners had locked in mortgages with a low fixed rate and so were reluctant to sell (see, for example, Fonseca and Liu 2023 for the United States).

Despite these commonalities, house prices have evolved very differently across countries amid monetary policy tightening. Since the beginning of the current hiking cycle, nominal house prices have declined in about a third of countries in the sample considered here (a rare occurrence) but continued to rise elsewhere (Figure 2.4). Regardless, house prices remained elevated at the end of 2023 in most countries. Similarly, household consumption has evolved differently across countries, indicating that some households have started to feel the pinch of monetary policy, but not those everywhere. House prices and consumption have often moved in the same direction, rising in tandem in some countries (for example, Colombia and Hungary) and declining in others (for example, Germany and Sweden). While this diversity is likely driven by factors beyond monetary policy, it still suggests that a formal study of housing markets may shed light on the differential effects of monetary policy across countries.

**Figure 2.5. The Housing Channels of Monetary Policy**



Source: IMF staff.

### The Housing Channels of Monetary Policy Transmission

This section discusses conceptually how monetary policy operates through housing. Figure 2.5 summarizes the housing channels of monetary policy transmission to household consumption and residential investment, which together represent about 70 percent of GDP in most economies (Online Annex Figure 2.2.1). The figure is stylized and abstracts from second-round effects from consumption and investment back to house prices and credit.<sup>8</sup>

First, through a *cash flow channel* (channel 1 in Figure 2.5), rising policy rates directly depress consumption by homeowners with adjustable-rate mortgages who cannot borrow easily (Di Maggio and others 2017; Flodén and others 2021).<sup>9</sup> The same logic applies in reverse when policy rates are lowered. The *cash flow channel* operates even in countries with high

<sup>8</sup>For clarity, the figure ignores effects on rents or effects from unconventional monetary policy. Changes in policy rates can affect rents through homeownership decisions: if rising mortgage costs outpace declining home prices, prospective new buyers may decide to delay buying property and remain in the rental market. Existing owners may also decide to sell as mortgage costs become prohibitive. This in turn can pressure rents upward, with negative impacts on renters' consumption and positive impacts on residential investment. In addition, unconventional monetary policy (e.g., quantitative easing) may affect house prices by shifting investor demand through a portfolio-rebalancing effect much like that in the expectations/risk premium channel discussed later in the chapter.

<sup>9</sup>Although bank earnings may rise in a hiking cycle, this windfall is not typically spent to offset the fall in homeowners' consumption.

The observation that rising policy rates directly depress consumption by homeowners with adjustable-rate mortgages who cannot borrow easily abstracts from the response of banks. Altunok, Arslan, and Ongena (2023) find that banks holding adjustable-rate mortgages benefit from rising policy rates and thus may be more willing to supply credit relative to banks holding fixed-rate mortgages.



incidences of fixed-rate mortgages if refinancing is not costly, but only when rates are lowered. In this case, refinancing allows households to lower their mortgage payments and spend more.

Second, rising rates can depress demand for housing through an *expectations/risk premium channel* (channel 2). As is true of any long-term asset, house prices are very sensitive to changes in interest rates, through evolving expectations about the future path of monetary policy and house prices. This in turn affects individual behavior (for example, homeownership decisions, mortgage choices, and leverage) and hence the macroeconomy (Kuchler, Piazzesi, and Stroebel 2023). For example, optimism about future house price growth can be a key determinant of house price booms (Kaplan, Mitman, and Violante 2020). Conversely, if households expect house prices will fall in the future, they tend to reduce their demand for housing in the present. When the demand for housing drops, it becomes harder to sell houses. Lenders respond by raising rates on mortgages to compensate for the increased risk of accepting less-liquid collateral. Such a rise in the cost of borrowing further depresses demand and the price of housing (Favilukis, Ludvigson, and Van Nieuwerburgh 2017).

Third, once rising rates depress house prices, homeowners' consumption may fall through a *wealth channel* (channel 3), as home values are often their main form of wealth (Kaplan, Mitman, and Violante 2020). These direct effects are strengthened by a *collateral channel* (channel 4), because homes serve as collateral in mortgages (Kiyotaki and Moore 1997; Chapter 3 of the April 2008 *World Economic Outlook* [WEO]; Iacoviello and Neri 2010; Mian, Rao, and Sufi 2013; Bhutta and Keys 2016; Beraja and others 2019). Reduced access to credit because of depressed home values can in turn lower household consumption.<sup>10</sup>

Finally, changes in interest rates affect consumption and investment through *credit channels*. The demand for credit responds to changes in mortgage rates through an *interest rate channel* (channel 5): when policy rates rise, mortgage rates also tend to rise (van Binsbergen and Grotteria 2023), reducing the demand for credit and housing (Mian and Sufi 2009; Jordà, Schularick, and Taylor 2015). This is often accompanied by a contraction in the supply and composition of

credit (Bernanke and Gertler 1995; Chapter 2 of the October 2016 *Global Financial Stability Report*), either through a *bank lending channel* (channel 6), as a result of higher funding costs—the interest paid by banks to savers—or lower deposits, or through a *balance sheet channel* (channel 7), if lenders reduce credit to riskier households, anticipating that the net worth of borrowers will fall and their default risk increase. Borrowers cut their consumption as a result. Changes to credit supply can also affect house prices (Mian and Sufi 2018), with knock-on effects on both consumption and residential investment.

The subsequent sections focus on channels 1 through 5. The same channel may be associated with multiple mortgage and housing characteristics.<sup>11</sup> For example:

- The *cash flow channel* (channel 1) will be stronger where households are directly exposed to changes in mortgage rates, that is, the *interest rate channel* (channel 5) is active. This would be the case where *fixed-rate mortgages* are rare, where *household debt* is higher, or where credit is less restricted by macroprudential policies—that is, where *loan-to-value limits* are looser.
- The *expectations/risk premium channel* (channel 2) can be stronger in regions where house prices have risen faster and preexisting *overvaluation* is greater, since households' house price expectations are known to be backward looking (Kuchler, Piazzesi, and Stroebel 2023). This effect is reinforced in regions with larger *housing supply restrictions*, where quantities respond less.
- The *wealth channel* and *collateral channel* (channels 3 and 4) will also be more pronounced where *household debt* is higher or *loan-to-value limits* are looser, because these factors make it easier for homeowners to use their houses as collateral against additional borrowing, including through cash-out refinancing. Moreover, in places where *housing supply restrictions* are higher, prices will tend to react more strongly to changes in monetary policy. This direct wealth effect is strengthened by collateral effects, since

<sup>11</sup>Other characteristics may be relevant. For example, banking sector characteristics such as competition, regulation, risk management, and size may impact how policy rates transmit to mortgage rates, and to real activity through the housing channels. In addition, changes in housing policies such as real estate taxes or rent subsidies may also matter. Finally, in some countries, the prevalence of nonresident purchases may affect how monetary policy transmits to house prices (Chapter 3 of the April 2018 *Global Financial Stability Report*). These lie outside the scope of this chapter.

<sup>10</sup>Relatedly, a risk-taking channel can amplify the collateral channel: if banks take on more risk in low-rate environments, when collateral is more valuable, a sharp repricing of collateral during a hiking cycle can lead to bank distress, with implications for financial stability.

house prices are more likely to be *overvalued* in these regions, and thus households tend to be more leveraged. All the factors discussed also depend on the degree to which credit demand reacts to monetary policy—the *interest rate channel*.

- The *interest rate channel* (channel 5) will have more muted effects if regulatory *loan-to-value limits* are stricter, because these shift borrowing toward wealthier households, which rely less on debt and thus tend to respond less to changes in monetary policy.

### Housing Channels Vary Significantly across Countries

To shed light on the housing channels described in the previous section, this section studies empirically the importance of mortgage and housing market characteristics using a local projections instrumental variable framework (Stock and Watson 2018). The first subsection assesses the importance of mortgage market characteristics in a country-level panel of advanced economies and selected emerging markets. It also combines two characteristics in a model to assess complementarities. The second subsection uses a regional data set, with a reduced number of countries, to assess the importance of housing market characteristics. Both subsections map results back to the conceptual channels and study nominal house prices and real consumption or income. Differences in characteristics are not found to affect the transmission to investment. On the technical side, to address the fact that policy rates themselves respond to economic activity, both subsections use newly constructed monetary policy *shocks* based on deviations of actual rate decisions from analysts' expectations.<sup>12</sup>

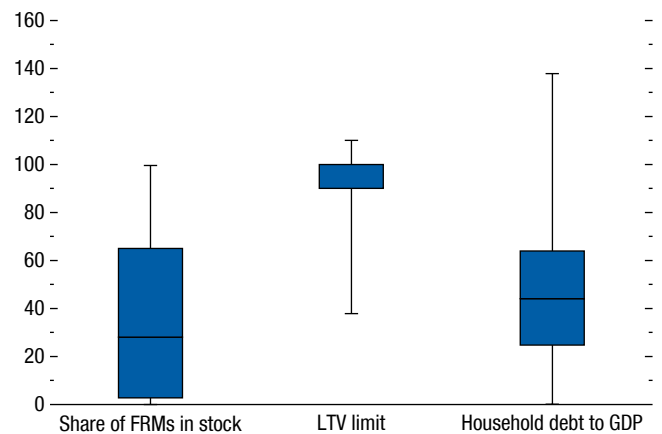
#### Mortgage Market Characteristics Matter

This subsection applies a local projections instrumental variable framework to a panel of 33 emerging market and advanced economies<sup>13</sup> to study the role of three mortgage market characteristics in shaping the

<sup>12</sup>See Online Annex 2.3. Results are broadly robust to using shocks cleaned for information effects, following Bauer and Swanson (2023). Checo, Grigoli, and Sandri (2024) argue that data on these surprises from Bloomberg are good measures of monetary shocks in emerging markets.

<sup>13</sup>Controls include time and country fixed effects and eight lags of changes in the dependent variable and other macroeconomic outcomes. See Online Annexes 2.4 and 2.5 for details. See Section 2.1.1 of Online Annex 2.1 for details on coverage.

**Figure 2.6. Heterogeneity in Mortgage Market Characteristics (Percent)**



Sources: Bank for International Settlements; Integrated Macropprudential Policy (iMaPP) Database; national authorities; and IMF staff calculations.

Note: The figure shows the cross-country distribution of the share of fixed-rate mortgages (FRMs) as a proportion of the outstanding stock; regulatory loan-to-value (LTV) limits on mortgages; and the ratio of household debt to GDP. The horizontal line inside each box represents the median; the upper and lower edges of each box show the top and bottom quartiles. Whiskers show the maximum and the minimum. The sample covers 1998:Q4 to 2023:Q1.

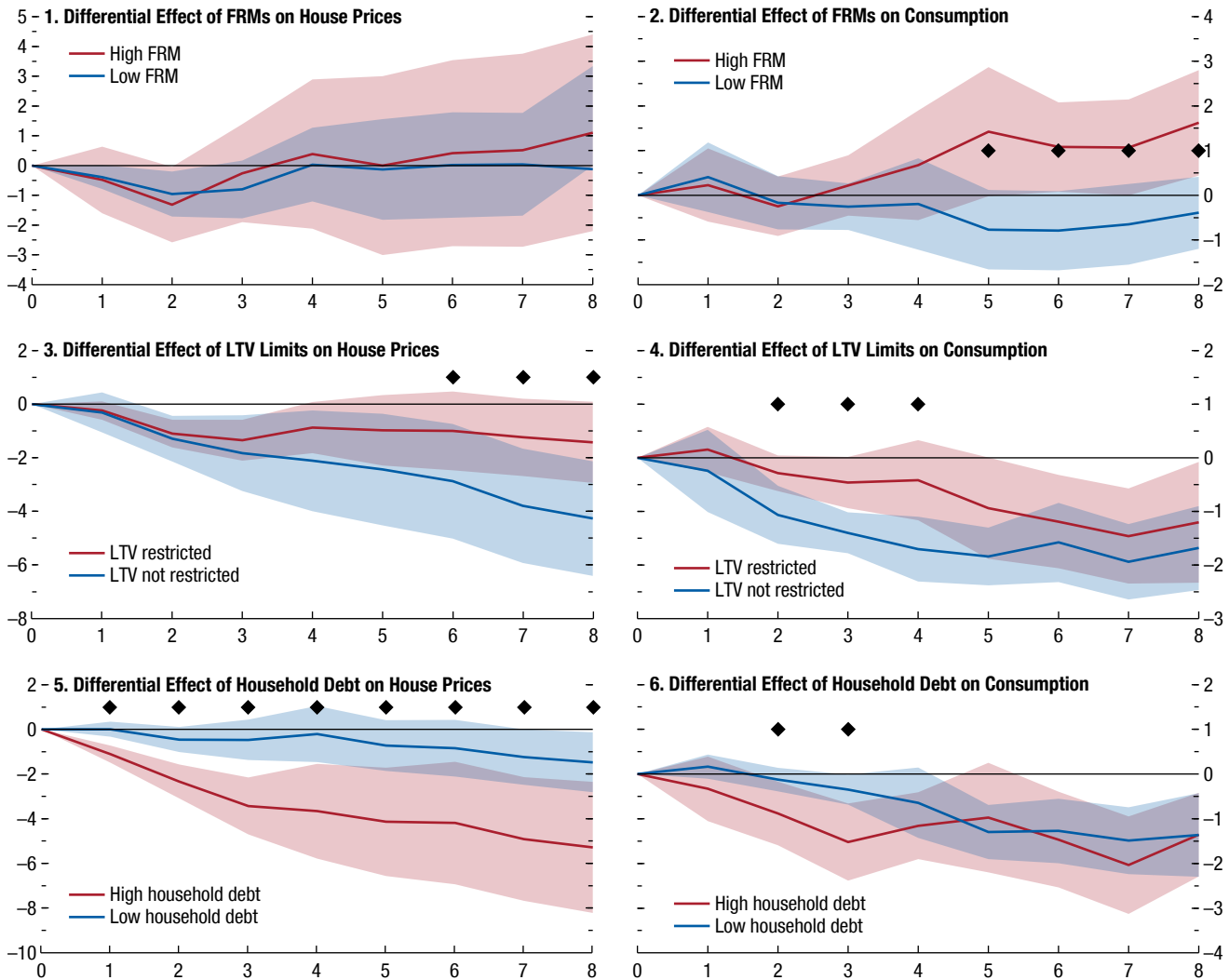
transmission of monetary policy: (1) a new measure of the share of FRMs in the stock of outstanding mortgages,<sup>14</sup> (2) regulatory limits on the size of mortgages relative to home values, or LTV ratios, which constrain leverage at mortgage origination, and (3) the ratio of household debt to GDP, a proxy for the relative depth and relevance of domestic mortgage markets. These characteristics can be linked to some of the housing channels of monetary policy transmission as discussed previously.

Mortgage market characteristics vary significantly across countries (Figure 2.6). Fixed-rate mortgages are rare or nonexistent in some countries (for example, Finland and South Africa) but are the majority of mortgages in others (Belgium, Mexico, and the United States). At the same time, regulatory LTV limits can be as restrictive as 45 percent in Korea, whereas in many countries LTV limits are as high as 100 percent or more (France, Germany, and the United States).<sup>15</sup>

<sup>14</sup>Countries define fixed-rate mortgages differently. To improve comparability, mortgages are deemed fixed rate if nominal payments do not reset within a year. Creating this new measure involved discussions with several central banks. See Online Annex Table 2.2.2 for details.

<sup>15</sup>Other borrower-based measures (like debt-service-to-income or debt-to-income ratios) are not studied here because granular data on them are not available, although they may have an impact on credit and thereby house prices (see Araujo and others 2020; Biljanovska and others 2023; and Alam and others, forthcoming). LTV limits are averaged across all mortgage types and constitute an upper limit. Lenders may impose stricter requirements.

**Figure 2.7. Differential Effects of Monetary Policy Depending on Mortgage Market Characteristics**  
(Percentage points)



Sources: Bank for International Settlements; Bloomberg Finance L.P.; European Central Bank; Eurostat; national authorities; and IMF staff calculations.  
 Note: Numbers on the horizontal axes in the panels represent quarters. Lines reflect the cumulative percentage point response to a 100 basis point change in policy rates. Shaded areas represent 90 percent confidence intervals. Two groups for each characteristic are created: “High FRM” if share of FRMs is above the sample median, “low FRM” otherwise; “LTV restricted” if LTV limits are below 100 percent, “LTV not restricted” otherwise; and “High household debt” if household debt to GDP is above the sample median, “Low household debt” if otherwise. Diamonds indicate where the difference between coefficients is statistically significant at least at the 10 percent level. For details, see Online Annex 2.5. FRM = fixed-rate mortgages whose nominal payments do not reset within a year as a share of outstanding mortgages; LTV = regulatory loan-to-value limits.

Similarly, household debt is below 50 percent of GDP in some (for example, Chile, Colombia, and Israel) and exceeds 100 percent of GDP in others (Australia, Canada, and Norway).

**Fixed-Rate Mortgages Dampen Monetary Policy Transmission to Consumption**

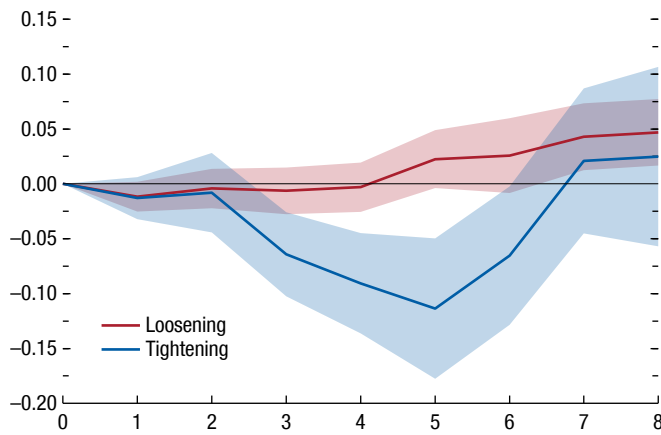
The degree to which monetary policy is able to affect consumption depends on whether rates on existing mortgages adjust to changes in policy rates

(Figure 2.7, panels 1 and 2). While there are no significant differences in the transmission of monetary policy to house prices, a high share of FRMs significantly dampens the transmission of monetary policy to consumption relative to when FRMs are rare, with these differences becoming significant after five quarters.

The differential effects on consumption reflect the *cash flow channel* and are likely driven by a delay in interest rate pass-through. When most mortgages have fixed rates, mortgage payments do not adjust as



**Figure 2.8. Differential Effects of Monetary Policy on Consumption Depending on Shares of Fixed-Rate Mortgages (Percentage points)**



Sources: Bloomberg Finance L.P.; European Central Bank; national authorities; and IMF staff calculations.

Note: Numbers on the horizontal axis in the figure represent quarters. Lines depict the cumulative differential response of real consumption to a 100 basis point monetary policy shock when shares of fixed-rate mortgages are low compared with when they are high, split along the sample median. The shaded areas indicate 90 percent confidence intervals. For details, see Online Annex 2.5.

quickly to a change in monetary policy (Online Annex Figure 2.5.3). In this situation, many consumers will not feel the pinch of rising policy rates until the rate on their mortgage resets. This mechanism will temporarily reduce the strength of the *cash flow channel*.<sup>16</sup>

### **Fixed-Rate Mortgages Matter More When Monetary Policy Is Tightening**

The ability to refinance is critical to understanding the role of FRMs in the transmission of monetary policy. When policy rates are lowered, borrowers with FRMs who are able to refinance may reduce their monthly mortgage payments. In this case, FRMs will not limit the transmission of monetary policy as much. But when policy rates are rising, most borrowers with FRMs have no incentive to refinance, because they will prefer to keep their mortgage payments at their lower fixed rate. Hence, the differential effect of FRMs on transmission is more relevant when monetary policy is tightening than when it is loosening (Figure 2.8).<sup>17</sup>

<sup>16</sup>This is consistent with findings for the euro area (Calza, Monacelli, and Stracca 2013; Pica 2021; Corsetti, Duarte, and Mann 2022).

<sup>17</sup>See Wong (2019), Berger and others (2021), and Eichenbaum, Rebelo, and Wong (2022). The magnitudes in Figures 2.7 and 2.8 are not comparable. See Online Annex 2.5 for details.

### **Tighter Regulatory LTV Limits Delay Monetary Policy Transmission**

When regulatory LTV limits are above 100 percent, that is, when they are not restricted,<sup>18</sup> both house prices and private consumption respond more forcefully to monetary policy. For house prices, the differential effect of LTV limits becomes significant over time (Figure 2.7, panel 3). For example, eight quarters after a 100 basis point increase (decline) in policy rates, house prices drop (rise) by 1 percentage point when LTV limits are restricted and by 4 percentage points when LTV limits are not restricted. The effects of monetary policy on consumption materialize significantly faster when LTV limits are not restricted, although these differences dissipate after four quarters (Figure 2.7, panel 4). This difference by the fourth quarter is economically large: the effect when LTVs are restricted is about half of what it is when they are not.

Tighter LTV limits, since they imply larger down payments, typically more acutely restrict the ability of poorer households to borrow. Hence, house prices and consumption may respond more when LTV limits are not restricted, since the borrower pool includes poorer, more indebted households, which typically have a higher marginal propensity to consume. In addition, leverage may be higher where properties are most overvalued, making house prices more sensitive to policy rate changes, consistent with the findings of the next subsection. Why might the effects on house prices be stronger than those on consumption? Unless existing homeowners can use their homes as collateral for loans to finance nonhousing expenditures (through cash-out refinancing), developments in house prices are unlikely to affect aggregate spending.<sup>19</sup> Since cash-out refinancing is rare in most countries, the *collateral* and *wealth channels* are likely to be less relevant than the *interest rate channel*, which is active at the time of home purchases.

### **Household Indebtedness Strengthens and Accelerates Monetary Policy Transmission**

Similarly to the results for LTV limits, where households are more indebted, monetary policy has a stronger effect on house prices (Figure 2.7, panel 5).

<sup>18</sup>While LTV limits are measured ex ante, they may not always be fully exogenous to monetary policy decisions ex post.

<sup>19</sup>The literature estimates the average propensity to consume out of changes in housing wealth to be between 5 and 7 percent in the United States, with the effect driven by a loosening of borrowing constraints and home equity extraction (Mian, Rao, and Sufi 2013; Aladangady 2017).

Eight quarters after a change in monetary policy, nominal house prices respond about 3 percentage points more when household debt ratios are above the sample median relative to when they are below. In addition, the consumption response to a monetary policy impulse is significantly faster if debt is higher (Figure 2.7, panel 6), even if statistically the difference winds down after three quarters.

Countries with higher household debt tend to be those where consumers are more dependent on mortgages to purchase a property. Hence, housing transactions are generally more affected by changes in policy rates, through credit demand and the *interest rate channel*. Consistent with the effects for LTV limits, monetary policy seems to have slower pass-through to private consumption, although both reach average effects over the long term.<sup>20</sup> This suggests that ultimately what matters is the degree to which existing mortgage borrowers are exposed to interest rate changes, which takes precedence over the *collateral channel* and the *wealth channel*.

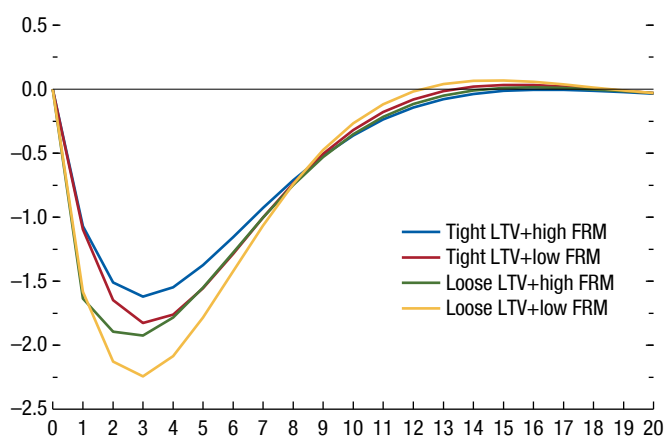
#### *LTV Limits and the Prevalence of Fixed-Rate Mortgages Are Highly Complementary*

Up to this point, mortgage market characteristics have been examined individually for expositional and technical reasons. This subsection uses the two-agent New Keynesian model with housing and leverage of Chen and others (2023) to illustrate the joint effects of the share of fixed-rate mortgages and regulatory LTV limits.

Model simulations suggest that the prevalence of FRMs and the effects of LTV limits reinforce each other. Figure 2.9 shows that the transmission of monetary policy to household consumption is weakest under more restrictive LTV limits and highly prevalent FRMs (the blue line in the figure). The complementarity between the two characteristics is seen in the greater rise in transmission when moving from high to low FRMs, given loose LTV limits (by 17 percent from the red to the yellow line) versus tight LTV limits (by 13 percent from the blue to the green line), and when moving from loose to tight LTV limits, given low FRMs (by 23 percent from the green to the yellow line) versus high FRMs (by 19 percent from the blue to the red line). The direction and timing of marginal effects are consistent with the earlier empirical results, although magnitudes cannot be compared directly.

<sup>20</sup>Results are similar when the share of households with mortgages is used as an interaction term (see Online Annex Figure 2.5.1). The result is also broadly consistent with findings in Corsetti, Duarte, and Mann (2022).

**Figure 2.9. Effects of Monetary Policy on Consumption**  
(Percent of steady-state level)



Source: IMF staff calculations.

Note: Based on the model of Chen and others (2023). Numbers on the horizontal axis in the figure represent quarters. Lines reflect the response to a 100 basis point change in policy rates. Tight and loose LTV stand for LTV of 0.75 and 0.9, respectively. High and low FRM stand for a share of fixed-rate mortgages of 0.95 and 0.7, respectively. See Online Annex 2.7 for details. FRM = fixed-rate mortgages whose nominal payments do not reset within a year as a share of outstanding mortgages; LTV = regulatory loan-to-value limits.

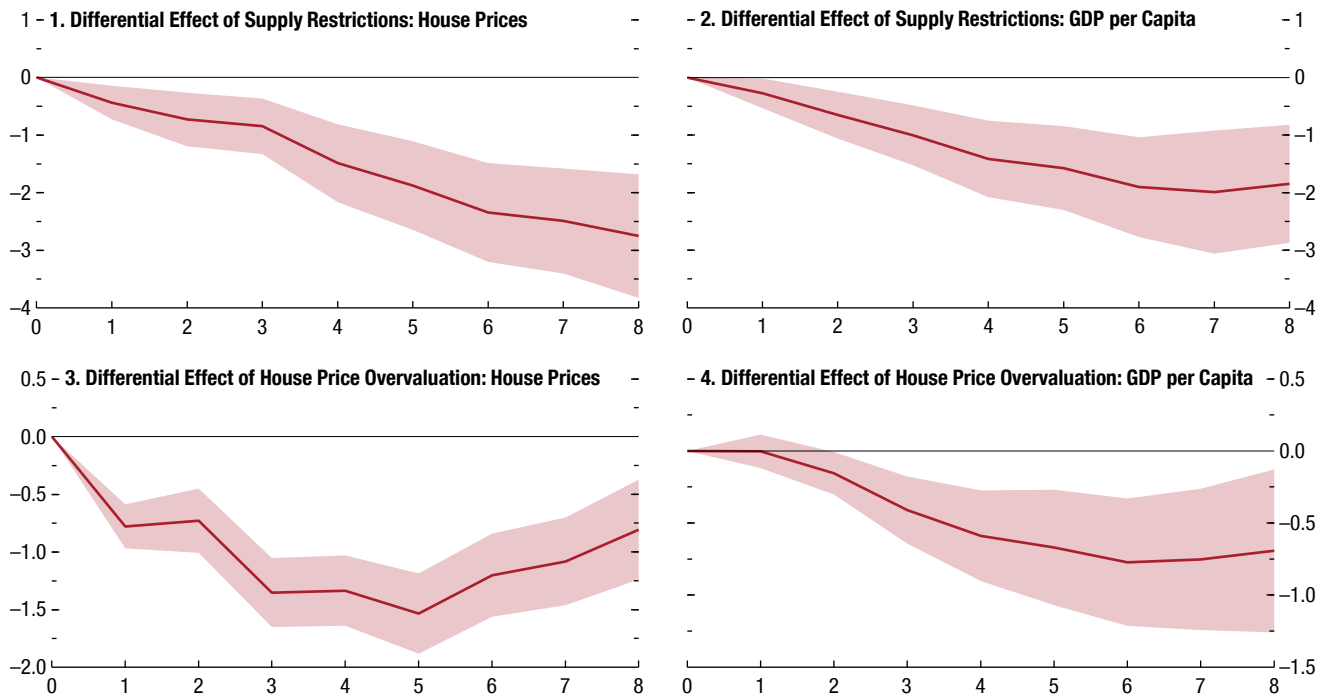
#### **Housing Market Characteristics Matter**

To estimate the sensitivity of monetary policy transmission to housing market characteristics, which vary significantly within countries, this section applies a local projections instrumental variable framework to a regional cross-country data set. This time, however, time-country fixed effects are included.<sup>21</sup> The first characteristic, “housing supply restrictions,” reflecting local regulations that constrain land use or limit the supply of housing, is proxied by population density and has been shown to account for most regional variation in house prices in the United States (Saiz 2010). The second, “house price overvaluation,” is measured through deviations from the regional long-term house-price-to-income ratio.<sup>22</sup> These characteristics shed light on the *wealth*, *collateral*, and *expectations channels*, as discussed conceptually in the section “The Housing Channels of Monetary Policy Transmission” and clarified further in the present subsection. Both housing market characteristics exhibit a right-tailed

<sup>21</sup>Controls include 12 lags of log differences in the dependent variable and other macroeconomic outcomes. See Online Annex 2.6 for details.

<sup>22</sup>Housing overvaluations are computed as deviations from the long-term house price-to-income ratio. More sophisticated parametric models considering multiple drivers of house prices could provide more accurate estimates of overvaluation (see, for example, Igan and Loungani 2012).

**Figure 2.10. Differential Effects of Monetary Policy Depending on Local Housing Market Characteristics**  
(Percentage points relative to base effect)



Sources: CBS Open Data; CEIC Data Company Limited; Eurostat; Organisation for Economic Co-operation and Development; national authorities; and IMF staff calculations.

Note: See Online Annex Table 2.1.4 for the list of sources on national authorities' data. Numbers on the horizontal axes in the panels represent quarters. Solid lines represent the cumulative response to a 100 basis point change in the policy rate. The shaded areas indicate 90 percent confidence intervals. Differential effects of supply restrictions (house price overvaluation) denote relative effects between regions in the top 10th percentile of population density (regions with price-to-income ratio in the top 25th percentile of their own distribution) compared to other regions.

distribution (Online Annex Figure 2.6.2), suggesting that nonlinearities may be important. The outcome variables studied are nominal house prices and real GDP per capita, the latter serving as a proxy for consumption, as a result of data limitations.

### *Housing Supply Restrictions Strengthen the Transmission of Monetary Policy*

Following a 100 basis point tightening (loosening) of policy rates, nominal house prices decline (rise) by an additional 3 percentage points after eight quarters in areas with restricted housing supply, compared with areas where supply is less restricted (Figure 2.10, panels 1 and 2). This effect is 50 percent larger than the average effect of monetary policy on house prices. Concurrently, real GDP per capita also undergoes an additional decline (rise) of 2 percentage points at peak in supply-restricted regions (about one-third larger than the corresponding average effects). The effects of monetary policy in housing-supply-restricted regions also seem more back-loaded.

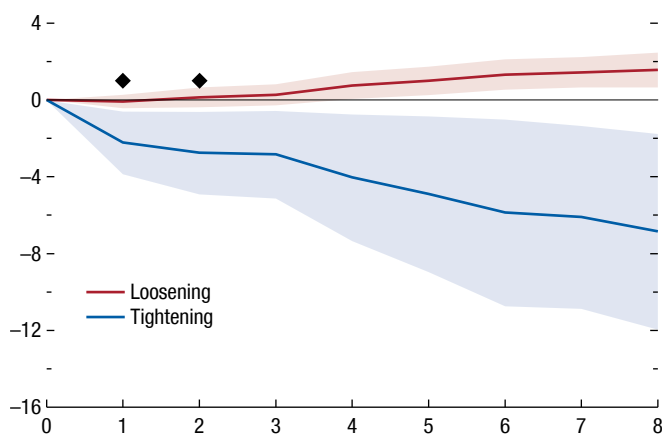
Changes in policy rates affect the demand for housing through the *interest rate channel*. However, the same shift in demand and mortgage rates leads to larger changes in house prices in supply-restricted regions. This in turn results in decreased private consumption and GDP through both the *wealth channel* and the *collateral channel*.<sup>23</sup>

### *Recent House Price Overvaluation Strengthens the Transmission of Monetary Policy*

Similarly, following a tightening (loosening) of policy rates by 100 basis points, the peak fall (rise) in nominal house prices is 1.5 percentage points greater in areas with recent house price overvaluation relative to those without (Figure 2.10, panels 3 and 4). The effects are again large, about three-quarters of the average effect of monetary policy on house prices. At the same time, real GDP per capita declines (rises) an extra percentage

<sup>23</sup>See Albuquerque, Iseringhausen, and Opitz (2024) for similar findings for the United States.

**Figure 2.11. Differential Effects of Monetary Policy on House Prices Depending on Supply Restrictions**  
(Percentage points)



Sources: CBS Open Data; CEIC Data Company Limited; Eurostat; Organisation for Economic Co-operation and Development; national authorities; and IMF staff calculations.

Note: See Online Annex Table 2.1.4 for the list of sources on national authorities' data. Numbers on the horizontal axis in the figure represent quarters. Solid red (blue) line represents the cumulative response to a 100 basis point loosening (tightening) in the policy rate. The shaded areas indicate 90 percent confidence intervals. Diamonds indicate where the difference between coefficients is statistically significant at the 10 percent level. Differential effects of supply restrictions (house price overvaluation) denote relative effects between regions in the top 10th percentile of population density (regions with price-to-income ratio in the top 25th percentile of their own distribution) relative to other regions.

point in regions with recent house price overvaluation (about two-thirds of the average effect). The differential effect is back-loaded for GDP per capita but not for house prices, which peak at about five quarters.

Sharp rises in house prices are often driven by overoptimism about future house prices (*expectations channel*). These are typically accompanied by excessive leverage (*collateral channel*), giving rise to spirals of falling house prices and foreclosures when monetary policy tightens. Income and consumption decline through the *expectations*, *collateral*, and *wealth* channels.<sup>24</sup>

### Supply Restrictions and Price Overvaluation Matter More When Monetary Policy Tightens

Furthermore, the analysis suggests that supply constraints and overvalued house prices matter more when rates are rising, although the lower power of this specification means that symmetry can be rejected only for house prices and in the first two quarters (Figure 2.11; Online Annex Figure 2.6.1). Households in areas with supply constraints, overvalued housing, or both tend to

<sup>24</sup>See similar findings for the United States in Chodorow-Reich, Guren, and McQuade (2024).

be more leveraged. Thus, one possible explanation for this asymmetry is the shape of the leverage distribution: fewer households become borrowing unconstrained after an easing of monetary policy than those that become more constrained when monetary policy tightens.<sup>25</sup>

### Putting It Together: The Strength of the Housing Channels across Countries

The heat map in Figure 2.12 shows that the degree of transmission of monetary policy varies significantly across countries (based on 2022 data or the latest available). The first three columns focus on mortgage market characteristics: the share of fixed-rate mortgages, regulatory LTV limits, and household debt. Meanwhile, the fourth and fifth columns focus on housing market characteristics: housing supply restrictions and the degree of house price overvaluations.<sup>26</sup> Darker reds depict countries with stronger monetary policy transmission based on the cross-country distribution for each variable, whereas lighter reds indicate the opposite. Countries with the strongest transmission are at the top of the figure; those more likely to have the weakest transmission are at the bottom.

Countries such as Australia and Japan appear to have stronger housing channels of monetary policy transmission, with low shares of fixed-rate mortgages, less-restrictive LTV limits, high household debt (only to some extent Japan), and a somewhat elevated proportion of the population living in housing-supply-restricted areas.<sup>27</sup> In contrast, countries such as Colombia, Hungary, and Israel are more likely to exhibit weaker transmission, with notably low levels of household debt and of supply constraints.

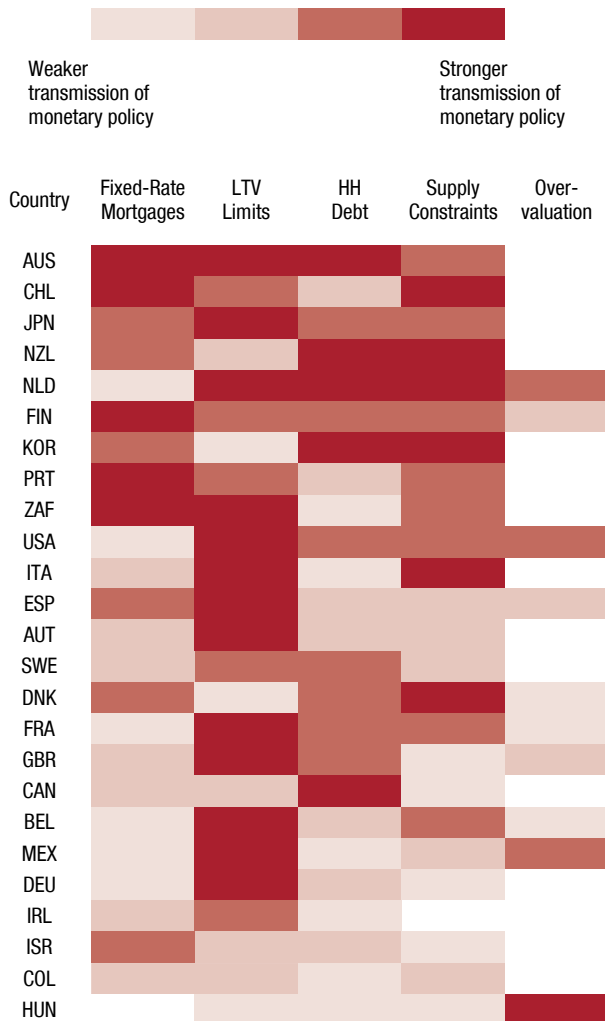
Important caveats are that columns in the figure cannot be compared or aggregated for each country and that the figure focuses solely on housing channels. The relevance of other channels may vary across countries; for example, the exchange rate channel is a

<sup>25</sup>See Hedlund and others (2017), Huang and Tang (2012), and Albuquerque, Iseringhausen, and Opitz (2024) for similar findings.

<sup>26</sup>Both housing market characteristics are evaluated using regional data, and neither is indicative of national-level averages for population density or house price overvaluation. See notes to Figures 2.12 and 2.14.

<sup>27</sup>Chile is not mentioned despite being close to the top of Figure 2.12 to account for the fact that mortgage payments in Chile vary with inflation. Thus, monetary policy transmission to mortgage payments is likely to be weaker relative to the case in which mortgages adjust to market rates.

**Figure 2.12. Heterogeneity in Monetary Policy Transmission**



Sources: Bank for International Settlements; CEIC Data Company Limited; European Central Bank; Eurostat; Integrated Macroprudential Policy (iMaPP) Database; Organisation for Economic Co-operation and Development; national authorities; and IMF staff calculations.

Note: Fixed-rate mortgages are the share of the total outstanding stock, 2022:Q4 (or latest available). Fixed-rate mortgages exclude mortgages that adjust to inflation (as in Chile); LTV limits are the regulatory loan-to-value limits, averaged across all mortgage types, 2021:Q4; HH debt is the household credit-to-GDP ratio, 2022:Q4; supply constraints are the proportion of population living in areas with high population density, 2022:Q4 (or latest available). Regions above the 90th percentile of population density within each country are defined as high-population-density areas; overvaluation is the median price-to-income ratio (PIR) in overvalued areas, 2022:Q4 (or latest available). A region is defined as overvalued if its PIR is above the 75th percentile of its regional time series. For each of the five criteria, countries obtain a score between 1 and 4 reflecting their percentile in the cross-country distribution. Judgment is used for borderline cases. Countries are ranked based on their average score. White cells indicate missing data. Economy list uses International Organization for Standardization (ISO) country codes.

key channel for emerging and highly open economies (Brandão-Marques and others 2020).

Still, the ranking in the heat map lines up broadly with actual changes in house prices and real consumption since the start of each country’s most recent hiking cycle (Figure 2.4), although many other shocks drive both variables beyond monetary policy. For example, countries such as Colombia and Hungary have experienced more significant house price and real consumption growth since the onset of the monetary policy tightening cycle. In contrast, in Australia, house prices declined significantly before recovering recently, and real consumption has been stagnant.

### Housing Channels May Have Weakened in Many Countries

Complicating the assessment of the strength of the housing channels of monetary policy is the fact that mortgage and housing market characteristics themselves change over time, although at a slow pace. This section documents the evolution over time and across countries of the previously studied mortgage and housing market characteristics and then draws insights into how monetary policy transmission may have shifted by applying the documented changes in mortgage and housing market characteristics to the estimates from the previous section.

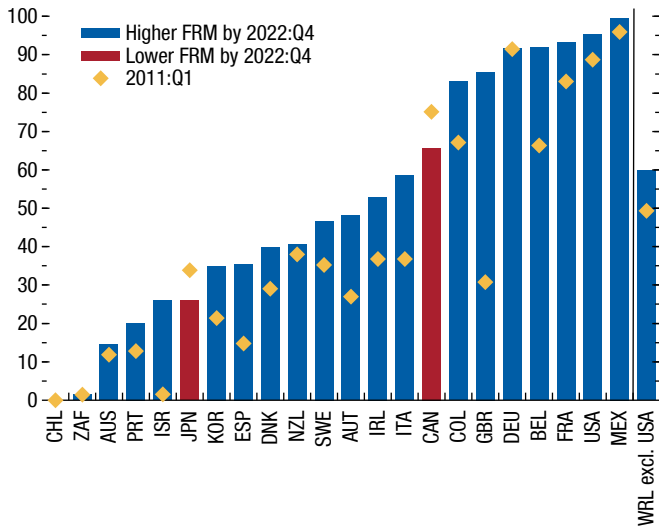
### Shifting Mortgage and Housing Market Characteristics . . .

Mortgage market characteristics have changed significantly in some countries since the global financial crisis. Fixed-rate mortgages have become more prevalent (Figure 2.13), with the increase driven by low rates, as discussed previously. Regulatory LTV limits have either tightened or remained stable (Online Annex Figure 2.2.6). Household debt ratios have increased in some countries, notably Chile, France, and Korea, but decreased in others, such as Denmark, Ireland, and Spain (Online Annex Figure 2.2.7).

Housing markets have also undergone notable changes, particularly during the pandemic (Online Annex Figure 2.2.8). In most countries analyzed, the national-level housing supply is now likely to be more elastic as a result of migration from densely populated urban areas to less dense rural or suburban areas during the pandemic years. Regarding house price overvaluation, observed changes have been



**Figure 2.13. Changes in the Share of Fixed-Rate Mortgages**  
(Percentage points)



Sources: European Central Bank; national authorities; and IMF staff calculations. Note: Diamonds denote values at 2011:Q1 (or earliest available); bars denote values at 2022:Q4 (or latest available). Red bars denote countries for which the share of FRMs in stock decreased between 2011:Q1 and 2022:Q4; blue bars denote countries for which the share of FRMs in stock increased. For further details and definitions, see Online Annex Table 2.2.2. Economy list uses International Organization for Standardization (ISO) country codes. excl. = excluding; FRM = mortgages whose nominal payments do not reset within a year as a share of outstanding mortgages; WRL = world.

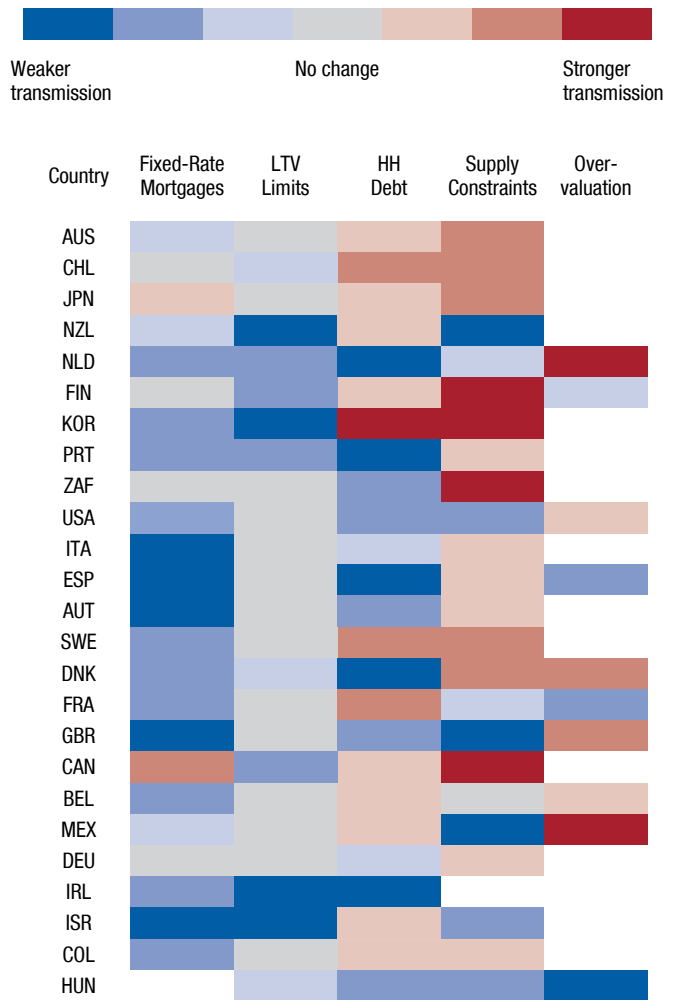
more balanced. In some countries, areas that were overvalued in 2019 have seen stagnant or declining price-to-income ratios (for example, Finland and Hungary) as people moved away from previously overvalued regions, contributing to a more even distribution of valuations across regions within a country. However, in other countries the reverse has happened: house price overvaluation has risen precisely where house prices were already overvalued (for example, Mexico and The Netherlands).

**... Suggest Weaker Transmission Now in Many Countries**

Figure 2.14 illustrates the implications of the shifts in characteristics for the transmission of monetary policy. The first three columns present a summary of the developments in mortgage markets between 2011 and the latest available data; the fourth and fifth columns summarize the changes in housing market characteristics between 2019 and 2022.<sup>28</sup> Shades of blue on the

<sup>28</sup>The reason for this different timing is that housing markets shifted significantly during the pandemic.

**Figure 2.14. Changes in Monetary Policy Transmission**



Sources: Bank for International Settlements; CEIC Data Company Limited; European Central Bank; Eurostat; Integrated Macroprudential Policy (iMaPP) Database; Organisation for Economic Co-operation and Development; national authorities; and IMF staff calculations. Note: Fixed-rate mortgages are the change in the share of the total outstanding stock, from 2011:Q1 (or earliest available) to 2022:Q4 (or latest available). Fixed rate mortgages exclude mortgages that adjust to inflation (as in Chile); LTV limits are the change in regulatory loan-to-value limits, averaged across all mortgage types, from 2011:Q1 to 2021:Q4; HH debt is the change in household credit-to-GDP ratio, from 2011:Q1 to 2022:Q4; supply constraints are the population growth differential between areas with high and low population density, from 2019:Q4 to 2022:Q4 (or latest available). Regions above the 90th percentile of population density within each country are defined as high-population-density areas; overvaluation is the median price-to-income ratio (PIR) growth differential between overvalued and nonovervalued areas, from 2019:Q4 to 2022:Q4 (or latest available). A region is defined as overvalued if its PIR is above the 75th percentile of its regional time series. For each of the five criteria, countries obtain a score between 1 and 3 reflecting their percentile in the cross-country distribution within positive and negative changes. Judgment is used for borderline cases. Gray cells indicate no change. Countries are ranked based on the order of Figure 2.12. White cells indicate missing data. Economy list uses International Organization for Standardization (ISO) country codes.

heat map indicate changes in characteristics that imply weakening in monetary policy transmission, whereas shades of red indicate strengthening. Gray represents no change in transmission. Shades are based on a country's position within the cross-country distribution of changes of the same direction. Countries are listed in the same order as in Figure 2.12, which shows the overall strength of transmission—with the strongest transmission at the top and the weakest at the bottom.

Changes in mortgage market characteristics in countries such as Canada, Chile, and Japan suggest a strengthening of the transmission of monetary policy, driven mainly by a declining or stable share of FRMs, an increase in debt, and more constrained housing supply. Transmission in Hungary, Ireland, Portugal, and the United States, however, seems to have weakened, as characteristics there have moved in the opposite direction. At the global level, the heat map points to a decline in the transmission of monetary policy through the *cash flow*, *wealth*, and *collateral* channels, albeit to varying degrees across countries. Contributing factors include increased adoption of fixed-rate mortgages, tighter LTV limits, lower debt, outmigration from densely populated areas, and house price deflation in some previously overvalued areas.

Here, again, the heat map ignores changes in channels of transmission beyond housing and thus gives only a partial view of the changing strength of monetary policy transmission. The fact that policy rates have been raised over the last two years at a speed, degree, and breadth that is unprecedented in the last several decades may have also affected the transmission of monetary policy. Box 2.1 examines another channel—the *interest rate pass-through channel*—in Europe; Box 2.2 discusses the role of real estate in China's relatively weak transmission.

## Policy Implications

Monetary policy affects economic activity through housing. The strength of these housing channels varies significantly across countries and has weakened recently in several economies. These findings hold implications for macroprudential and monetary authorities.

First, regarding borrower-based macroprudential measures, this chapter does not study their effectiveness. A large body of literature establishes that tighter macroprudential regulation improves financial and economic stability and therefore should be set with

those objectives in mind. This chapter takes the level of regulation as given and finds that monetary policy may have smaller effects in countries with relatively tight regulation. This is because borrowers are on average less leveraged and so are not as sensitive to changing interest rates. This is desirable because it allows monetary policy to focus on managing aggregate demand and price pressures and thereby to act more freely, without fear of precipitating a financial crunch.

Second, turning to monetary policy, the chapter's findings suggest that a deep, country-specific understanding of housing channels is important and can help in calibrating and adjusting policy. In countries where the housing channels are strong, monitoring housing market developments and changes in household debt service can help identify early signs of overtightening. Where monetary policy transmission is weak, more forceful early action can be taken when signs of overheating and inflationary pressures first emerge.

But what about now? Most central banks have made significant progress toward their inflation targets. It could follow from the discussion that if transmission is weak, erring on the side of too much tightening is always less costly. However, overtightening, or leaving rates higher for longer, could nevertheless be a greater risk now. While fixed-rate mortgages have indeed become more common in many countries, fixation periods are often short. Over time, and as rates on these mortgages reset, monetary policy transmission could suddenly turn more effective and thereby depress consumption. Although central banks already incorporate this possibility in their decisions, the effects on consumption could still be larger than expected. Financial instability could also follow if defaults rise abruptly. This is especially true in countries where households are highly indebted or where bankruptcy laws favor borrowers. The sharp rise in house prices during the pandemic has also rendered some markets overvalued. These may be more likely to correct if rates remain high for long, particularly where macroprudential policies did not prevent the buildup of leverage. With a view to the next tightening cycle, prudential authorities should add instruments such as caps on debt-service-to-income ratios, if not already in place, to prevent such financial stability side effects of monetary policy.

In sum, the longer rates are kept high, the greater the likelihood that households will feel the pinch, even where so far they have been relatively sheltered.

### Box 2.1. Interest Rate Pass-Through in Europe

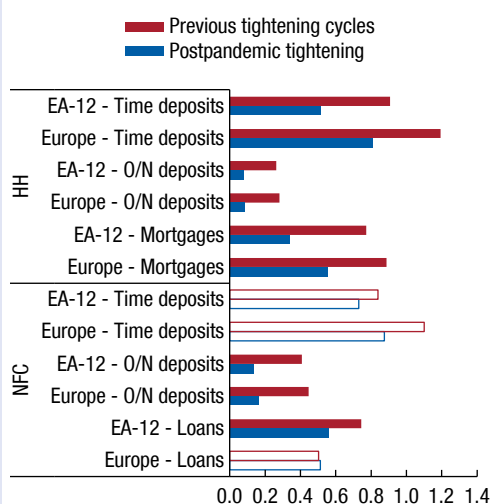
*This box finds that some bank interest rates in Europe may have become less sensitive to changes in policy rates. The effect of monetary policy on bank interest rates (“pass-through”) is an important ingredient of monetary policy transmission.*

In the postpandemic tightening cycle in Europe, pass-through has been heterogeneous across types of interest rates (Figure 2.1.1). Pass-through seems highest to time deposits, followed by that to mortgages and to loans to nonfinancial corporations. Relative to past cycles, pass-through in Europe has weakened somewhat, except for that to nonfinancial corporation time deposits and loans.

The effects on real activity of mortgage rate pass-through depend on mortgage market characteristics such as the prevalence of variable-rate mortgages and the share of households with mortgages. In some European countries, pass-through to outstanding mortgages is high, but the share of households with mortgages is relatively low. This softens monetary transmission (top-left quadrant in Figure 2.1.2). In others, strong pass-through, in combination with a high stock of mortgages (top-right quadrant), can imply large changes in household debt-service costs. The annual increase in mortgage-servicing costs relative to mid-2022 varies significantly across the euro area (Figure 2.1.3), from Portugal at 1.2 percent of GDP to Malta at virtually zero.

The authors of this box are Luis Brandão-Marques and Florian Misch, based on Beyer and others (2024).

**Figure 2.1.1. Pass-Through to Bank Interest Rates over Time**  
(Percent)

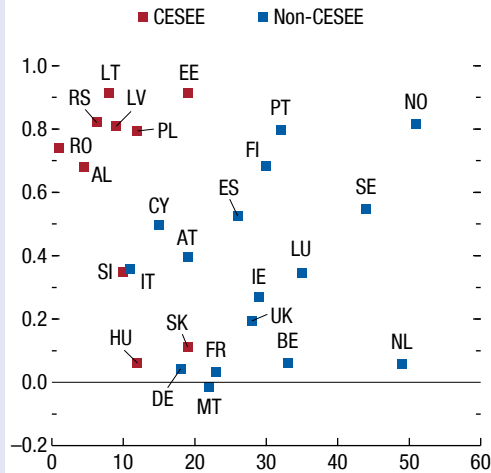


Sources: Beyer and others 2024; and IMF staff calculations.

Note: Pass-through is based on regression analysis in the spirit of Burstein and Gopinath (2014). The differences between solid bars are statistically significant at the 10 percent level or better. EA-12 comprises Austria, Belgium, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, The Netherlands, Portugal, and Spain. HH = household; NFC = nonfinancial corporation; O/N = overnight.

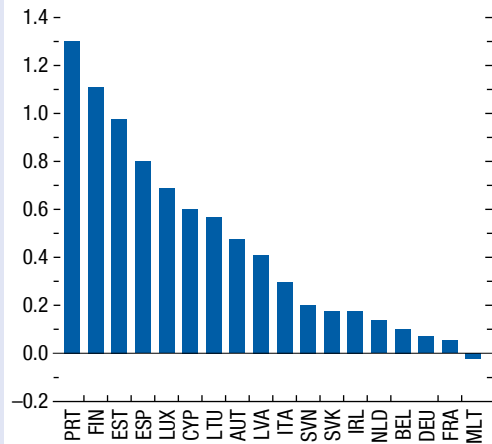
Box 2.1 (continued)

**Figure 2.1.2. Pass-Through and Share of Households with Mortgages (2021–23)**  
(Ratio)



Sources: Beyer and others 2024; and IMF staff calculations.  
Note: Interest rate betas are defined as the ratio of the cumulative increase in rates of existing mortgages to the cumulative increase in the policy rate in the postpandemic hiking cycle. Economy list uses International Organization for Standardization (ISO) country codes. CESEE = Central, Eastern, and Southeastern Europe.

**Figure 2.1.3. Changes in Mortgage Service Costs after European Central Bank Hikes**  
(Percent of 2022 GDP; refers to July 2022 mortgage stock)



Sources: Beyer and others 2024; and IMF staff calculations.  
Note: Economy list uses International Organization for Standardization (ISO) country codes.

### Box 2.2. China’s Monetary Policy and the Housing Market

*In China, the transmission from policy rates to the real economy through the housing market has been weak. Increasing reliance on interest-rate-based tools could help improve policy rate transmission to households.*

Before the recent downturn in China’s property sector, the country’s housing market exhibited sensitivity to shifts in short-term interest rates. Lower short-term borrowing costs were followed by accelerating house price growth (Figure 2.2.1, panel 1), suggesting an impact of policy rates on the housing market through the *expectations/risk premium* and *credit channels*. However, the relationship between house prices and borrowing costs has weakened since the property sector downturn began in mid-2021, with nonmonetary factors, including developer distress and large inventories of unfinished homes, playing a more significant role in housing market dynamics.

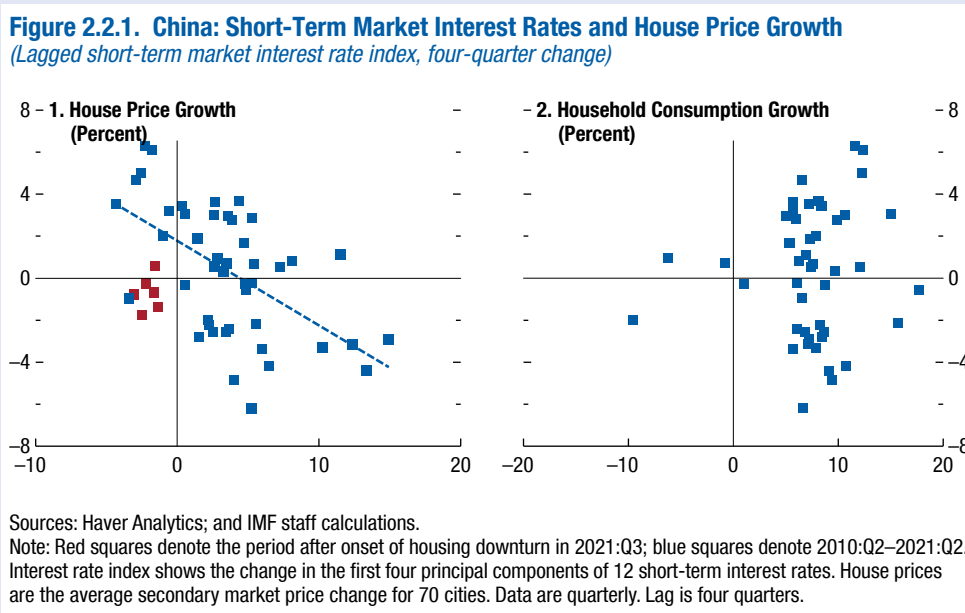
Changes in short-term interest rates have a more muted impact on consumption (Figure 2.2.1, panel 2), indicating limited transmission through the *wealth* and *collateral channels*. In the past, wealth effects have been subdued overall, since a preference for home-ownership is often associated with higher saving rates, largely because of the rising burden of house purchases relative to income (IMF 2022). Restrictions on home

equity credit and low regulatory mortgage loan-to-value limits—60 percent, which is close to the 10th percentile in a cross-country comparison (Figure 2.6)—further weakened the sensitivity of consumption to interest rates through the *collateral channel*.

In China’s most recent property downturn and monetary easing cycle, transmission via the *cash flow channel* has also been relatively weak. Despite the prevalence of floating interest rates, existing borrowers have seen limited benefits, because benchmark reference rates have adjusted only modestly, reflecting limited use of interest-rate-based policy easing. At the same time, interest rates on new mortgages—less influenced by short-term interest rates—have noticeably declined, thanks to relaxed mortgage rate regulations. This reduction, however, has not benefited existing mortgage holders given the lack of a well-established refinancing mechanism.

Recent monetary policy easing, in the form of multiple rate cuts, has had only a limited impact on housing-related interest rates. This highlights problems in policy transmission across the interest rate structure, which prompted a one-time mortgage rate cut in September 2023. Increasing use of interest-rate-based tools to ease monetary policy, as opposed to greater reliance on credit policies, will help ensure more effective policy transmission via the housing channel.

The authors of this box are Henry Hoyle and Estelle Xue Liu.





## References

- Aastveit, Knut Are, and André K. Anundsen. 2022. “Asymmetric Effects of Monetary Policy in Regional Housing Markets.” *American Economic Journal: Macroeconomics* 14 (4): 499–529. <https://doi.org/10.1257/mac.20190011>.
- Aladangady, Aditya. 2017. “Housing Wealth and Consumption: Evidence from Geographically-Linked Microdata.” *American Economic Review* 107 (11): 3415–46. <https://doi.org/10.1257/aer.20150491>.
- Alam, Zohair, Adrian Alter, Jesse Eiseman, Gaston Gelos, Heedon Kang, Machiko Narita, Erlend Nier, and Naixi Wang. Forthcoming. “Digging Deeper—Evidence on the Effects of Macroprudential Policies from a New Database.” Published ahead of print, January 22, 2024. *Journal of Money, Credit and Banking*. <https://doi.org/10.1111/jmcb.13130>.
- Albuquerque, Bruno, Martin Iseringhausen, and Frederic Opitz. 2024. “The Housing Supply Channel of Monetary Policy.” IMF Working Paper 24/023, International Monetary Fund, Washington, DC. <https://www.imf.org/en/Publications/WP/Issues/2024/02/02/The-Housing-Supply-Channel-of-Monetary-Policy-544046>.
- Altunok, Fatih, Yavuz Arslan, and Steven Ongena. 2023. “Monetary Policy Transmission with Adjustable and Fixed Rate Mortgages: The Role of Credit Supply.” Discussion Paper 18293, Centre for Economic Policy Research, London. <https://cepr.org/publications/dp18293>.
- Araujo, Juliana D., Manasa Patnam, Adina Popescu, Fabian Valencia, and Weijia Yao. 2020. “Effects of Macroprudential Policy: Evidence from over 6,000 Estimates.” IMF Working Paper 20/067, International Monetary Fund, Washington, DC. <https://doi.org/10.5089/9781513545400.001>.
- Battistini, Niccolò, Matteo Falagiarra, Angelina Hackmann, and Moreno Roma. 2022. “Navigating the Housing Channel of Monetary Policy across Euro Area Regions.” ECB Working Paper 2022/2752, European Central Bank, Frankfurt. <https://www.ecb.europa.eu/pub/pdf/scpwps/ecb.wp2752-efdb19d8b.en.pdf>.
- Bauer, Michael D., and Eric T. Swanson. 2023. “An Alternative Explanation for the ‘Fed Information Effect.’” *American Economic Review* 113 (3): 664–700. <https://doi.org/10.1257/aer.20201220>.
- Beraja, Martin, Andreas Fuster, Erik Hurst, and Joseph Vavra. 2019. “Regional Heterogeneity and the Refinancing Channel of Monetary Policy.” *Quarterly Journal of Economics* 134 (1): 109–83. <https://doi.org/10.1093/qje/qjy021>.
- Berger, David, Konstantin Milbradt, Fabrice Tourre, and Joseph Vavra. 2021. “Mortgage Prepayment and Path-Dependent Effects of Monetary Policy.” *American Economic Review* 111 (9): 2829–78. <https://doi.org/10.1257/aer.20181857>.
- Bernanke, Ben S., and Mark Gertler. 1995. “Inside the Black Box: The Credit Channel of Monetary Policy Transmission.” *Journal of Economic Perspectives* 9 (4): 27–48. <https://doi.org/10.1257/jep.9.4.27>.
- Bernanke, Ben S., and Kenneth N. Kuttner. 2005. “What Explains the Stock Market’s Reaction to Federal Reserve Policy?” *Journal of Finance* 60 (3): 1221–57. <https://doi.org/10.1111/j.1540-6261.2005.00760.x>.
- Beyer, Robert C. M., Ezgi O. Ozturk, Claire Li, Florian Misch, Ruo Chen, and Lev Ratnovski. 2024. “Monetary Policy Pass-Through to Interest Rates: Stylized Facts from 30 European Countries.” IMF Working Paper 24/009, International Monetary Fund, Washington, DC. <https://www.imf.org/en/Publications/WP/Issues/2024/01/12/Monetary-Policy-Pass-Through-to-Interest-Rates-Stylized-Facts-from-30-European-Countries-543715>.
- Bhatta, Neil, and Benjamin J. Keys. 2016. “Interest Rates and Equity Extraction during the Housing Boom.” *American Economic Review* 106 (7): 1742–74. <https://doi.org/10.1257/aer.20140040>.
- Biljanovska, Nina, Sophia Chen, R. G. Gelos, Deniz O. Igan, Maria Soledad Martinez Peria, Erlend Nier, and Fabian Valencia. 2023. “Macroprudential Policy Effects: Evidence and Open Questions.” IMF Departmental Paper 23/002, International Monetary Fund, Washington, DC. <https://doi.org/10.5089/9798400226304.087>.
- Biljanovska, Nina, and Giovanni Dell’Ariccia. 2023. “Flattening the Curve and the Flight of the Rich: Pandemic-Induced Shifts in US and European Housing Markets.” IMF Working Paper 23/266, International Monetary Fund, Washington, DC. <https://www.imf.org/en/Publications/WP/Issues/2023/12/22/Flattening-the-Curve-and-the-Flight-of-the-Rich-Pandemic-Induced-Shifts-in-US-and-European-542850>.
- Brandão-Marques, Luis, Gaston Gelos, Thomas Harjes, Ratna Sahay, and Yi Xue. 2020. “Monetary Policy Transmission in Emerging Markets and Developing Economies.” IMF Working Paper 20/035, International Monetary Fund, Washington, DC. <https://www.imf.org/en/Publications/WP/Issues/2020/02/21/Monetary-Policy-Transmission-in-Emerging-Markets-and-Developing-Economies-49036>.
- Burstein, Ariel, and Gita Gopinath. 2014. “International Prices and Exchange Rates.” In *Handbook of International Economics*, vol. 4, 391–451. Amsterdam: Elsevier.
- Calza, Alessandro, Tommaso Monacelli, and Livio Stracca. 2013. “Housing Finance and Monetary Policy.” *Journal of the European Economic Association* 11 (S1): 101–22. <https://doi.org/10.1111/j.1542-4774.2012.01095.x>.
- Checo, Ariadne, Francesco Grigoli, and Damiano Sandri. 2024. “Monetary Policy Transmission in Emerging Markets: Proverbial Concerns, Novel Evidence.” BIS Working Papers 1170, Bank for International Settlement, Basel, Switzerland. <https://www.bis.org/publ/work1170.htm>.
- Chen, Jiaqian, Daria Finocchiaro, Jesper Lindé, and Karl Walentin. 2023. “The Costs of Macroprudential Deleveraging in a Liquidity Trap.” *Review of Economic Dynamics* 51 (December): 991–1011. <https://doi.org/10.1016/j.red.2023.09.005>.
- Chodorow-Reich, Gabriel, Adam M. Guren, and Timothy J. McQuade. 2024. “The 2000s Housing Cycle with 2020 Hind-sight: A Neo-Kindlebergerian View.” *Review of Economic Studies* 91 (2): 785–816. <https://doi.org/10.1093/restud/rdad045>.

- Cloyne, James, Clodomiro Ferreira, and Paolo Surico. 2020. “Monetary Policy When Households Have Debt: New Evidence on the Transmission Mechanism.” *Review of Economic Studies* 87 (1): 102–29. <https://doi.org/10.1093/restud/rdy074>.
- Corsetti, Giancarlo, João B. Duarte, and Samuel Mann. 2022. “One Money, Many Markets.” *Journal of the European Economic Association* 20 (1): 513–48. <https://doi.org/10.1093/jeea/jvab030>.
- Deb, Pragyan, Harald Finger, Kenichiro Kashiwase, Yosuke Kido, Siddharth Kothari, and Evan Papageorgiou. 2022. “Housing Market Stability and Affordability in Asia-Pacific.” IMF Departmental Paper 22/020, International Monetary Fund, Washington, DC. <https://www.imf.org/en/Publications/Departmental-Papers-Policy-Papers/Issues/2022/12/13/Housing-Market-Stability-and-Affordability-in-Asia-Pacific-513882>.
- Di Maggio, Marco, Amir Kermani, Benjamin J. Keys, Tomasz Piskorski, Rodney Ramcharan, Amit Seru, and Vincent Yao. 2017. “Interest Rate Pass-Through: Mortgage Rates, Household Consumption, and Voluntary Deleveraging.” *American Economic Review* 107 (11): 3550–88. <https://doi.org/10.1257/aer.20141313>.
- Eichenbaum, Martin, Sergio Rebelo, and Arlene Wong. 2022. “State-Dependent Effects of Monetary Policy: The Refinancing Channel.” *American Economic Review* 112 (3): 721–61. <https://doi.org/10.1257/aer.20191244>.
- Favilukis, Jack, Sydney C. Ludvigson, and Stijn Van Nieuwerburgh. 2017. “The Macroeconomic Effects of Housing Wealth, Housing Finance, and Limited Risk Sharing in General Equilibrium.” *Journal of Political Economy* 125 (1): 140–223. <https://doi.org/10.1086/689606>.
- Flodén, Martin, Matilda Kilström, Jósef Sigurdsson, and Roine Vestman. 2021. “Household Debt and Monetary Policy: Revealing the Cash-Flow Channel.” *Economic Journal* 131 (636): 1742–71. <https://doi.org/10.1093/ej/ueaa135>.
- Fonseca, Julia, and Lu Liu. 2023. “Mortgage Lock-In, Mobility, and Labor Reallocation.” SSRN Scholarly Paper, Rochester, NY. <https://doi.org/10.2139/ssrn.4399613>.
- Friedman, Milton. 1961. “The Lag in Effect of Monetary Policy.” *Journal of Political Economy* 69 (5): 447–66. <https://www.jstor.org/stable/1828534>.
- Gorea, Denis, Oleksiy Kryvtsov, and Marianna Kudlyak. 2022. “House Price Responses to Monetary Policy Surprises: Evidence from the U.S. Listings Data.” Working Paper 2022–16, Federal Reserve Bank of San Francisco, San Francisco. <https://www.frbsf.org/economic-research/publications/working-papers/2022/16/>.
- Gupta, Arpit, Vrinda Mittal, Jonas Peeters, and Stijn Van Nieuwerburgh. 2022. “Flattening the Curve: Pandemic-Induced Revaluation of Urban Real Estate.” *Journal of Financial Economics* 1462: 594–636. <https://doi.org/10.1016/j.jfineco.2021.10.008>.
- Hedlund, Aaron, Fatih Karahan, Kurt Mitman, and Serdar Ozkan. 2017. “Monetary Policy, Heterogeneity, and the Housing Channel.” Meeting Paper 1610, Society for Economic Dynamics. <https://econpapers.repec.org/paper/redsed017/1610.htm>.
- Huang, Haifang, and Yao Tang. 2012. “Residential Land Use Regulation and the US Housing Price Cycle between 2000 and 2009.” *Journal of Urban Economics* 71 (1): 93–99. <https://doi.org/10.1016/j.jue.2011.08.001>.
- Iacoviello, Matteo, and Stefano Neri. 2010. “Housing Market Spillovers: Evidence from an Estimated DSGE Model.” *American Economic Journal: Macroeconomics* 2 (2): 125–64. <https://doi.org/10.1257/mac.2.2.125>.
- Igan, Deniz, and Prakash Loungani. 2012. “Global Housing Cycles.” Working Paper 12/217, International Monetary Fund, Washington, DC. <https://www.imf.org/en/Publications/WP/Issues/2016/12/31/Global-Housing-Cycles-26229>.
- International Monetary Fund (IMF). 2022. “People’s Republic of China: Selected Issues: Household Savings and Its Drivers—Some Stylized Facts.” IMF Country Report 22/022, International Monetary Fund, Washington, DC. <https://doi.org/10.5089/9798400201486.002>.
- Jordà, Òscar. 2005. “Estimation and Inference of Impulse Responses by Local Projections.” *American Economic Review* 95 (1): 161–82. <https://doi.org/10.1257/0002828053828518>.
- Jordà, Òscar, Moritz Schularick, and Alan M. Taylor. 2015. “Betting the House.” In “37th Annual NBER International Seminar on Macroeconomics,” edited by Jeffrey Frankel, Hélène Rey, and Andrew Rose. Supplement, *Journal of International Economics* 96 (S1): S2–S18. <https://doi.org/10.1016/j.jinteco.2014.12.011>.
- Kaplan, Greg, Kurt Mitman, and Giovanni L. Violante. 2020. “The Housing Boom and Bust: Model Meets Evidence.” *Journal of Political Economy* 128 (9): 3285–345. <https://doi.org/10.1086/708816>.
- Keynes, John Maynard. 1936. *The General Theory of Employment, Interest and Money*. London: Macmillan.
- Kiyotaki, Nobuhiro, and John Moore. 1997. “Credit Cycles.” *Journal of Political Economy* 105 (2): 211–48. <https://doi.org/10.1086/262072>.
- Kuchler, Theresa, Monika Piazzesi, and Johannes Stroebel. 2023. “Housing Market Expectations.” In *Handbook of Economic Expectations*, edited by Rüdiger Bachmann, Giorgio Topa, and Wilbert Van der Klaauw, 163–91. Amsterdam: Elsevier. <https://doi.org/10.1016/B978-0-12-822927-9.00013-6>.
- Li, Wenli, and Yichen Su. 2023. “The Great Reshuffle: Residential Sorting during the COVID-19 Pandemic and Its Welfare Implications.” [https://papers.ssrn.com/sol3/papers.cfm?abstract\\_id=3997810](https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3997810).
- Mian, Atif, Kamalesh Rao, and Amir Sufi. 2013. “Household Balance Sheets, Consumption, and the Economic Slump.” *Quarterly Journal of Economics* 128 (4): 1687–726. <https://doi.org/10.1093/qje/qj020>.
- Mian, Atif, and Amir Sufi. 2009. “The Consequences of Mortgage Credit Expansion: Evidence from the U.S. Mortgage

- Default Crisis.” *Quarterly Journal of Economics* 124 (4): 1449–96. <https://doi.org/10.1162/qjec.2009.124.4.1449>.
- Mian, Atif, and Amir Sufi. 2018. “Finance and Business Cycles: The Credit-Driven Household Demand Channel.” *Journal of Economic Perspectives* 32 (3): 31–58. <https://doi.org/10.1257/jep.32.3.31>.
- Pica, Stefano. 2021. “Housing Markets and the Heterogeneous Effects of Monetary Policy across the Euro Area.” SSRN Scholarly Paper, Rochester, NY. <https://doi.org/10.2139/ssrn.4060424>.
- Saiz, Albert. 2010. “The Geographic Determinants of Housing Supply.” *Quarterly Journal of Economics* 125 (3): 1253–96. <https://www.jstor.org/stable/27867510>.
- Stock, James H., and Mark W. Watson. 2018. “Identification and Estimation of Dynamic Causal Effects in Macroeconomics Using External Instruments.” *Economic Journal* 128 (610): 917–48. <https://doi.org/10.1111/econj.12593>.
- van Binsbergen, Jules H., and Marco Grotteria. 2023. “Monetary Policy Wedges and the Long-Term Liabilities of Households and Firms.” SSRN Scholarly Paper, Rochester, NY. <https://doi.org/10.2139/ssrn.4457817>.
- Wong, Arlene. 2019. “Refinancing and the Transmission of Monetary Policy to Consumption.” Unpublished, Princeton Economics, Princeton University, Princeton, NJ.

