2. Macroprudential Policies and House Prices in Europe: An Overview of Recent Experiences

This chapter documents the increasing use of macroprudential policies (MaPPs) in Europe in recent years to build financial resilience, contain general and sectoral credit growth, and limit house price increases. Considering these objectives and drawing from case studies, the chapter finds evidence that borrower-side measures, supported by lender-side measures, helped limit the share of riskier mortgages, thereby building resilience. Evidence is more mixed as to the ability of MaPPs to contain house price and overall credit growth against the backdrop of a still-accommodative monetary policy and other factors.

Macroprudential Measures in European Countries

The recent reacceleration in house prices has prompted the adoption of MaPPs in several European countries. Though credit and house price concerns are not yet generalized, house prices have increased substantially in several European countries over the past few years (Figure 2.1).[1,2] In most of these countries, higher house prices have been accompanied by rising household debt (Figure 2.2) and rapid household credit growth (Figure 2.3).

To contain the buildup of systemic risks, especially in the residential housing market, many European countries have strengthened their MaPPs (Figure 2.4). While MaPPs have been implemented across Europe, countries with larger postcrisis increases in house prices and household debt tended to adopt more MaPPs (Figures 2.5, 2.6).

The main objectives of the recently introduced MaPPs, as stated by country authorities, were improving financial stability, building financial resilience, and containing general and sectoral credit growth. Within these broader objectives, policies were generally focused on protecting borrowers, strengthening banking systems, and slowing down house price increases (Figure 2.7). The latter was an objective in most economies, but particularly in the *Czech Republic, Estonia, Norway*, and *Sweden*.

In some countries (*Estonia, Norway, Switzerland*), the relaxation of lending standards was a major concern. Constraining the rise in the share of loans denominated in foreign currency was a prominent goal in *Hungary*. The various capital buffers adopted beginning in 2013, in line with the EU Capital Requirements Directive (CRD IV), were aimed at containing not only housing sector imbalances, but also credit cycle swings.

Reflecting these objectives, various macroprudential measures, with different design and calibration, were implemented across countries (Figure 2.8):

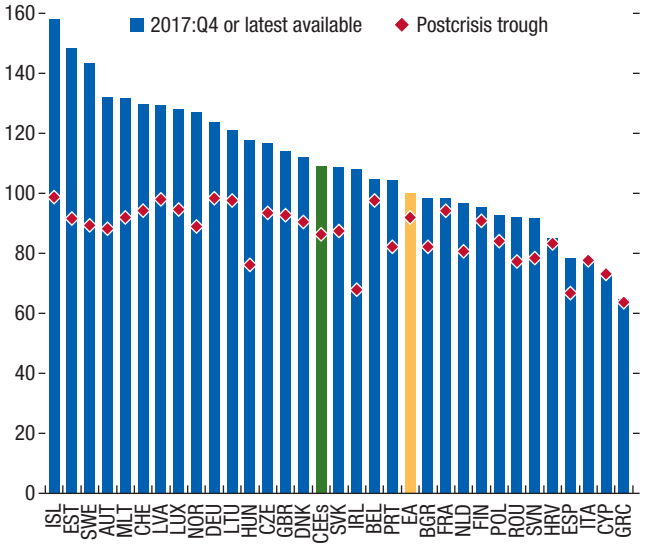
- Loan-to-value (LTV) caps. In response to the fast growth of mortgage lending, several countries introduced LTV caps ranging from 35 to 100 percent, but mostly between 60 and 95 percent. Caps are often differentiated, with less binding ceilings on primary residences (*Cyprus*), for first-time buyers (*Finland*, *Ireland*), or for mortgages with collateral, guarantees, or insurance (*Estonia*, *Latvia, Poland, Romania*). Mortgages in foreign currencies (*Hungary, Poland, Romania*) or for nonprimary residences in the capital city

This chapter was prepared by an IMF staff team composed of Cheikh Anta Gueye, Marco Arena, Tingyun Chen, Seung Mo Choi, Nan Geng, Tonny Lybek, and Evan Papageorgiou. The team was led by Thomas Dorsey and Cheikh Anta Gueye under the overall guidance of Jörg Decressin and Enrica Detragiache. Laura Papi provided useful advice and comments. Hannah Jung and Nomelie Veluz provided administrative support.

[1]Euro Area Policies—IMF Staff Report for the 2018 Article IV Consultation with Member Countries.

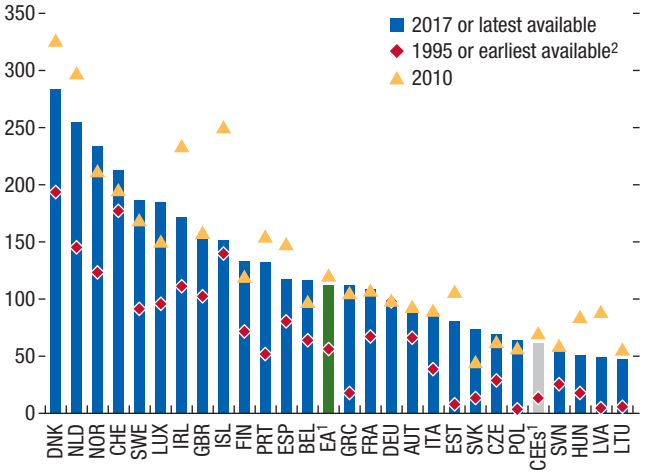
[2]There is evidence that growing household incomes and wealth, rising population, lower interest rates, and structural factors behind the uptrends in house prices. See Girouard and others (2006), Égert and Mihaljek (2007), Kholodilin and Ulbricht (2015), and Geng (2018).

Figure 2.1. Real House Price Index
(Index, 2010 = 100)



Sources: Country authorities; Haver Analytics; Organisation for Economic Co-operation and Development; and IMF staff calculations.

Figure 2.2. Household Debt
(Percent of household net disposable income)



Sources: Organisation for Economic Co-operation and Development; and IMF staff calculations.
[1]Due to data availability, CYP and MLT are excluded for EA average, and BGR, HRV, and ROU are excluded for CEE.
[2]Earliest available dates: IRL: 2001; LUX: 1999; ESP: 1999.

Note: AUT = Austria; BEL = Belgium; BGR = Bulgaria; CEEs = Central and Eastern European; CHE = Switzerland; CYP = Cyprus; CZE = Czech Republic; DEU = Germany; DNK = Denmark; EA = Euroarea; ESP = Spain; EST = Estonia; FIN = Finland; FRA = France; GBR = The United Kingdom; GRC = Greece; HRV = Croatia; HUN = Hungary; IRL = Ireland; ISL = Iceland; ITA = Italy; LVA = Latvia; LTU = Lithuania; LUX = Luxembourg; MLT = Malta; NLD = The Netherlands; NOR = Norway; POL = Poland; PRT = Portugal; ROU = Romania; SVK = Slovak Republic; SVN = Slovenia; SWE = Sweden.

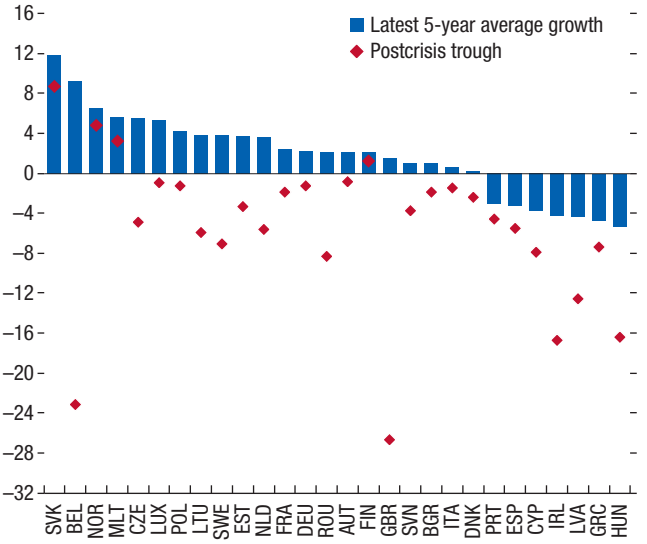
(*Norway*) are subject to more stringent caps. Since their initial adoption, LTV caps have been tightened in several countries (*Czech Republic, Netherlands, Norway, Poland, the Slovak Republic*).

- Debt-to-income (DTI)/loan-to-income (LTI) and debt service-to-income (DSTI) caps. To contain potential vulnerabilities in households' balance sheets, many countries have introduced either DTI/LTI or DSTI caps (the *Slovak Republic* adopted both LTI and DSTI caps). DSTI caps vary by borrower income level (*Czech Republic*, *Hungary*, *Poland*, *Portugal*, the *Slovak Republic*, *Slovenia*), currency of denomination (*Cyprus* and *Hungary*), LTV level (*Lithuania*), or interest fixing period/debt service frequency (*Hungary* and *Slovak Republic*). *Romania's* DSTI caps are determined by scenario analysis that considers currency, interest rate, and income risks. In the *Czech Republic*, *Ireland*, *Norway*, the *Slovak Republic*, the DTI/LTI caps were introduced as a complement to LTV caps. In the *United Kingdom*, only LTI caps have been implemented.

- Capital Requirements. So far, half of the EU countries have adopted the full Basel III capital conservation buffer (CB) of 2.5 percent of risk-weighted assets, while others are phasing it in gradually. All countries have introduced the countercyclical capital buffer (CCB), but only the *Czech Republic, France, Iceland, Norway*, the *Slovak Republic, Sweden, Switzerland*, and the *United Kingdom* have nonzero buffers. A total of 13 countries have adopted the systemic risk buffer (SRB).[3] Some countries have also imposed sectoral risk-weight floors on commercial real estate (*Croatia*, *Finland*, *Ireland*, *Norway*, *Romania*, *Sweden*) and residential mortgages (*Belgium*, *Croatia*, *Norway*, *Slovenia*, *Sweden*). Among this group, *Norway* and

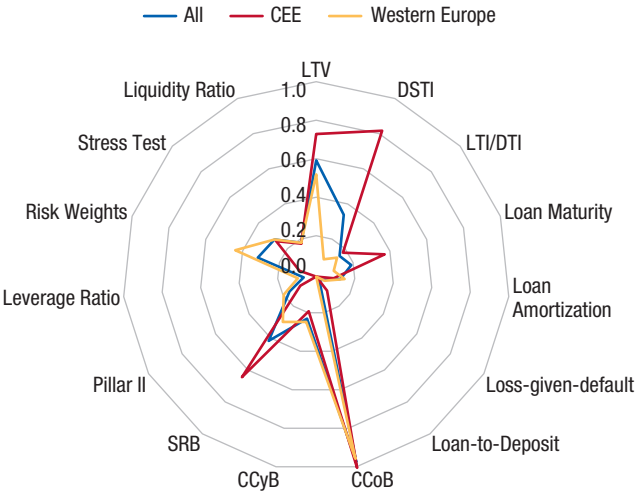
[3]In July 2017, Hungary introduced a systemic risk buffer for banks with large portfolios of nonperforming commercial real estate loans. At the end of 2017, only two banks were affected, and currently only one bank is subject to this charge. The initiative had been announced to give banks time to reduce their exposure.

Figure 2.3. Household Credit Growth
(Year-over-year percent change)



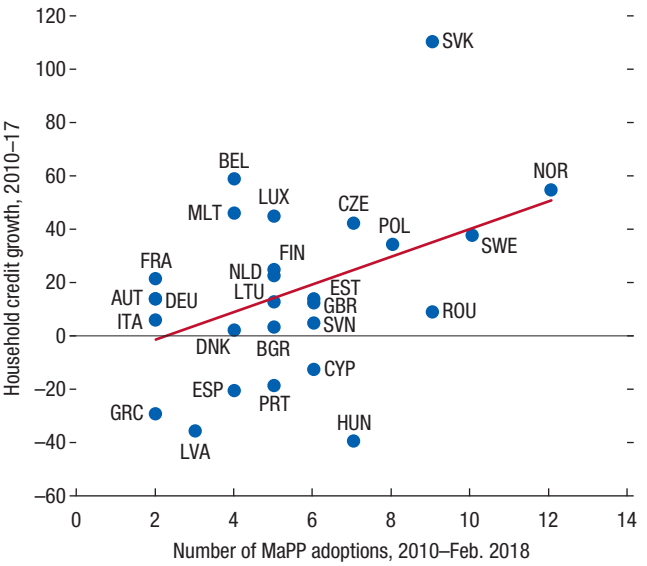
Sources: Eurostat; and Haver Analytics.

Figure 2.4. Adoption of Macroprudential Measures by Region
(Share of countries adopting the measures)



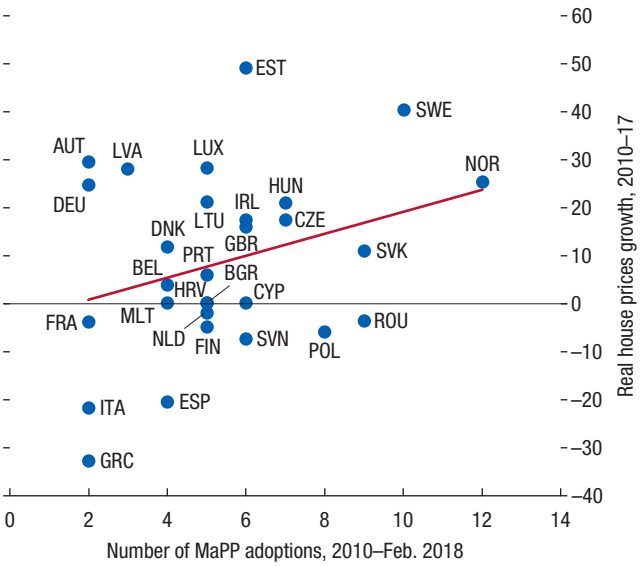
Sources: European Systemic Risk Board database; and IMF staff calculations.

Figure 2.5. Number of Measures and Change in Household Credit[1]



Sources: European Systemic Risk Board database; Eurostat; Haver Analytics; and IMF staff calculations.

Figure 2.6. Number of Measures and Change in House Prices[1]

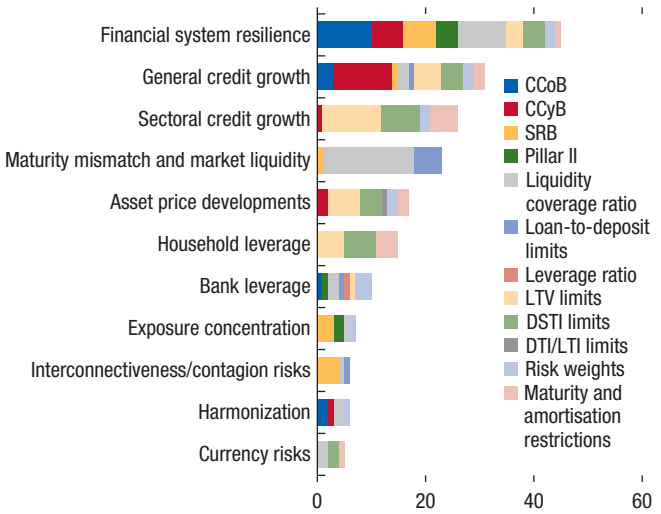


Sources: European Systemic Risk Board database; Organisation for Economic Co-operation and Development; and IMF staff calculations.

Note: AUT = Austria; BEL = Belgium; BGR = Bulgaria; CYP = Cyprus; CZE = Czech Republic; DEU = Germany; DNK = Denmark; ESP = Spain; EST = Estonia; FIN = Finland; FRA = France; GBR = The United Kingdom; GRC = Greece; HUN = Hungary; IRL = Ireland; ITA = Italy; LVA = Latvia; LTU = Lithuania; LUX = Luxembourg; MLT = Malta; NLD = The Netherlands; NOR = Norway; POL = Poland; PRT = Portugal; ROU = Romania; SVK = Slovak Republic; SVN = Slovenia; SWE = Sweden.
[1]Comparability of number of policies implemented across countries might not be possible in all cases since some countries implement MaPP as packages, for example, Denmark.

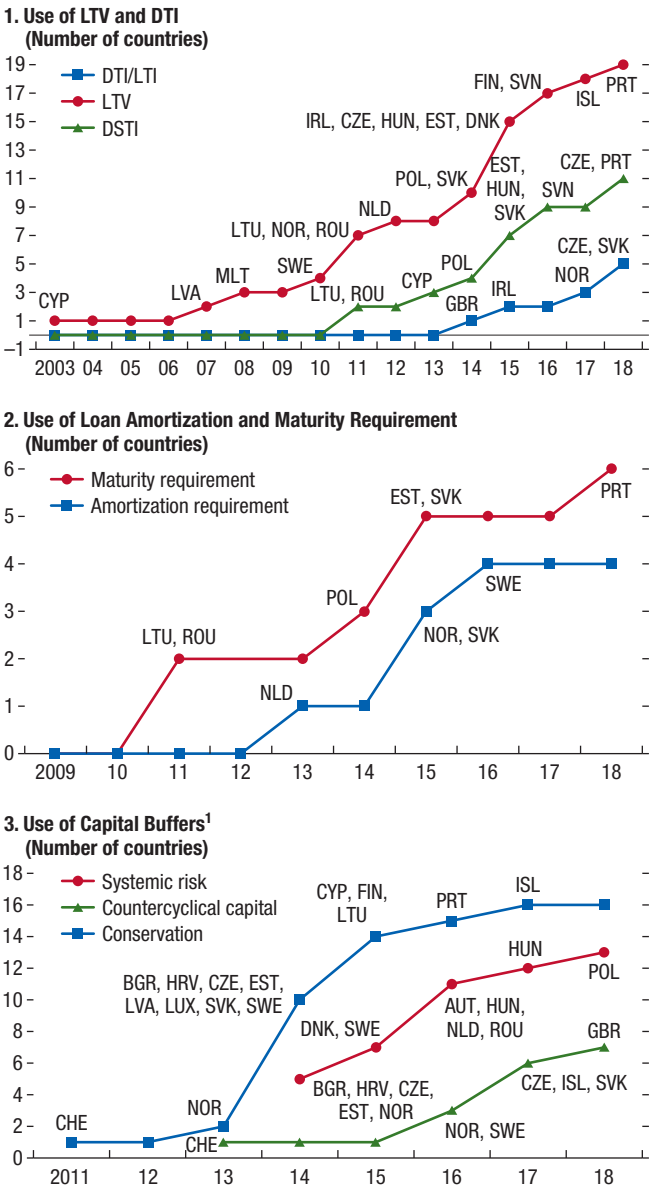
Sweden have applied the most measure, and their required aggregate capital buffers are among the highest in Europe. *Poland* has imposed a risk weight of 150 percent on foreign-exchange-denominated household mortgages.

Figure 2.7. Policy Objectives
(Number of measures)



Sources: European Systemic Risk Board database; and IMF staff calculations.

Figure 2.8. Adoption of Key Macroprudential Measures
(As of July 2018)



Sources: European Systemic Risk Board database; and IMF staff calculations.
[1]Countries with full implementation of capital conservation buffer of 2.5 percent is shown in the figure. The rest have adopted the measure which is gradually phasing in. All countries have adopted countercyclical buffers, but only countries that appear here have adopted non-zero buffers. Finland adopted SRB in June 2017, but it will not be activated until July 2019.

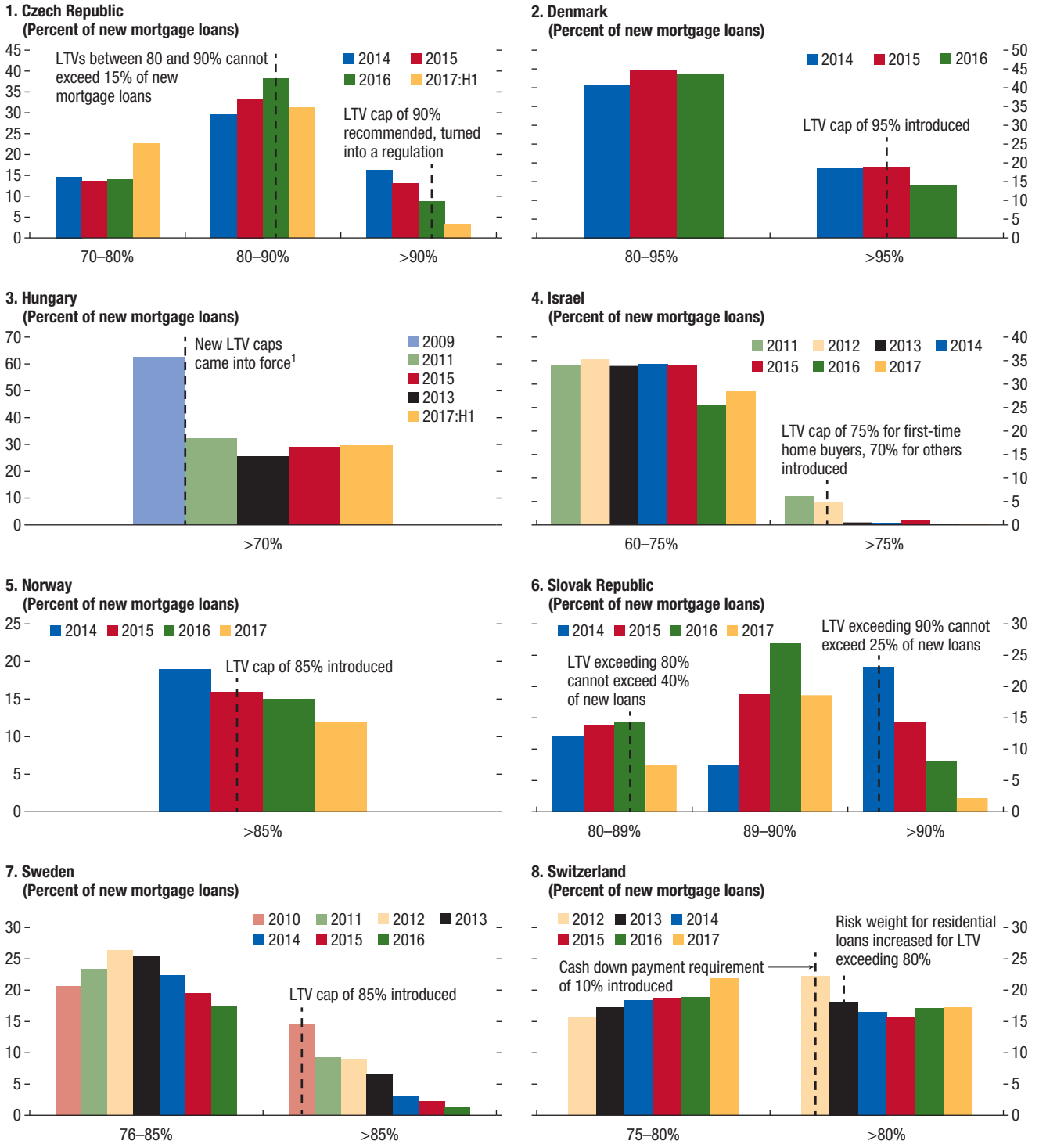
What We Learned from Country Experiences

Thoroughly assessing the effectiveness of MaPPs is challenging. A simple before-after comparison suggests that the introduction of borrower-based MaPPs, supported by lender-based measures, influenced the dimensions directly targeted by the measures, while their impact on house prices and overall credit growth was mixed. That said, a more conclusive evaluation of the effects of these policies has to await the completion of a full economic and financial cycle. In addition, country experiences indicate that circumvention needs to be addressed.

In this section, we draw on eight case studies to assess the MaPPs' effectiveness by analyzing the evolution of the specific target variables these measures were meant to affect, as well as the dynamics of house prices and credit. Analysis of the relative effectiveness of different macroprudential instruments/measures is beyond the scope of this chapter.

Figure 2.9. Share of High LTV Loans in Selected Countries

After limits on LTV ratios were imposed, the share of mortgage loans with LTVs exceeding these limits has decreased in the Czech Republic, Israel, Norway, Slovak Republic, Sweden, and Switzerland.



Sources: Bank of Israel; Central Bank of Hungary; Czech National Bank; Danmarks Nationalbank; Finansinspektionen; National Bank of Slovakia; the Norwegian FSA; Swiss National Bank; and IMF staff calculations.

[1]Effective March 2010, the following maximum LTV (loan-to-value) ratios came into force: 75 percent for retail mortgages in domestic currency, 60 percent for euros and 45 percent for other currencies. The ratios were 5 percentage points higher on loans for residential leasing. The LTV caps on retail mortgage loans have since been adjusted to, respectively 80 percent, 50 percent, and 35 percent. Regarding financial leases, 5 percentage points higher LTV limits can be applied.

Impact on Riskier Mortgages

Macroprudential measures had some effects on reducing high-LTV mortgage loans to households (Figure 2.9):[4]

- ***Czech Republic.*** Macroprudential measures included lender-based measures (CB at 2.5 percent, CCB at 1 percent, and SRB ranging within 1 to 3 percent) in place since 2014, as well as a tightening of the maximum recommended LTV ratio in the second quarter of 2017. Their implementation was followed by a clear decline in the share of new mortgages with LTVs above 80 percent and an increase in those with an LTV between 70 and 80 percent. This outcome, however, should be assessed carefully as it may have been partly offset by a more favorable valuation of collateral. Meanwhile, debt-servicing and loan-to-income ratios did not show a meaningful improvement over the period.
- ***Denmark.*** Restrictions on the borrowing capacity of households relative to their disposable income and their interest rate sensitivity have been in effect since 2014. A consumer protection clause was introduced in 2015 mandating at least a 5 percent down payment for residential real estate purchases, translating into a 95 percent maximum LTV. After these measures, the share of new borrowers with LTV above 95 percent declined markedly, while the share of borrowers with LTV between 80 and 90 percent declined slightly. These measures were supplemented by guidelines on good business practices for housing credit (2017), which helped increase the resilience of borrowers, for instance by promoting a higher share of fixed-rate mortgages, and by limiting excessive leverage by households with lower incomes.
- ***Hungary.*** Since the global financial crisis, the authorities have been implementing a variety of borrower-based MaPPs. In March 2010, 75/60/45 percent maximum LTV ratios were adopted for mortgage loans denominated in, respectively, local currency, euros, and other currencies. In early November 2014, the central bank and the banks' association agreed on a fast and orderly conversion of foreign exchange mortgage loans to local currency, in order to reduce the exposure of household balance sheet to exchange rate risk. Beginning in 2015, the maximum LTV ratios were, respectively, 80, 50, and 35 percent and were complemented with payment-to-income ratios (PTIs, akin to DSTIs). For borrowers with a net monthly income below Ft 400,000 (about €1,250), the PTI ratios are 50/25/10 percent. For borrowers with a higher income, the ratios are 60/30/15 percent. Effective October 2018, and to be further tightened beginning in July 2019, the PTI ratios have been modified to encourage longer interest rate fixing periods. In April 2017, the mortgage funding adequacy ratio was introduced to ensure stable long-term funding for long-term mortgage lending. The above measures—together with the central bank certified consumer-friendly housing loans introduced in 2017—have likely helped the quality and sustainability of housing loans. The share of new housing loans with an LTV ratio over 70 percent more than halved, to about 30 percent in the first half of 2017, compared with 2009. Also, the authorities' assessment is that "the regulations contribute to preventing excessive household indebtedness and to mitigating banks' future losses" (MNB 2017, page 11).
- ***Norway.*** In response to high house prices and growing household debt, the authorities implemented higher capital and liquidity requirements (CB, CCB, SRB, domestically systemic important institutions [D-SIISs]), leverage ratios in 2013–17, and borrower-based measures targeted to the mortgage market (LTV limit, DTI limit, amortization requirements). Following the implementation of the LTV cap, the share of new loans with an LTV ratio above 85 percent has declined. The DTI measure that went

[4]The definitions of LTV, DTI, and DSTI vary widely within the European Union.

into effect at beginning of 2017 also led to a decline of about 7 percentage points in the share of new mortgages with a DTI cap of more than 500 percent in 2016. This share was 2 percent in 2017.

- ***Israel.*** Measures included LTV caps adopted in November 2012 (75 percent for first-time buyers and 50 percent for mortgages for investment properties) and an increase in risk weights adopted in March 2013 (to 50 percent for those with an LTV ratio of 45–60 percent, and to 75 percent for those with an LTV ratio above 60 percent). The measures appear to have been effective, as the proportion of new mortgages with an LTV of more than 75 percent declined from 6 percent in October 2012 to 0.5 percent by February 2014, and the proportion of mortgages with an LTV between 60 and 75 percent also declined modestly. A significant drop in the latter in 2016 likely related to new regulatory requirements fully implemented in 2015 and to fiscal measures that aim to discourage investor demand.
- ***The Slovak Republic.*** Several MaPPs have been introduced to contain increasing household indebtedness, high concentration of residential mortgages in bank portfolios, and rapidly growing house prices. LTV measures implemented in 2014 and the recent decision to set the CCB to 0.5 percent have helped to improve lending standards and credit quality. Specifically, the share of new loans with an LTV ratio of more than 90 percent fell to below 20 percent by the second quarter of 2015 and continued to decline to 6.3 percent by the third quarter of 2016. The proportion of new mortgages with an LTV ratio of 80 to 90 percent initially increased but has since come down noticeably.
- ***Sweden.*** To counteract unhealthy lending practices and strengthen consumer protection, the authorities introduced a mortgage cap in 2010, mandating that new mortgage loans not exceed 85 percent of the value of the home. The share of high-LTV mortgages declined after these measures. In addition, a study by the authorities using a difference-in-differences approach found that households limited by the mortgage cap borrowed approximately 13 percent less and purchased homes that were approximately 10 percent less expensive than they would have otherwise (Finansinspektionen 2017). The mortgage cap has had the greatest effect outside the metropolitan regions.
- ***Switzerland.*** Facing strong and prolonged growth in house prices, risk weights were raised for the part of a residential mortgage in excess of an 80 percent LTV ratio at the beginning of 2013. The proportion of new mortgages with an LTV ratio higher than 80 percent declined by about 5 percentage points in 2013. In addition, *Switzerland* was the first country in Europe to activate the CCB in 2013, targeting mortgage-backed positions secured by residential property. The buffer was set at 1 percent initially and raised to 2 percent in 2014. Following these measures, capital-constrained or mortgage-intensive banks raised their mortgage rates, and as a result, new mortgage loans were shifted to better-capitalized and less-mortgage-intensive institutions.

Impact on House Prices and Credit Growth

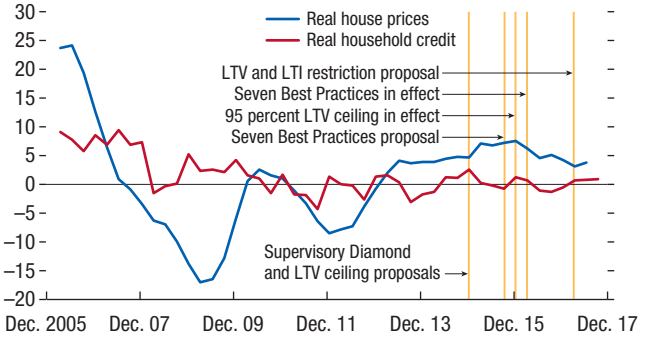
Our assessment, however, provides a more mixed picture of the impact of macroprudential measures on house prices and overall credit growth (Figure 2.10). In some countries (for example *Denmark*), house price growth on a national level was not accompanied by rapid growth in bank credit. Thus, measures that targeted mortgage credit were not likely to affect house price dynamics in these countries. In addition, circumvention may have played a role in some cases (see next section).

In *Switzerland*, following several macroprudential measures, real estate price growth and the pace of mortgage lending have gradually eased. In

Figure 2.10. MaPPs, Household Credit Growth, and House Prices in Select Countries

Among other factors, measures in 2014–15 may have contributed in moderating credit growth.

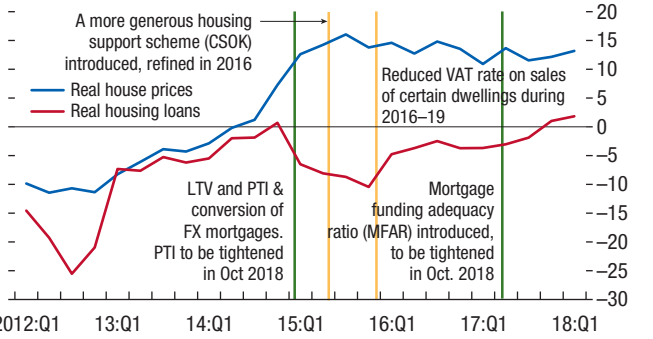
1. Denmark: House Prices and Household Credit
(Year-over-year percent change)



Sources: Statistics Denmark; and IMF staff calculations.

House price growth in Hungary appears to have stabilized, following the measures.

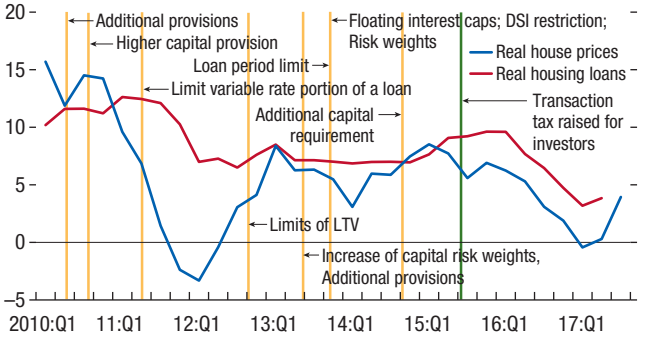
2. Hungary: House Prices and Housing Loans
(Year-over-year percent change)



Sources: Hungarian Central Bank; Hungarian Ministry for National Economy; and IMF staff calculations.

Growth rate of house prices has decelerated since late 2016, reflecting changes in the regulatory requirements since 2015 and some fiscal measures ...

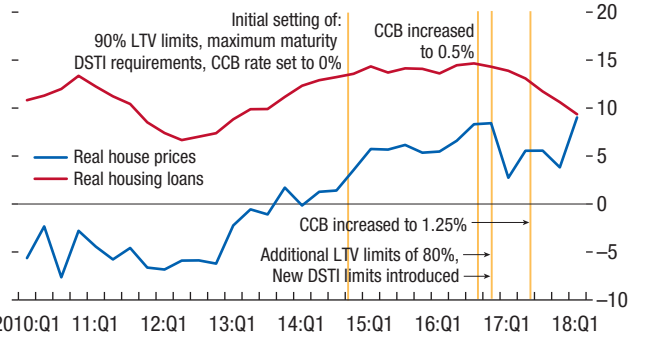
3. Israel: House Prices and Housing Loans
(Year-over-year percent change)



Source: Bank of Israel.

... while the impact of measures in the Slovak Republic on credit growth seems to have been limited.

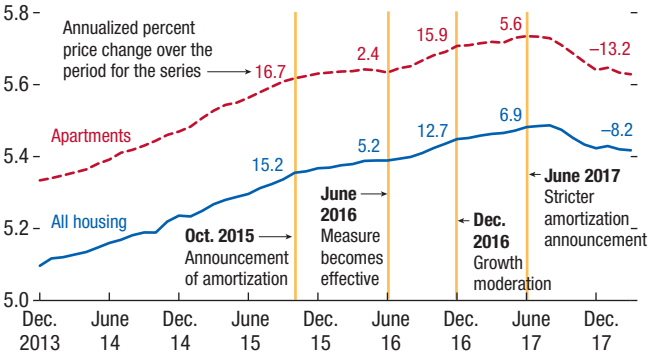
4. Slovak Republic: House Prices and Housing Loans
(Year-over-year percent change)



Sources: Haver Analytics; and National Bank of Slovakia.

Sweden's amortization requirement measures seem to have dampened house prices at least initially, but other factors such as prospects for increased housing supply may have also played a role.

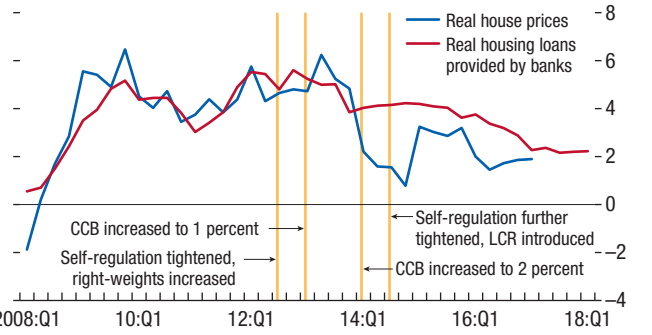
5. Sweden: Amortization Measure Effect on Property Prices
(SA, index level, in logarithm)



Sources: OMX Valueguard; and IMF staff calculations.

MaPPs have had a lasting moderating effect on the level of household debt, but only a transitory impact on the level of house prices in Switzerland.

6. Switzerland: House Prices and Housing Loans
(Year-over-year percent change)



Sources: Haver Analytics; IMF Global Housing Watch; and IMF staff calculations.

contrast, house prices in the *Czech Republic*, *Hungary*, and the *Slovak Republic* continued to grow rapidly after macroprudential measures were introduced, though the measures may have helped to contain faster increases. In *Israel*, credit to households continued to rise gradually relative to GDP, even as MaPP succeeded in reducing the share of risky loans. House prices—which were not a MaPP target in this case—continued to rise, partly reflecting low interest rates and housing supply impediments. A deceleration in house prices observed since late 2016 reflects a combination of proposed fiscal measures to discourage investor demand, a rise in mortgage interest rates linked to capital surcharges on mortgage lending, and market uncertainty associated with the Buyer's Price program. In *Norway*, the impact on house prices appears to have been only transitory. This is also in line with the recent experience of *Sweden*, where amortization requirements and LTV requirements curbed credit growth, but had less of an impact on house prices. Amortization requirement measures seem to have dampened house prices at least initially, but other factors, such as prospects for increased housing supply, may have also played some role.[5]

While a simple before-after analysis shows that in a number of cases house prices and credit growth trends did not appear to change after the implementation of MaPP measures, a deeper assessment using counterfactual analysis indicates that macroprudential measures may have contributed to contain household credit and house price growth in *Norway* and *Sweden* (Box 2.1), although counterfactual paths are imprecisely estimated.

Further Considerations for Effectiveness: Circumvention and Interaction with Other Policies

There is evidence that macroprudential measures were partly circumvented by nonbank financing and other avenues in some countries. For instance Dimova, Kongsamut, and Vandenbussche (2016) show that some measures imposed on banks in *Bulgaria* and *Romania* to contain credit growth before the global financial crisis were partly circumvented through loan booking with nonbank financial institutions.

More recently, in *Switzerland*, mortgage loans by pension funds and insurance companies, albeit small, are growing faster than bank mortgage loans, warranting careful monitoring. In the *Czech Republic*, consumer credit may have substituted for mortgages. Fortunately, jurisdictions are seeking to broaden the application of MaPPs to avoid circumvention. Recently, *Iceland* introduced a binding LTV for new mortgage loans applicable to all institutions providing mortgages (July 2017). The *Slovak Republic* also introduced binding limits on the DSTI ratio (80 percent) and on the maturity (eight years) for new consumer loans, which apply to all providers, whether domestic or foreign.

Cross-border loans have also been an avenue for circumvention.[6] For instance, *Estonia* implemented several macroprudential measures in the mid-2000s during the financial upswing, which are believed to have been less effective due to cross-border circumvention (Kang and others 2017; and Sutt, Korju, and Siibak 2011). This led to the creation of networks among the authorities in the region to, among other objectives, counter circumvention (for example the Nordic-Baltic Macroprudential Forum [Farelius and Billborn 2016]). Currently, within the countries that belong to the European Systemic Risk Board (ESRB) there is a framework to ensure that the macroprudential instruments envisioned under the European CRR/CRD IV directive are reciprocated, and indeed reciprocation

[5]Næss-Schmidt and others (2017).

[6]Kang and others (2017) find evidence of cross-border circumvention in European countries. Also, Cerutti, Claessens, and Laeven (2015), Akinci and Olmstead-Rumsey (2015), Reinhardt and Sowerbutts (2015), and Buch and Goldberg (2017) broadly find that macroprudential tightening is associated with lower domestic credit but often with higher cross-border borrowing. Choi, Kodres, and Lu (2018) document unintended consequences of macroprudential measures in a cross-country setup.

has occurred in several instances.[7,8] However, reciprocity of other instruments, including LTV and DTI limits, remains voluntary.

Supplementing MaPPs with other policies could also help their effectiveness. MaPPs have a stronger effect when reinforced by monetary policy (Gambacorta and Murcia 2017), but monetary policy needs to target price stability. Therefore, it may not be always available to support MaPPs and, at times, may even operate in the opposite direction. Nonetheless, several policy instruments in addition to MaPPs affect the housing market and have been used in the countries under study. For instance, in *Hungary*, covered bond funding was restricted to low-LTV loans after the crisis to improve the stability of banks' funding sources (IMF 2011). Similarly, the reduction in the scope of mortgage interest tax deductibility planned in *Denmark*, *Finland*, *Netherlands*, and *Sweden* will help contain imbalances in the housing market.[9] Taxes on real estate ownership or transactions can be also used to pursue policy goals like those of MaPPs. For instance, in *Israel*, a proposed tax on owners of more than two apartments likely resulted in a decline in housing transactions in 2017 (Baudot-Trajtenberg, Tzur-Ilan, and Frayberg 2018).

Conclusions and Policy Lessons

With monetary policy remaining accommodative in most countries and house prices on the rise, many European countries have stepped up the implementation of MaPPs. Among the most-used measures are borrower-side measures (LTVs, DTIs/LTIs, stepped-up amortization requirements) as well as bank capital requirements (countercyclical capital buffers, systemic risk buffers, systematically financial institution buffers, floors on risk weights). While some countries have introduced a comprehensive set of measures, potential leakages and circumvention seem to pose challenges, as even borrower-based measures are not always applied to all types of loans.

There is evidence that borrower-side measures, supported by lender-based measures, help limit the share of riskier mortgages, which makes economies more resilient. Specifically, in most countries following the introduction of MaPPs, the growth of high-LTV mortgages slowed down, suggesting that the measures may have been helpful. But whether MaPPs can contain the formation of house price and credit bubbles as monetary policy remains accommodative is more difficult to establish. In some countries, household credit and house price growth slowed down following the introduction of borrower-based measures, but in other cases they did not. Implementation of MaPPs is recent, and most countries have not gone through a full economic and financial cycle, so a comprehensive evaluation of the effects of these policies is still premature. Another open question is to what extent countries should rely on MaPPs rather than on complementary policy instruments (that is, tax policy, mortgage interest deductibility, zoning, construction, and planning restriction), which can also have strong effects on the housing and credit markets. The answer, presumably, should be a function of the specific forces that are driving excessive lending and house price increases.

[7]The ESRB goes beyond CRR/CRD IV to recommend the reciprocation of buffer rates higher than 2.5 percent (ESRB 2018).

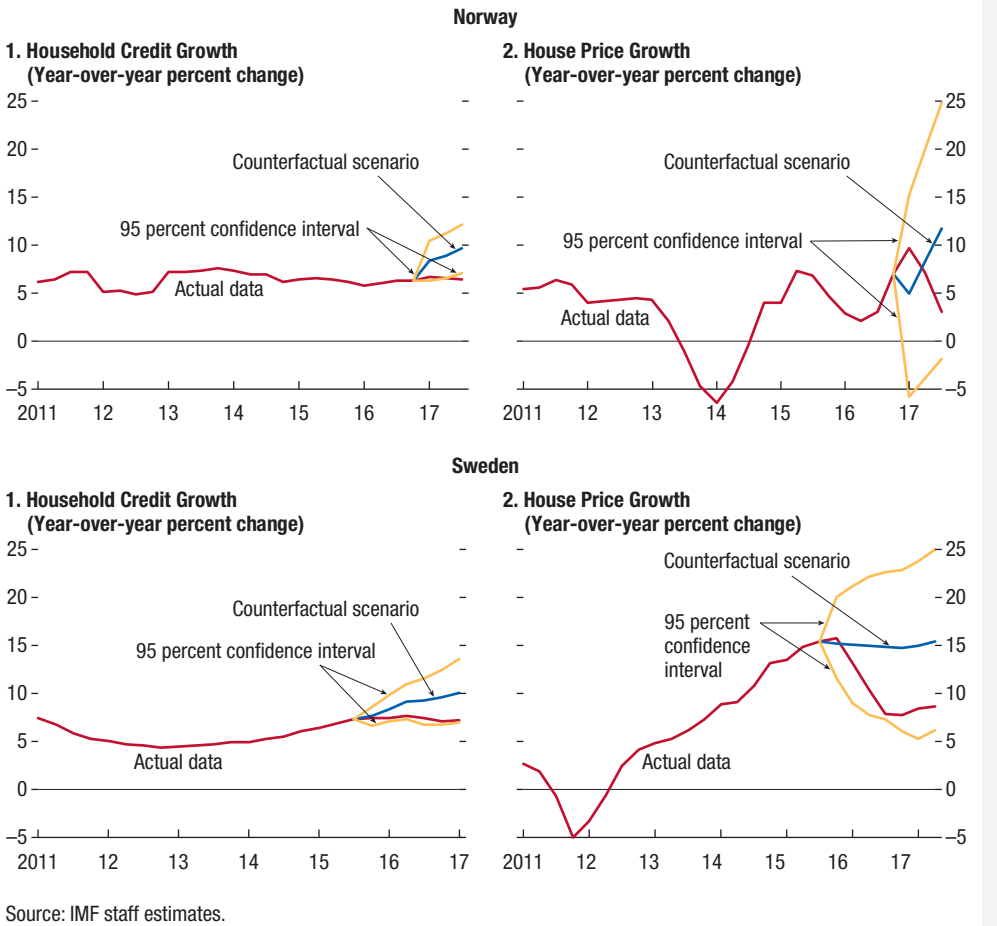
[8]In terms of implementation, 14 member states reciprocated the Estonian risk buffer in 2016. Nine member states reciprocated the Belgian national flexibility measure in 2016 (5 percentage point risk weight add-on applied to Belgian mortgage loan exposures of credit institutions using the internal ratings based [IRB] approach). Also, in late 2017, the Finnish national flexibility measure (a credit-institution-specific average risk weight floor of 15 percent for IRB banks, at the portfolio level, of residential mortgage loans secured by housing units in Finland) was recommended by the ESRB for reciprocation. See ESRB (2018).

[9]See IMF (2018a) for Denmark, IMF (2018b) for the Netherlands, and IMF (2017a) for Sweden, for discussions on mortgage interest deductibility.

Box 2.1. The Impact of Macroprudential Policies in Norway and Sweden—Counterfactual Analysis

To assess the effectiveness of macroprudential policy (MaPP) measures, counterfactual analysis is used to gauge the impact of MaPPs specifically targeted at the housing market on containing household credit in *Norway* and *Sweden*. Following Price (2014), we estimated the effectiveness of these measures by projecting counterfactual growth rates of household credit and house prices using data from the first quarter of 2003 for *Norway* and from the first quarter of 1981 in the case of *Sweden*. The estimation proceeded in two steps. First, a vector autoregression model was estimated consisting of housing-specific variables (household credit growth, house price growth, housing starts/completions, house sales) and macroeconomic variables (household income growth, output gap, net immigration rate, population growth, mortgage interest rate) using data prior to the implementation of the measures. Second, based on model predictions, the dynamics of housing-specific variables were projected conditional on the actual behavior of macroeconomic variables in the periods after the measures became effective.

Figure 2.1.1. The Impact of MaPPs on Household Credit Growth in Norway and Sweden—Counterfactual Analyses



Source: IMF staff estimates.

Box 2.1 *(continued)*

The analysis suggests that household credit growth would have been higher without the measures, but statistical significance is borderline. Actual credit growth paths are found to remain below counterfactuals in both cases, with the difference becoming statistically significant at the 95 percent confidence level in *Norway* starting several quarters after the introduction of MaPPs. In *Sweden*, actual credit growth is close to—but still within—the lower bound of the confidence interval. Not surprisingly, MaPPs appear to affect house prices and household credit with delays, so over time the mitigating impact may become larger. Turning to house prices, counterfactuals are above actual values in *Sweden*, but not significantly so. In *Norway*, the difference is positive only in 2017, and the estimated confidence interval is very large. While these results are suggestive of some effect on household credit, they should be interpreted with care, bearing in mind the relatively short time since the implementation of some measures and the well-known empirical challenge in isolating the impact of policy changes from that of other intervening factors

References

Akinci, Ozge, and Jane Olmstead-Rumsey. 2015. "How Effective Are Macroprudential Policies? An Empirical Investigation." International Finance Discussion Paper 1136, Board of Governors of the Federal Reserve System, Washington, DC.

Baudot-Trajtenberg, Nadine, Nitan Tzur-Ilan, and Roi Frayberg. 2018. "Assessing the Impact of Macroprudential Tools: The Case of Israel." BIS Papers No 94, Bank for International Settlements. Basel.

Buch, Claudia M., and Linda S. Goldberg. 2017. "Cross-Border Prudential Policy Spillovers: How Much? How Important? Evidence from the International Banking Research Network." *International Journal of Central Banking* 13 (S1): 505–58.

Cerutti, Eugenio, Stijn Claessens, and Luc Laeven. 2015. "The Use and Effectiveness of Macroprudential Policies: New Evidence." IMF Working Paper 15/61, International Monetary Fund, Washington, DC.

Choi, Seung Mo, Laura Kodres, and Jing Lu. 2018. "Friend or Foe? Cross-Border Linkages, Contagious Banking Crises, and 'Coordinated' Macroprudential Policies." IMF Working Paper 18/9, International Monetary Fund, Washington, DC.

Claessens, Stijn, Swati R. Ghosh, and Roxana Mihet. 2013. "Macro-Prudential Policies to Mitigate Financial System Vulnerabilities." *Journal of International Money and Finance* 39: 153–85.

Dimova, Dilyana, Piyabha Kongsamut, and Jérôme Vandenbussche. 2016. "Macroprudential Policies in Southeastern Europe." IMF Working Paper 16/29, International Monetary Fund, Washington, DC.

Égert, Balázs, and Dubravko Mihaljek. 2007. "Determinants of House Prices in Central and Eastern Europe." BIS Working Paper 236, Bank for International Settlements, Basel.

European Systemic Risk Board (ESRB). 2018. "A Review of Macroprudential Policy in the EU in 2017." Frankfurt.

Farelius, David, and Jill Billborn. 2016. "Macroprudential Policy in the Nordic-Baltic Area." *Sveriges Riksbank Economic Review* 1: 133–46.

Finansinspektionen. 2017. "Amortisation Requirement Reduced Household Debt." *FI Analysis* (April): 10.

Gambacorta, Leonardo, and Andrés Murcia. 2017. "The Impact of Macroprudential Policies and Their Interaction with Monetary Policy: An Empirical Analysis Using Credit Registry Data." BIS Working Paper 636, Bank for International Settlements. Basel.

Geng, Nan. 2018. "Fundamental Drivers of House Prices in Advanced Economies." IMF Working Paper 18/164, International Monetary Fund, Washington, DC.

Girouard, Nathalie, Mike Kennedy, Paul van den Noord, and Christophe André. 2006. "Recent House Price Developments: The Role of Fundamentals." OECD Economics Department Working Paper 475, Organisation for Economic Co-operation and Development, Paris.

International Monetary Fund (IMF). 2011. "Macroprudential Policy: An Organizing Framework." IMF Policy Paper, Washington, DC.

———. 2013. "Key Aspects of Macroprudential Policy." IMF Policy Paper, Washington, DC.

———.2014. "Staff Guidance Note on Macroprudential Policy—Detailed Guidance on Instruments." Washington, DC.

———. 2017a. *Sweden: 2017 Article IV Consultation*. IMF Country Report No. 17/350.Washington, DC

———. 2017b. "Increasing Resilience to Large and Volatile Capital Flows: The Role of Macroprudential Policies." IMF Policy Paper, Washington, DC.

———. 2018a. *Denmark: 2018 Article IV Consultation*. IMF Country Report 18/177, Washington, DC.

———. 2018b. *Kingdom of the Netherlands: 2018 Article IV Consultation*. IMF Country Report 18/130, Washington, DC.

Kang, Heedon, Francis Vitek, Rina Bhattacharya, Phakawa Jeasakul, Sònia Muñoz, Naixi Wang, Rasool Zandvakil. 2017. "Macroprudential Policy Spillovers: A Quantitative Analysis." IMF Working Paper 17/170, International Monetary Fund, Washington, DC.

Kholodilin, Konstantin A., and Dirk Ulbricht. 2015. "Urban House Prices: A Tale of 48 Cities." *Economics: The Open-Access, Open-Assessment E-Journal* 9 (28): 1–43.

Magyar Nemzeti Bank (Hungarian Central Bank, MNB). 2017. "Macroprudential Report." Budapest.

Næss-Schmidt, Sigurd, Jonas Bjarke Jensen, Christian Heebøll, and Palle Søre. 2017. *The Role of Macroprudential Policy in Sweden*. Copenhagen: Copenhagen Economics.

Price, Gael. 2014. "How Has the LVR Restriction Affected the Housing Market: A Counterfactual Analysis." Reserve Bank of New Zealand Analytical Notes AN2014/03, Wellington.

Reinhardt, Dennis, and Rhiannon Sowerbutts. 2015. "Regulatory Arbitrage in Action: Evidence from Banking Flows and Macroprudential Policy." Bank of England Working Paper 546, London.

Sutt, Andres, Helen Korju, Kadri Siibak. 2011. "The Role of Macro-Prudential Policies in the Boom and Adjustment Phase of the Credit Cycle in Estonia." Policy Research Working Paper WPS 5835, World Bank, Washington, DC.