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Recent advances in the literature on capital flow management

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No 317

Contents

Abstract

Large swings in cross-border capital flows can have consequences for domestic stability and open a channel for the transmission of shocks and spillovers across economies, including the euro area. Against this backdrop, the present paper reviews new evidence for the effectiveness of capital flow management policies in achieving macroeconomic and financial stability. Particular attention is paid to literature that has been used by the International Monetary Fund (IMF) to underpin its so-called Integrated Policy Framework, in which the roles of monetary, exchange rate, macroprudential and capital flow management policies are considered jointly.

The literature published since the global financial crisis continues to affirm the effectiveness of capital flow management measures (CFMs) in addressing financial stability risks resulting from capital flow reversals; at the same time, however, it also continues to underscore that such policies should not substitute for warranted economic adjustments and structural reforms. Even so, recent literature also provides a case for considering, under certain circumstances, “precautionary” CFMs which could be applied to capital inflows to prevent a boom-and-bust cycle from being set in motion. This paper also highlights the need for further work on the long-term effects of such precautionary instruments, as well as their joint use with monetary policy instruments.

Regarding capital flow management policies within the domain of central banks, the literature points to the usefulness of foreign exchange interventions (FXIs) in mitigating financial stability risks in countries with specific characteristics such as currency mismatches, borrowing constraints and shallow foreign exchange markets that are common to emerging market and developing economies alike. However, the literature also warns that such measures may reduce economic agents’ incentives to hedge against currency risks, with the result that unfavourable initial conditions become further entrenched. More research is therefore needed to better understand the long-run effects of FXIs with respect to financial development and central bank credibility.

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Executive summary

It has long been acknowledged that, while global financial integration delivers sizeable benefits through international risk sharing, it also comes with risks that leave some countries susceptible to sudden capital flow reversals. The traditional view was that such risks should be managed through a combination of sound stability-oriented macroeconomic policies, strong institutional frameworks and financial development without frequently having to resort to measures that limit the free flow of capital. The latter were often seen as measures of last resort to be applied when policy space for using traditional macroeconomic policies became limited (see, for example, Broos et al., 2016).

However, recent experience and advances in the literature have prompted a rethink of the appropriate policy mix. Given that countries have been implementing capital flow management policies with increasing frequency, policymakers' experience of the potential benefits and drawbacks has grown apace. The literature has likewise advanced our understanding of the role of specific characteristics that are common both to emerging markets and to developing economies (e.g. currency mismatches, borrowing constraints, shallow foreign exchange markets) in driving economic and financial stability outcomes in the presence of volatile capital flows. The combination of practical and theoretical advances has led to calls among policymakers for a more flexible approach to capital flow management. In particular, the concept has been put forth of including in policymakers' toolkit precautionary measures that could be applied to capital inflows to prevent boom-and-bust cycles. For example, the International Monetary Fund (IMF), in its review of the "Institutional View on the Liberalization and Management of Capital Flows" published in March 2022, underscored that capital flow management measures (CFMs) may be useful for addressing financial stability risks in a pre-emptive manner (IMF, 2022), potentially avoiding the build-up of stock vulnerabilities, notably currency mismatches, that conventional policy instruments might not address effectively.

Although the European System of Central Banks (ESCB) has always underscored the potential benefits of financial openness, it has also recognised that large swings in cross-border flows can affect domestic stability. European Union Member States have opted for totally free, non-discriminatory capital mobility while reaping significant benefits from this option in recent decades. At the same time, with increasing global financial integration, the ESCB has also recognised that central banks must consider the impact of financial openness both on macro-financial dynamics and on the transmission mechanisms through which monetary policy operates (Lane, 2019).

Large swings in cross-border capital flows can have consequences for domestic stability and open a channel for the transmission of shocks and spillovers across economies, including the euro area. The euro area can in fact be affected by emerging market developments – via either the trade channel,

financial spillovers or global confidence effects. In the absence of a monetary policy response, a shock to foreign demand will typically induce substantial declines in exports, output and inflation. Consequently, global discussions about best practices in the area of capital flow management matter for the ESCB.

In 2022 the IMF reviewed its Institutional View (IV) on Capital Flow Management. Since 2012, the IV has provided a macroeconomic framework for consistent policy advice on liberalising and managing capital flows, with the goal of helping countries harness the benefits of capital flows while managing the risks (IMF, 2018). In the past three years, IMF staff have reconsidered the intellectual foundations of the 2012 policy and invested in an Integrated Policy Framework (IPF), which uses modelling and empirical investigations to understand how monetary, exchange rate (including foreign exchange intervention), macroprudential and capital flow management policies interact. The IPF played an important role in the IMF's subsequent review of its IV on the Liberalization and Management of Capital Flows. The 2022 review of the IV confirmed the core principles of the original IV, namely that cross-border capital flows can bring substantial benefits and that CFMs may be useful in certain circumstances but should not substitute for warranted macroeconomic adjustment. It suggested two policy changes: First, the review of the IV recognises that CFMs, which are also macroprudential measures (MPMs) targeting capital inflows, may be useful in pre-emptively addressing certain financial stability risks (e.g. stemming from currency mismatches), which conventional policy instruments may not be able to address during a capital flow reversal. Second, the appropriateness of macro-critical CFMs will not be assessed any longer for specific types of measures which require special treatment by virtue of their particular nature (measures introduced solely for security reasons; certain measures adopted pursuant to internationally agreed prudential frameworks, including reciprocity agreements, anti-money laundering/countering the financing of terrorism measures implemented consistently with international standards; and measures arising from certain international cooperation standards addressing tax avoidance and evasion).

Against this backdrop, the present paper reviews advances in the literature on capital flow management policies. Particular attention is paid to the literature which has been used by the IMF to underpin its IPF. This review considers both the theoretical advances in and the empirical evidence on capital flow management policies.

New theoretical models have had a significant impact on the policy debate by considering monetary policy along with MPMs, CFMs and foreign exchange interventions (FXIs) within a single framework. They confirm previous views that floating exchange rates are an important adjustment mechanism and that CFMs should be used mainly in response to financial shocks that trigger capital flow volatility. At the same time, these new approaches also suggest new avenues for the optimal policy mix in the presence of frictions and vulnerabilities. In particular, the models demonstrate the possible absence of a predetermined hierarchy among the policy tools considered; these models additionally show that capital flow management policies can enhance monetary autonomy and improve financial stability in the presence of financial frictions. Moreover, the theoretical literature

illustrates that, in countries susceptible to sudden stops, “precautionary CFMs” on capital inflows – which are applied before an external shock hits – can lower risks to financial stability. In some cases, CFMs can also help to plug gaps in MPM coverage.

Several caveats with respect to the theoretical advances should be kept in mind, however.

- The optimal policy mix in such models is often sensitive to **unobservable parameters**, which complicates tailoring an optimal policy mix to address the specific needs of individual countries.
- The literature has not modelled the potential interdependencies between the use of capital flow management policies and the build-up of foreign currency mismatches. **Models often assume that foreign currency mismatches are exogenous** in the steady state. However, such balance sheet mismatches might depend on the availability of CFMs. For example, one-sided FXIs may be perceived as an implicit insurance mechanism, fostering borrowing in foreign currencies and thereby potentially exacerbating the very imbalances that capital flow management tools aim to address.
- Most new models analyse the optimal policy problem from the **perspective of a small open economy**. For larger economies, alternative models are more suitable.
- Assessing the costs and benefits of capital flow management policies from a global perspective – e.g. by **taking spillovers and spillbacks into account** – might also lead to different policy conclusions.
- The **Global Financial Safety Net (GFSN) is currently not explicitly included** in many models but could be relevant from a global perspective since it might help to mitigate capital flow reversals without necessarily resorting to capital flow management policies.
- The **models’ fiscal sector should be expanded**, while still preserving model tractability.

On the empirical side, a meta-study approach suggests strong evidence for the effectiveness of capital flow management policies in mitigating financial stability risks.

The empirical studies reviewed in this paper also suggest that there may be some room to introduce “precautionary” CFMs on capital inflows, notably when addressing risks that arise from the build-up of stock vulnerabilities such as currency mismatches.

The recent empirical literature also claims that FXIs have the potential to lower financial stability risks stemming from currency mismatches. Furthermore, FXIs

may be effective in relieving short-term pressures and in supporting market functioning during market illiquidity episodes, thus **reducing financial stress.**

The empirical evidence on other pertinent policy questions is less clear-cut.

- There is no clear consensus in the literature on whether **CFMs** are more or less costly overall than other tools. In particular, evidence on the potential long-term effects of CFMs is limited.
- **Where capital controls** have been in place, they have typically been used persistently over time. This casts some doubt on the suitability of such measures for short-term macroeconomic and financial stability management.
- The empirical literature on the **joint use of capital flow management policies** in combination with other policies such as monetary policy is still in its infancy. It would therefore be prudent to avoid drawing strong conclusions based on this limited body of literature.
- While preliminary findings point to the usefulness of FXIs in countries with currency mismatches, more research is needed, for example on financial development and central bank credibility, to better understand the **long-run effects of FXIs**.

1 Introduction

Global financial integration, while beneficial overall, also entails risks such as increased vulnerabilities and countries' susceptibility to sudden reversals in capital flows. Historical events such as the taper tantrum episode in 2013 and recent capital flow patterns during the coronavirus (COVID-19) pandemic and the war in Ukraine in 2022 have served as stark reminders.

The traditional view was that such risks should be managed by a combination of sound stability-oriented macroeconomic policies, strong institutional frameworks and financial development without frequently having to resort to measures which limit the free flow of capital. The latter were often seen as measures of last resort to be applied only when there was limited space for traditional macroeconomic policies (see, for example, Broos et al., 2016).

The traditional view was inspired by the IMF's IV on capital flows, adopted in 2012. The IV has provided a macroeconomic framework for consistent policy advice on liberalising and managing capital flows, with the goal of helping countries harness the benefits of capital flows while managing the risks (IMF, 2018). The original IV envisages several circumstances in which measures to limit the free flow of capital may be appropriate. In the context of capital inflow surges, measures to limit the free flow of capital may play a useful role, particularly when there is limited room for adjusting macroeconomic policies and when appropriate policies require time to take effect or the inflow surge contributes to financial risks. In the case of disruptive outflows, the IV envisages that measures may play a role in limiting the free flow of capital only when the country is in crisis or when those measures form part of a broader policy package that addresses the fundamental causes of the crisis. Outside of crisis circumstances, according to the IV, there would typically be scope to address the effects of capital outflows through macroeconomic, structural and financial sector policies instead.

In 2020, the IV was complemented by the IPF. In the IPF, the roles of monetary, exchange rate (including foreign exchange intervention), macroprudential and capital flow management policies are considered jointly, along with their interactions with each other and other policies, the primary focus being on countries with flexible exchange rates (IMF, 2020a). It aims to provide a systematic framework for policymakers by clarifying the conditions under which the implementation of these instruments is appropriate while also serving as guidance in the use of multiple tools.

In its review of the IV in 2022, the IMF responded to policymakers' calls for greater flexibility in managing capital flows. In recent years, countries have increasingly used tools to manage capital flows. Moreover, the literature has advanced the understanding of the role of certain financial frictions in the presence of international capital flows. The lessons drawn from experience, coupled with theoretical advances, have prompted policymakers to call for more flexible approaches to managing capital flows, including the pre-emptive use of precautionary measures. In its Review of the IV, which was completed in March

2022, the IMF by and large confirmed the key elements of the original IV. However, the revised IV recognises that pre-emptive use of certain measures may be appropriate in specific cases, notably in addressing risks that arise from the build-up of stock vulnerabilities such as currency mismatches (IMF, 2022).

Although the ECB and the European System of Central Banks (ESCB) have always underscored the potential benefits of financial openness, they have likewise recognised that large swings in cross-border flows can affect domestic stability. European Union Member States have opted for totally free, non-discriminatory capital mobility and have reaped significant benefits from this option in recent decades. At the same time, with increased global financial integration, central banks must consider the impact both on macro-financial dynamics and on the transmission mechanisms through which monetary policy operates (Lane, 2019).

Large swings in cross-border capital flows can have consequences for domestic stability and open a channel for the transmission of shocks and spillovers across economies, including the euro area. The euro area can in fact be affected by developments in emerging markets, via either the trade channel, financial spillovers or global confidence effects. In the absence of a monetary policy response, a shock to foreign demand will induce substantial declines in exports, output and inflation. According to simulations using the ECB's New Area-Wide Model II, an export preference shock peaking at a 4% deviation from its steady-state value can lead to a decline in euro area GDP of more than 1 percentage point relative to its trend (Lane, 2019). Consequently, global discussions about best practices in capital flow management are also relevant from an ESCB perspective.

Against this backdrop, the present paper reviews recent advances in the literature on comprehensive sets of policies that can help policymakers to address capital flow issues. A potentially broad toolkit is available. It encompasses all measures that are part of the IPF, i.e. those that directly address capital flows – referred to in this paper as CFMs – and also MPMs, FXIs and monetary policy measures. In turn, the narrower definition of CFMs – to adopt the IMF's nomenclature – includes two basic types of measures, namely (i) residency-based measures, which are measures affecting cross-border financial activity that discriminate on the basis of residency; and (ii) other CFMs, which are measures that do not discriminate based on residency but are nonetheless "designed to limit capital flows".[1]

When evaluating the effectiveness of such instruments, particular attention is paid to literature which has been used by the IMF to underpin its IPF. This paper also looks at a very recent strand of literature, albeit still in its infancy, on the joint use of tools.

This paper proceeds as follows. Section 2 reviews the progress that has been made in the literature for small open-economy dynamic stochastic general equilibrium (DSGE) models with various types of financial frictions. Section 3 adopts

[1] Accordingly, "capital flow management policies" is used throughout this paper as an umbrella term to describe a broad set of policy instruments, including CFMs, MPMs and FXIs, that impact cross-border capital flows.

a meta-study approach, which is used to evaluate the vast body of recent empirical contributions on capital flow management policies. Section 4 concludes.

2 Models with a role for capital flow management policies

2.1 Capital flow management in DSGE models with financial frictions

For the most part, the theoretical literature evaluating the application of capital flow management policies is based on DSGE models with financial frictions. Two key advancements in this literature relate to (i) the introduction of specific financial frictions such as balance sheet mismatches, which are important for emerging market and developing economies (EMDEs), and (ii) the inclusion of several types of friction that are present simultaneously.

These models typically add dominant currency pricing and certain financial frictions to a DSGE model with rigid prices. This allows for the consideration of policy responses to a large number of shocks by choosing an appropriate calibration of some crucial features driving the results, including the currency of trade invoicing, the degree of currency mismatches, the tightness of both external and domestic borrowing constraints and the depth of foreign exchange markets. Such models can be analytically solved for optimal combinations of broad sets of policies that are available to policymakers to address capital flow issues (including monetary policy, FXIs, MPMs and CFMs; see also Adrian et al., 2020) in order to respond to various shocks, depending on country characteristics. It should be noted that foreign exchange mismatches in the steady state of such models are assumed to be exogenous and are calibrated in the model to current data. Outside the steady state, investors can change the denomination of assets and liabilities in response to shocks.

Another strand of models incorporates additional frictions to help capture key features of many EMDEs and of financial stress episodes. For example, Basu et al. (2020) included a non-linear balance sheet channel, which implies that a highly indebted economy is particularly susceptible to capital flow and exchange rate pressures when global risk sentiment deteriorates. They also captured the key role of the balance sheet channel of exchange rates, which can markedly affect domestic financial conditions in the presence of foreign currency mismatches. Last but not least, insofar as monetary policy credibility may be imperfect, exchange rate changes can also have pronounced effects on inflation expectations.

Overall, key policy insights from both strands of models, as also documented in IMF (2020, p. 14) and confirmed in IMF (2022), include the following:

On the choice of appropriate policies and their interactions:

(a) Where financial frictions and shocks justify the use of additional tools, there is **no one-to-one assignment between policies and market imperfections.** Policies typically affect several imperfections, while also

interacting with each other. As a result, the optimal policy mix will depend on the specific country circumstances. Their applications in a policy context call for the development of suitable metrics to guide policy judgements.

(b) **MPMs and CFMs may act either as substitutes or as complements** when deployed to manage financial stability risks associated with capital inflows. In the case of capital inflows to the banking sector, which MPMs typically target, they act as (imperfect) substitutes. By curbing domestic agents' borrowing from domestic banks, MPMs can also indirectly impede external borrowing by banks. Similarly, CFMs that curb external funding by banks can limit their lending to domestic agents. This substitutability could be particularly relevant for countries that are unable to use CFMs (owing to treaty obligations, for example). However, this substitutability does not hold when capital tends to flow into unregulated corners of the financial sector or when MPMs are circumvented by non-bank economic agents borrowing directly from abroad. In such cases, CFMs may become complements to MPMs by helping to plug leakages.

On the appropriateness of use:

(c) Just because a policy tool may be available does not imply that it should be used.

(d) **Full exchange rate flexibility is appropriate in many cases** (i.e. in countries with deep foreign exchange markets, continuous access to external financial markets and well-anchored inflation expectations).

(e) **High dollar invoicing in trade weakens the macroeconomic stabilisation benefits of exchange rate flexibility** but **does not create a need for using other capital flow management tools** unless there are other financial market imperfections.

(f) Even with these imperfections, **the active use of FXIs, MPMs and CFMs should generally be limited to shocks emanating from financial markets rather than from the real economy** (unless the shocks give rise to financial stability concerns). For example, Basu et al. (2020) show that countries facing permanent productivity shocks should rely solely on exchange rate flexibility under both producer currency pricing and dominant currency pricing, whereas countries with high external foreign exchange debt whose banks are vulnerable to external debt limit shocks should impose positive ex ante capital controls.

(g) Using capital flow management policies to support misaligned exchange rates leads to a reduction in welfare.

(h) **Precautionary CFMs on capital inflows can lower risks to financial stability in countries that are vulnerable to sudden stops** (e.g. countries with large amounts of unhedged foreign exchange debt).

(i) **Appropriate use of FXIs, MPMs and CFMs in the face of financial frictions and shocks can enhance monetary policy autonomy** in addition to contributing to financial stability.

- If foreign exchange markets are shallow and FXIs have gained traction, interventions that lean against inflow/outflow surges will reduce the excessive volatility of the exchange rate and interest rate premia.
- The deployment of MPMs and CFMs that aim to moderate capital inflows during normal times can prevent the build-up of risky liability structures.
- CFMs that aim to moderate capital outflows which are applied in times of crisis can attenuate exchange rate pressures arising from monetary policy easing and help to preserve financial stability.

2.2 Welfare analysis of capital flow management tools

Some progress has also been made in assessing the full benefits and costs of capital flow management policies. Jeanne and Korinek (2020) and Benigno et al. (2016) provide a complete analysis of precautionary CFMs even though Jeanne and Korinek focus mostly on optimal domestic macroprudential policy and liquidity provision both before and after financial crises. They show that it is optimal to use ex ante prudential regulations to minimise the welfare costs of financial and macroeconomic instability because ex post policy interventions generally impose deadweight losses on their own and may distort ex ante incentives. Benigno et al. (2016) show that, under some circumstances, the optimal policy mix will combine prudential capital controls in tranquil times with policies that limit exchange rate depreciation in crisis times, thus strengthening the theoretical case for using CFMs under some circumstances. In fact, Korinek (2020) notes that CFMs can improve welfare because capital flows generate externalities which private sector agents do not internalise. CFMs, in turn, act as Pigouvian taxes, addressing pecuniary externalities arising from capital outflows when balance sheet effects are at work. Likewise, CFMs may address aggregate demand externalities, e.g. by restricting capital inflows into an overheated economy or by limiting capital outflows from an economy with demand shortages. In view of these mechanisms, Erten, Korinek and Ocampo (2021) conclude that there is room for precautionary CFMs that lean against boom-and-bust cycles in international capital flows.

There is no a priori reason to expect that some instruments should take precedence over others (Korinek, 2020). In fact, alternative instruments will imply different costs in addition to impacts on financial market development and investor

confidence, depending on specific country circumstances. As a result, countries may want to choose combinations of different policy tools.[2]

2.3 Implications for the use of capital flow management policies

Recent advances in building a solid theoretical foundation for using capital flow management policies have provided valuable contributions to the literature. In particular, they have deepened the understanding both of specific policy challenges that are mainly present in EMDEs and of the ways in which different capital flow management policies interact with each other.

In terms of their policy implications, the models partly confirm the key aspects of the IMF's IV, e.g. that full exchange rate flexibility is often appropriate and that CFMs should mainly be used in response to financial shocks.

Nonetheless, the following considerations should be kept in mind as regards the models' implications:

- The **optimal policy mix will depend on some specific parameters** to which model outcomes are very sensitive. This metric problem complicates tailoring a particular policy mix to a specific country. For example, a minor change in assumption regarding the "shallow foreign exchange markets" parameter will influence the effectiveness of capital flow management tools in these models, e.g. FXIs will only become effective through the portfolio balance channel if the model is solved assuming shallow foreign exchange markets. Likewise, the optimal policy response to external shocks will greatly depend on the calibration of balance sheet frictions.

- The current set-up, in which MPMs and CFMs often appear to act as substitutes for each other, describes a domestic banking system that borrows primarily from international banks. If the domestic banking system is funded (mainly or fully) by domestic deposits, however, the **substitutability between CFMs and MPMs** may not hold.[3]

- Although the **fiscal sector** is often modelled in a less sophisticated way compared with other sectors, it would be important to understand its interaction with capital flow management policies, not least in the context of large-scale fiscal support such as during the COVID-19 pandemic. Aspects which would have to be clarified in more sophisticated modelling of the fiscal sector include

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2 An empirical survey by Montiel (2020) also noted that using CFMs restrictively relative to other instruments cannot be rationalised on the basis of the empirical literature. For example, according to Montiel (2020), it is not possible to find evidence on whether reserve accumulation would be preferable to CFMs on inflows or whether CFMs on inflows would be preferable to fiscal tightening even when the economy is operating at or near full employment.

3 The current modelling approaches could also be extended to incorporate more wedges and frictions, e.g. the domestic credit market does not account for any friction between savers (households) and borrowers (firms/households). As it may be impossible to accommodate numerous frictions at the same time without losing model tractability, it seems warranted to develop alternative model variants to verify the robustness of some results (e.g. pertaining to instrument substitutability).

whether (i) public spending should enter the utility function of the social planner in order to make public spending welfare-improving, (ii) financially constrained households should be included in addition to Ricardian households in order to give fiscal policy a redistributive role; and (iii) public debt should be allowed to be risky in the model. Allowing for a non-Ricardian role of the government could be particularly useful in analysing the interaction of the fiscal stance with other policies.

- As modelling frameworks are typically tailored to **small open economies** with flexible exchange rates, they are less suitable for large economies, countries belonging to a monetary union or countries with fixed exchange rates. For advanced economies, including the euro area, more relevant DSGE models which simulate the interaction of MPMs with monetary policy are being developed that may be more pertinent to the domestic policy debate surrounding the integration of monetary and macroprudential policy within a coherent framework (see, for example, Millard, Rubio and Varadi, 2021).

- In a similar vein, **non-standard monetary policy tools** and their interaction with capital flow management policies could warrant additional modelling given their extensive use by advanced economies, and increasingly also by EMDEs, during the pandemic. In addition, it should be noted that alternative DSGE models which simulate the interaction of MPMs with monetary policy in the domestic context are also being developed. These may be more pertinent to advanced economies since they consider more relevant financial frictions, including leverage limits on banks, while considering the macroeconomic and welfare effects of loan-to-value (LTV) limits and debt service ratio (DSR) limits on the economy and the housing market (see, for example, Millard, Rubio and Varadi, 2021).

- Finally, **foreign currency mismatches** are often assumed to be exogenous in the steady state. However, such balance sheet mismatches might depend on the availability of some capital flow management policies. In particular, one-sided FXIs may be perceived as an implicit insurance mechanism, fostering borrowing in foreign currencies and thereby potentially exacerbating the very imbalances that capital flow management tools aim to address.

3 Empirical evidence on the effectiveness of capital flow management policies

3.1 Overview

Since the outbreak of the global financial crisis, the empirical literature on capital flow management policies has expanded substantially. A useful starting point for a comprehensive survey of the literature can be found in IMF (2020a), where a large part of the empirical literature underpinning IPFs is discussed.

The empirical literature on capital flow management policies can be divided into four broad policy claims, which form a relatively benign narrative for capital flow management policies overall. As suggested in IMF (2020a), these four broad policy claims consist of the following elements:

- 'standard' adjustment mechanisms such as monetary policy and exchange rate flexibility have limitations that potentially result in the need for additional instruments;
- capital flow management policies are effective in reducing financial stability risks;
- the joint use of capital flow management policies may prove to be even more effective; and
- capital flow management policies barely have long-term adverse effects.

This section assesses the quality of the empirical evidence for these four policy claims across a wide range of academic papers. Using a meta-study approach, papers are graded according to whether or not they support a particular policy claim – assigning a score of 1 to papers that support a claim, a score of 0 to those that neither support nor counter a claim and a score of -1 to papers that clearly provide contrary evidence. The study focuses on the empirical evidence in the 156 papers cited in IMF (2020a)), with selected additional papers included when major advancements in the literature took place in the meantime, resulting in a total number of papers assessed of 165.[4] Each score is then weighted by a quality measure derived from the ECB's point system for assessing research quality.[5] Summing all paper scores for each policy claim, it is possible to provide a

[4] For example, the literature on the global financial cycle which may limit the effectiveness of monetary policy has advanced considerably since then.

[5] The ECB's point system evaluates research quality using criteria commonly adopted both in academia and in research departments of some major central banks. The allocation of journals to a quality-tiering system partly reflects a comparison with other rankings such as those provided by RePEc (based on the recursive impact factor and h-index) in addition to those used at some central banks (Federal Reserve Bank of New York, Federal Reserve Board, Riksbank, De Nederlandsche Bank and Norges Bank) and a recent ranking that is based on citations of the top five journals and that is used to effectively measure the relative impact of new journals (http://economicsjournals.blogspot.de/). In some cases, it may also reflect the greater importance of specific journals for central banks, e.g. for monetary policy and/or European economic and financial issues.

quantitative measure of the empirical evidence in the academic literature that supports a particular policy recommendation.[6]

The approach based on a meta-study naturally has some limitations. First, it might not fully capture some nuances in the debate. The publication score used in the meta-study only allows for "supporting", "neutral" and "counter-argument" papers. Second, the policy relevance of the papers might not be fully captured by the ECB's point system. At the same time, alternative rankings, e.g. based on the number of citations, are conceivable. Third, areas in which a new strand of literature has only recently emerged could be negatively affected in the ranking to the extent that the respective working papers have not yet been published in academic journals owing to their very recent publication date. Finally, it should be noted that the analysis could potentially suffer due to a publication bias, as it is often the case that non-results are not published in academic journals.

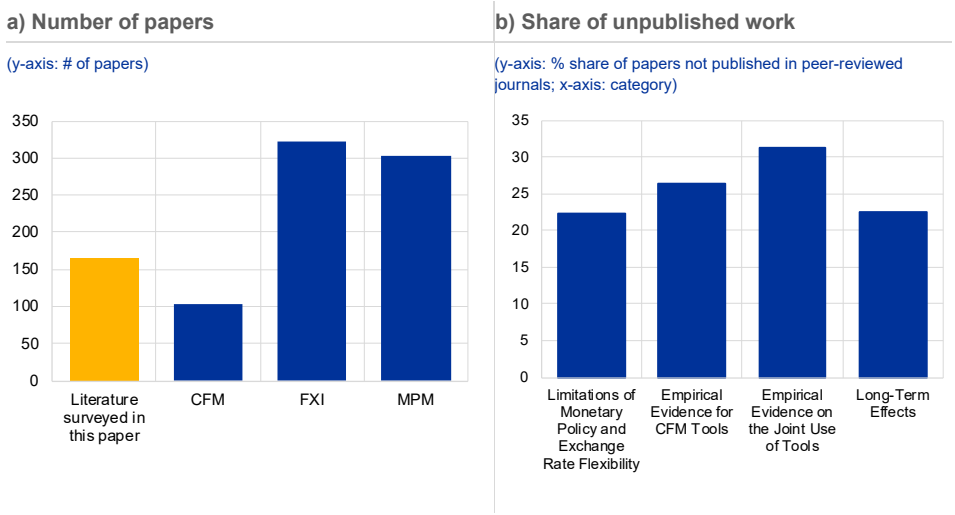
Chart 1 provides an initial overview of the number and quality of papers assessed in the meta-study. Chart 1a compares the papers reviewed with the number of papers indexed on IDEAS – the largest bibliographic database dedicated to economics[7] – which is derived from searches for specific capital flow management policies. As highlighted in the chart, the number of papers which can be found in the public domain is – in the case of FXIs and MPMs – larger than those included in the meta-study of this paper. However, many of these papers focus on the domestic effects of such measures and therefore do not address the issue of capital flow management. Overall, the representativeness of the papers surveyed in the meta-study seems to be appropriate, as fewer papers which directly examine capital flow management in its narrow sense can be found on IDEAS. **Chart 1b** shows that the survey includes some work that has not yet been published in peer-reviewed journals (e.g. in the form of working papers and policy reports). Indeed, in several categories it accounts for a relatively large share of the papers. While that may reflect the relatively low quality of the underlying literature, it is also likely to mirror the fact that this area has attracted the attention of researchers very recently only, with some papers not having yet reached publication as a result.

6 As a result, it is possible that, for a particular policy claim, the overall score can be negative if there are a sufficiently high number or high quality of papers that provide evidence against the specific claim.

7 Based on RePEc, a large volunteer effort to enhance the free dissemination of research in economics, IDEAS indexes over 3,800,000 items of research.

Chart 1

Papers reviewed in the meta-study



Sources: IMF (2020a) and ECB calculations.
Notes (left-hand scale): The yellow bar indicates the number of papers used in this study, which mainly relates to empirical evidence on the effectiveness of capital flow management tools relative to the joint use of these tools. The blue bars refer to papers, articles and book chapters that are listed on IDEAS and that contain the search terms "Capital Flow Management", "Foreign Exchange Interventions" and "Macro Prudential", published after 2010.
Notes (right-hand scale): The classification of papers not published in peer-reviewed journals refers to papers which have not been published in Tier 1 to Tier 3 journals according to the ECB's point system and also include working papers and book chapters.

Chart 2 provides more information on the quality and number of reviewed papers that strongly support the effectiveness of capital flow management policies. The strongest evidence in terms of both quantity and quality is provided for capital flow management policy effectiveness, as the latter tends to reduce financial stability risks, followed by robust evidence on limitations of monetary policy and exchange rate flexibility, as well as some evidence on the effectiveness of jointly using capital flow management policies **(Chart 2a).**[8] At the same time, some caution is warranted, as some of the publications are based on pre-crisis evidence (yellow dots, **Chart 2b**), which might not have captured recent changes in capital flow trends such as the shift from bank-based to market-based finance (CGFS, 2021).

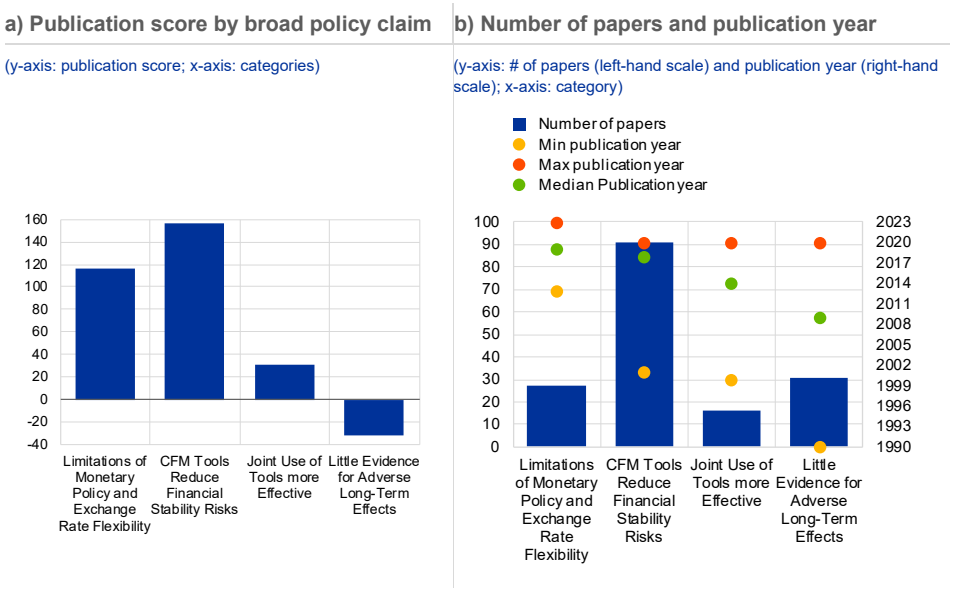
The evidence on the limited long-term adverse effects of such measures is demonstrably less solid. Several high-quality counter-argument papers yield an overall negative publication score for this broad policy claim. While the papers in the other areas are based on relatively recent empirical literature (median publication year postdating 2015), evidence on the claimed absence of long-term adverse effects partly relies on older literature dating back to the early 1990s, which underscores the fact that financial integration is associated with, and perhaps even causes, economic growth **(Chart 2b)**.[9]

8 It should be noted that the broad categories differ somewhat in scope so that the number of supportive papers may not be fully comparable across categories.

9 Adjusting for the fact that very recent papers of potentially high quality might be published within the next few years does not materially change the overall results. When using 'adjusted' instead of 'unadjusted' scores, it is assumed that all publications after 2018 have a publication score corresponding to the median of the overall sample. These results are available upon request.

Chart 2

Publication score, number of papers and publication year of the surveyed papers



Sources: IMF (2020a) and ECB calculations.
Notes: Publication score is based on the ECB's point system for publications (2017). Unpublished work refers to "Tier 4" publications of the ECB's point system, which include the working paper series of several policy institutions and selected book publishers. The publication score may be negative in the case of a high number or quality of studies contradicting the policy claim. Publication scores are not adjusted for biases arising from working papers which have not yet been published in academic journals by virtue of their very recent publication.

To draw policy implications from these first results of the meta-study, it is necessary to widen the scope beyond the four broad policy claims to include the more granular underlying debates and research questions. As shown in **Table 1**, within the four broad policy claims which form the overall narrative on capital flow management above, IMF (2020a) identifies 26 more specific policy claims that are embedded within the four broad claims. The latter are evaluated in more detail in the subsections below.

Table 1

Empirical claims in IMF (2020a)

Broad Policy Claim	Policy Claim #	Description
A. Monetary policy and exchange rate flexibility have limits		
	1	Monetary policy autonomy is often circumscribed in many countries.
	2	Monetary policy may not always be effective in addressing external shocks.
	3	Dominant currency pricing and financing can limit the benefits of exchange rate flexibility.
B. CFM tools effectively reduce financial stability risks		
	4	MPMs have been deployed with increasing frequency, especially in response to rapid credit growth.
	5	MPMs can reduce the domestic build-up of vulnerabilities stemming from easy global financial conditions.
	6	The short-run cost to output of MPMs seems small for the typical measure.
	7	However, macroprudential policy may "leak" by encouraging the provision of credit by non-banks and from abroad.
	8	MPMs may generate external spillovers.
	9	FXI is also used widely, including among inflation-targeting central banks in EMDEs with flexible exchange rates.
	10	FXI has a material effect on the exchange rate, at least in the short run.
	11	Interventions can help manage volatile capital flows.
	12	Foreign exchange reserves reduce external vulnerabilities, creating a case for precautionary accumulation to meet adequacy metrics.
	13	CFMs comprise a wide range of diverse instruments, which are difficult to measure quantitatively, thereby hampering empirical analysis.
	14	In practice, the majority of CFMs seem to be structural in nature.
	15	CFMs can be effective in changing the composition of capital flows to mitigate financial stability risks.
	16	There are beneficial effects from precautionary CFMs.
	17	CFMs can deflect capital flows to other borrowing countries with similar economic characteristics and have other unintended consequences.
C. Joint use of CFM tools may be even more effective		
	18	The appropriate use of MPMs, CFMs and FXI may afford greater room for monetary policy to focus on domestic stability objectives.
	19	IPF tools may interact in various ways.
	20	Policy combinations can be more effective than using a single instrument.
	21	Benefits of additional instruments increase when monetary policy faces a lower bound constraint on interest rates.
D. Adverse long-term effects of CFM use are likely to be limited		
	22	Sustained FXI may encourage corporate leverage and foreign currency borrowing.
	23	FXI may impact long-term financial development and reforms.
	24	FXI could also potentially weaken central bank credibility.
	25	Empirical evidence of CFMs' impact on long-term growth is limited.
	26	Overall long-term policy outcomes will ultimately depend on many policy dimensions.

Sources: IMF (2020a) and authors' compilation.

3.2 Limitations of monetary policy and exchange rate flexibility

There is evidence of a global financial cycle in which monetary policy autonomy may be impaired (policy claim #1). As pointed out in IMF (2020a), open economies may be subject to strong external shocks such as global financial cycles, which limits monetary policy autonomy. This can be true even under fully flexible exchange rates, which help cushion such external factors but do not insulate economies from them. These limitations of monetary policy and exchange rate flexibility may lead to an increased use of other policy tools such as CFMs. The evidence for a global financial cycle quoted in IMF (2020a) is based on pioneering work by Rey (2013). Subsequent work on its origins and transmission channels which was published in leading academic journals (Miranda-Agrippino and Rey, 2020; di Giovanni et al., 2022). This literature started with the observation of a global financial cycle in capital flows, asset prices and credit growth and the finding that a single global factor explains an important share of the variation of risky asset prices around the world.[10] Since the global financial cycle constrains national monetary policies regardless of the exchange rate regime, Rey (2013) also discusses the role of capital flow management and concludes that independent monetary policies are possible if and only if the capital account is managed. Miranda-Agrippino and Rey (2020) also provide evidence for the notion that the global financial cycle may be *caused* by US monetary policy. These findings are further supported by recent work on the risk-taking channel of monetary policy which documents significant effects of unexpected monetary policy changes on risk indicators (Bauer, Bernanke and Milstein, 2023).

There is also evidence that monetary policy may not always be effective in addressing financial stability risks that arise from global factors (policy claim #2). This notion is particularly supported by a broader body of literature (Gelos et al., 2019; Kalemli-Özcan, 2019; Brandao-Marques et al., 2020) which finds that monetary policy may not be an efficient tool for addressing financial stability risks stemming from external shocks, particularly in EMDEs. For example, Brandao-Marques et al. (2020) show that "leaning against the wind" can be costlier than the use of MPMs introduced to contain downside risks to future output growth and inflation stemming from easing global financial conditions.

It is not open to controversy that dominant currency pricing and financing may limit the benefits of exchange rate flexibility (policy claim #3), which is another argument put forth in the literature on IPFs. In fact, it has been rigorously demonstrated that, under dominant currency pricing, the short-term response of trade volumes to exchange rates is likely to be muted (Gopinath et al., 2020).

[10] Further recent evidence is surveyed in Miranda-Agrippino and Rey (2022) who also discuss the theoretical underpinnings of the global financial cycle. Key references on the global financial cycle and monetary policy spillovers provided in Miranda-Agrippino and Rey (2022) include Davis et al. (2021), Ca' Zorzi et al. (2023), Miranda-Agrippino and Nenova (2022), Morais et al. (2019) and Degasperi et al. (2021). Cerutti et al. (2019) explore the importance of global drivers of international capital flows by focusing on particular measures of goodness of fit and find some evidence for a global financial cycle in portfolio flows and bank lending and less support in foreign direct investment.

Additional studies such as Boz et al. (2017, 2019) and Georgiadis and Schumann (2019) are in line with these findings.

3.3 Empirical evidence on capital flow management policies

The empirical evidence on the effectiveness of capital flow management policies can be grouped into broad instrument categories. These include macroprudential measures (MPMs), foreign exchange interventions (FXIs) and capital flow management measures (CFMs), such as capital controls and MPMs which are designed to influence capital flows in line with the IMF's definition of CFMs.

3.3.1 Macroprudential measures (MPMs)

Newly available databases that track the implementation of MPMs across jurisdictions have led to an increasing number of high-quality studies quantifying the empirical effects of macroprudential policies. Useful databases for analysing MPMs include the IMF's iMaPP database, which has a global focus, and data from the ESRB or the ECB's MaPPED, which differ in terms of country coverage, granularity and types of indicators (e.g. binary versus continuous) that they provide.

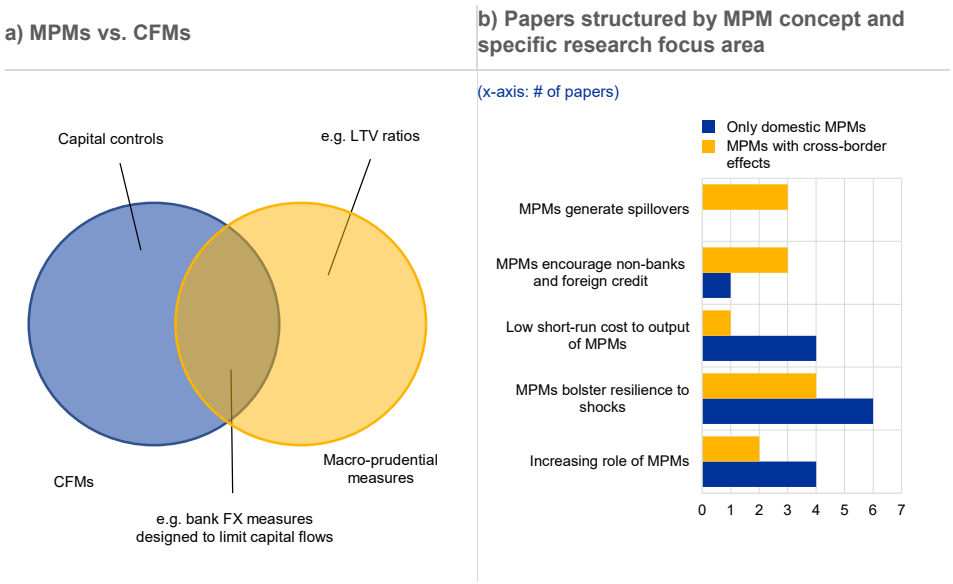
Separating MPMs with cross-border effects from those with a purely domestic focus poses an important challenge in this literature. Depending on their purpose, some MPMs may be similar to CFMs or capital controls (**Chart 3a**). Some MPMs have a domestic focus, with possibly indirect cross-border effects, while other MPMs such as bank FX measures designed to limit capital flows (see Frost et al., 2020) have a direct (intended) cross-border effect.

Given the particularly recent advances in studies covering MPMs, the key insights that have emerged from this literature are discussed below, thereby extending the scope beyond the references used for the meta-study approach. Given these overlaps, papers reviewed in IMF (2020a) are classified according to whether they have a largely domestic or cross-border focus, taking into account the nature of the measure, as well as the outcome variables considered in the respective studies (**Chart 3b**).[11]

[11] Table 1 in Annex 1 compares the studies surveyed in IMF (2020a) against a broader set of papers that investigated the effects of macroprudential policies. The focus herein lies on the international dimension of MPMs, building on a discussion of the literature in Eller et al. (2021), among others.

Chart 3

Domestic MPMs and MPMs with cross-border effects



Sources: Beck et al. (2015), IMF (2020a) and ECB calculations.
Notes: "Only domestic MPMs" includes papers which use the IMF's iMaPP database and which focus on the effect of domestic measures on domestic outcome variables. "MPMs with cross-border effects" includes studies which use the IMF's iMaPP database and predominantly look at measures with cross-border effects (such as bank FX measures) or the effect of MPMs on international variables.

The notion that MPMs have been deployed especially in response to rapid credit growth (policy claim #4) is largely based on studies which look at domestic MPMs. For example, Forbes' (2019) finding that MPMs often meet their objectives is based on domestic MPMs used to moderate domestic credit developments.[12] Likewise, the idea that MPMs mitigate the domestic build-up of vulnerabilities stemming from easy global financial conditions is largely based on papers which focus on domestic MPMs.

From a cross-border perspective, it appears more relevant that certain MPMs may also help strengthen domestic resilience to international shocks (policy claim #5). Forbes, Fratzscher and Straub (2015)[13] explicitly segregate MPMs that are related to cross-border exposure from those that are purely domestic. They find that MPMs can significantly reduce some measures of financial fragility, albeit most CFMs do not significantly affect other key targets such as exchange rates and capital flows. More recently, several papers have lent further support to the notion that MPMs can improve a country's resilience to international shocks. For example, Cesa-Bianchi et al. (2018) find that countries featuring lower LTV ratios and stricter limits on foreign currency borrowing are less vulnerable to global credit supply shocks. Similarly, Coman and Lloyd (2019) find that tighter LTV limits and reserve requirements appear to be particularly effective as measures to shield emerging markets from negative spillover effects of US monetary policy. Finally, Bergant et al.

12 Indeed, there seems to be increasing evidence that tighter MPMs may stabilise domestic credit cycles, especially if the focus lies on the impact of borrower-based MPMs on household credit as outcome variable (e.g. Cerutti et al., 2017; Akinci and Olmstead-Rumsey, 2018; Alam et al., 2019).

13 In earlier work, Ostry et al. (2012) show in a pre-crisis sample of EMDEs that capital controls and FX-related prudential measures are associated both with a lower proportion of FX lending in total domestic bank credit and with a lower proportion of portfolio debt liabilities in total external liabilities.

(2020) find that a tighter level of macroprudential regulation in emerging markets reduces the sensitivity of their GDP growth both to uncertainty shocks and to capital flow shocks. A broad set of macroprudential tools contribute to this result, including measures targeting bank capital and liquidity, foreign currency mismatches and risky forms of credit. At the same time, the authors find no evidence indicating that stricter capital controls lead to similar gains.

Other papers have explored whether MPMs have a stabilising impact on cross-border capital flows. Aysan et al. (2015) find that cross-border capital flows to Turkey were less sensitive to global factors following the implementation of MPMs. Cerutti and Zhou (2018) find that tighter MPMs in lender countries reduce direct cross-border banking outflows but are associated with larger outflows via local affiliates, whereas tighter MPMs in borrower countries are associated with larger direct cross-border banking inflows. Frost et al. (2020) find that the activation of FX-based MPMs reduces capital inflows by nearly 5% of GDP and is linked to a lower probability of banking crises and capital flow surges in the subsequent three years. Eller et al. (2021) conclude that tighter MPMs tend to reduce gross capital inflows for a sample of central, eastern and south-eastern European countries, with this effect being stronger in an environment characterised by low interest rates, thus suggesting that MPMs are more effective when conventional monetary policy is close to the zero lower bound.

A growing strand of literature addresses the impact of MPMs on domestic macroeconomic variables, which is often perceived to be small (policy claim #6). While some recent papers consider the output costs of macroprudential tightening to be rather small for most measures (Bergant et al., 2020; Alam et al., 2019; Araujo et al., 2020; Brandao-Marques et al., 2020), Richter et al. (2019) show that output costs can be larger over a medium-term horizon in the case of some measures (e.g. maximum loan-to-value ratios) while other studies confirm that tightening macroprudential policies could have a significant negative impact on macroeconomic aggregates such as real GDP and price level (Kim and Mehrotra, 2018; 2019).[14] Moreover, the majority of studies have examined domestic MPMs, which makes it difficult to draw strong conclusions for capital flow management.

Concerns stem from the notion that macroprudential policy may "leak" (policy claim #7) by encouraging the provision of credit by non-banks (Cizel et al., 2019) and from abroad.[15] The recent literature in this area demonstrates that foreign exchange regulations on banks in particular may shift foreign exchange vulnerability to other sectors (Ahnert et al., 2021) and that leakage effects appear stronger for borrower-based tools (Nier et al., 2020). This concern could be mitigated by stronger cross-border coordination of macroprudential policies, including

[14] Brandao-Marques et al. (2020) also find tentative evidence for the notion that macroprudential tightening in response to easing global financial conditions can help contain tail risks to GDP.

[15] See Gebauer and Mazelis (2020), who primarily address leakage to the non-bank (shadow) sector, as well as Portes et al. (2020).

reciprocation of measures, as suggested in several recent publications of the European Systemic Risk Board (ESRB) (e.g. Portes et al., 2020).[16]

With respect to more general external spillovers of MPMs (policy claim #8), case studies suggest that tightening prudential regulation in the home country may lead to a contraction in the credit supply of foreign subsidiaries (Tripathy, 2020).[17] Beirne and Friedrich (2017) also find evidence for external spillovers of MPMs and emphasise that the extent of such repercussions depends on banking sector conditions both at home and abroad. Recent IMF work suggests, however, that tighter macroprudential regulation in a country can also enhance the country's resilience with respect to global financial shocks, possibly because greater domestic stability supports more stable financial and trade flows (Bergant et al., 2020). Overall, the literature on international spillovers of MPMs does not yet appear to be rigorously conclusive, as results depend to a significant degree on measurement issues (e.g. whether the level or changes of MPMs are considered), instrument types and identification challenges.

3.3.2 Foreign exchange interventions (FXIs)

Although FXIs were traditionally perceived as mainly serving central banks in achieving exchange rate objectives, they have found much wider use instead (policy claim #9). Inflation-targeting central banks report that they use (sterilised) FXIs for other objectives, including preserving financial stability (IMF, 2020a). More recently, FXIs have also been widely used, e.g. during the COVID-19 crisis, including among EMDEs with flexible exchange rates.

Whether (sterilised) FXIs affect the exchange rate has remained controversial (policy claim #10).[18] Following the contribution of Sarno and Taylor (2001), recent advances in the literature suggest a material effect, at least in the short run (Chamon et al., 2019; Fratzscher et al., 2019.), with little evidence of asymmetries related to the effect of sales and purchases (Daude et al., 2016) – in particular when FXI is consistent both with fundamentals and with the monetary policy stance (Adler and Tovar, 2014). The evidence indicating a long-term effect remains limited, however.[19]

The traditional role of flexible exchange rates a shock absorber has been called into question. The evidence on the traditional expenditure switching channel

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16 Recent theoretical studies also find support for the notion that lack of reciprocity for some macroprudential instruments may result in "leakages" (Rubio, 2020). In a two-country DSGE model with housing and credit constraints, the author demonstrates that reciprocity is desirable.

17 There is a discrete strand of literature looking at international spillovers from microprudential regulation, which should be considered a separate issue beyond the scope of this paper. See, for example, Ongena et al. (2013) and Houston et al. (2012).

18 It is less open to controversy that non-sterilised interventions may have an effect on the exchange rate, as they change the domestic money supply. Under a sterilised intervention, however, the central bank offsets the effect on the monetary base through sales or purchases of domestic-currency assets. Such operations can impact the exchange rate via both the portfolio rebalancing channel and the signalling channel. For a detailed exposition, see Sarno and Taylor (2001).

19 On the theoretical side, Gabaix and Maggiori (2015) show that the potency of FXI relies entirely on market frictions similar to the theoretical advances described in Section 2.1. Blanchard et al. (2015) show – in an extension of the Mundell-Fleming model – that FXIs can be used to keep the exchange rate and interest rates unchanged in response to portfolio debt inflows.

of exchange rates tends to be weak partly due to dominant currency pricing (see section 3.2). In addition, "fear-of-floating" concerns have persisted in the presence of adverse effects excessive exchange rate volatility on countries with extensive debt denominated in foreign currency (Calvo and Reinhart, 2002).

But FXI may be ineffective in addressing the impact of monetary policy spillovers. As shown in Rey (2013) and Miranda-Agrippino and Rey (2020), exchange rate flexibility does not matter for the spillover effects of U.S. monetary policy as countries with fixed and flexible regimes are all affected by the global financial cycle. And if monetary policy spillovers work through changes in risk perceptions, exchange rate flexibility might help because an emerging market that wants to use monetary policy to limit exchange rate volatility needs to implement a much larger increase in the domestic policy rate since U.S. tightening increases risk premia (Kalemli-Özcan, 2019).

At the same time, FXIs may foster financial stability in the presence of currency mismatches, as suggested by several recent surveys and working papers (Hofman et al., 2020; Poirson Ward et al., 2020; Adleret al., 2020). These studies also acknowledge, however, that FXIs could entrench unfavourable initial conditions over time, additionally emphasising that effectiveness does not always imply appropriateness, which rests on an evaluation of potential trade-offs and unintended consequences (Poirson Ward et al., 2020). Furthermore, FXIs may be effective in relieving short-term pressures and in supporting market functioning during market illiquidity episodes, reducing financial stress as a result (Domanski et al., 2016).

And foreign exchange reserves tend to reduce external vulnerabilities (policy claim #11). Foreign exchange reserves tend to lower external borrowing costs, creating a case for precautionary accumulation in EMDEs (policy claim #12) (Frankel and Saravelos, 2012) unless the costs of holding reserves offset these benefits (Rodrik, 2006; Levy Yeyati, 2008).[20]

3.3.3 Capital flow management measures (CFMs)

Like MPMs, CFMs cover a wide range of diverse instruments affecting capital flows, thus rendering their evaluation as a policy tool challenging (policy claim #13).[21] Indeed, constructing an overall measure of financial account openness is a similarly challenging task, also in view of differences between de jure and de facto measures. As a result, many analyses restrict themselves to capital account controls (e.g. Chinn and Ito, 2008), whereas a more recent paper by Gupta and Masetti (2018) constructs a database that includes all forms of CFMs.

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[20] In addition, large balance sheets – namely, owing to FX accumulation – may leave central banks exposed to large financial losses (Filardo and Yetman, 2012).

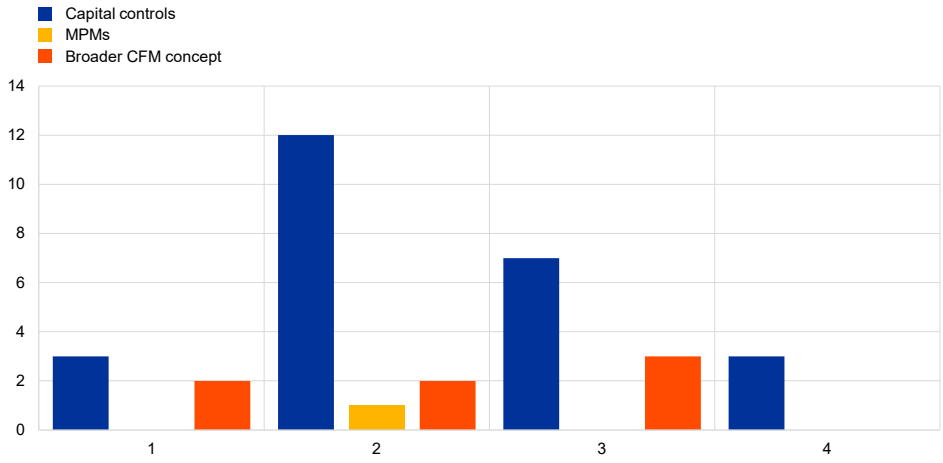
[21] The IMF has also introduced the concept of "CFM/MPMs" comprised of CFMs that are also classified as MPMs and that are designed to limit capital flows while reducing systemic financial risks stemming from such flows (IMF, 2020c). This definition partly overlaps with the broader concept of MPMs that have cross-border effects, as used in this paper.

Whereas capital controls seem to be structural in nature (policy claim #14), other CFMs may be more suitable as a policy tool for macroeconomic management. Eichengreen and Rose (2014) explain the persistence of capital controls in terms of the political costs required to remove them.[22] Gupta and Masetti (2018) confirm that capital controls are not used as an active tool at business cycle frequency. These empirical findings cast some doubt on the suitability of capital controls both for macroeconomic management and as a substitute for other CFMs or MPMs, as also underscored by Eichengreen and Rose (2014). However, this evidence refers largely to capital controls (**Chart 4**, first category), while experience shows that some macroprudential tools with cross-border effects are also used at higher frequencies, e.g. in response to credit developments (Alam et al., 2019).

Chart 4

Papers structured by CFM concept

(y-axis: publication score; x-axis: policy claim)



Source: ECB calculations.
Notes: x-axis: 1: In practice, the majority of CFMs seem to be structural in nature (policy claim #14). 2: The empirical evidence indicates that CFMs can be effective in changing the composition of capital flows to mitigate financial stability risks (policy claim #15). 3: Studies specifically point to the beneficial effects of precautionary CFMs (policy claim #16). 4: CFMs can deflect capital flows to other borrowing countries with similar economic characteristics and have other unintended consequences (policy claim #17).
Notes: Capital controls include only measures which explicitly discriminate against non-residents while mainly covering papers which use the IMF's AREAER database. "Broader CFM concept" includes studies which look at the effect of capital controls and MPMs with cross-border effects, albeit not all of them strictly comply with the IMF's definition of CFMs.

Likewise, the notion that CFMs may be effective in changing the composition of capital flows to mitigate financial stability risks (policy claim #15) is largely based on experience with capital controls. This evidence (**Chart 4,** second category) tends to show that certain capital controls can indeed tilt the composition of flows towards types which are more conducive to financial stability, i.e. fewer debt-based and more long-term flows.[23] The evidence tends to be stronger for inflow than for outflow controls (Magud et al., 2018). In addition, there is also some evidence that FX-based CFMs tend to reduce the risk of FX-driven lending booms and

22 The IMF's Independent Evaluation Office (IEO 2020) also cites the cases of Iceland (2008) and Cyprus (2013), which seem to suggest that, once introduced in response to a crisis, capital controls are difficult to remove.

23 See Erten et al., 2019 for a survey. Measures that tilt inflows towards equity and long-term flows may also be used pre-emptively, as they can be valuable against the build-up of imbalances threatening financial stability (Ostry et al., 2012; Ghosh, Quereshi and Sugawara, 2014). Additional research also suggests that CFMs can have a direct positive impact on financial stability (Montiel and Reinhart, 1999; Klein 2012; Ahmed and Zlate, 2014; Magud, Reinhart and Rogoff, 2018).

financial fragility (Frost et al., 2020), as well as that CFMs can help lower the volatility of responses to external shocks (Rey, 2015; Zeev, 2017).

While it is less clear whether CFMs are just as effective in impacting the overall volume of flows, it appears that the composition of capital flows may be even more important for financial stability.[24] For example, Korinek (2017) shows that portfolio equity and FDI flows are more benign due to their insurance-like properties, i.e. state-contingent repayment schedules. Against this backdrop and the strong empirical evidence indicating that CFMs have the capacity to change the composition of flows, it is noteworthy that policy recommendations on CFM use have paid relatively scant attention to the tilting of the composition of flows via CFMs (Montiel, 2020).

Beyond their immediate effects, there is a body of literature offering a more nuanced assessment of the beneficial effects of CFMs when used in a precautionary manner (policy claim #16). While the overall publication score of the literature quoted in IMF (2020a) is relatively high, the main support comes from an older paper which shows that existing CFMs on capital inflows do actually contain the fall in output during currency crises (Gupta et al., 2007). In addition, another paper has somewhat more recently shown that CFMs on debt flows in place during boom periods are associated with greater resilience via lower shares of FX lending and external portfolio debt (Ostry et al., 2012). More recently, Das et al. (2022) show that "pre-emptive" CFMs can reduce emerging markets' and developing countries' external finance premia during risk-off shocks, especially for vulnerable countries.

At the same time, these studies have not performed a comprehensive welfare analysis of precautionary CFMs (see Section 2.2) and have not reviewed long-standing debates about the link between financial integration and growth, which is also relevant in this context. For example, Klein (2012) provides no evidence for a positive causal effect of precautionary CFMs on growth. In addition, these studies often do not distinguish between advanced, emerging or developing economies, even though it has been demonstrated that the effect of financial integration on growth is heterogeneous and depends on both the level of development and the strength of institutions (Kose et al., 2011).

Like MPMs, CFMs may generate external spillovers, as they can deflect capital flows to other borrowing economies (policy claim #17). In the case of CFMs, this notion is supported by a careful case study on Brazil (Forbes et al., 2016), as well as broader evidence for EMDEs (Pasricha et al., 2018). Pasricha et al. (2018) find that CFMs in large EMDEs had significant implications for other countries both via exchange rates and via capital flows. In fact, these spillovers may have weakened the effectiveness of CFMs in the aftermath of the global financial crisis.[25] Overall, however, spillovers are often found to be heterogenous and tend to be small and

[24] Frost et al. (2020) find some evidence for FX-based MPMs to reduce overall capital inflows, albeit not for capital controls.

[25] Pasricha et al. (2018) show that net tightening of foreign inflow controls leads to an immediate appreciation of other countries' currencies and increases their gross capital inflows.

sometimes procyclical. In addition, their significance depends on the type of CFMs and country characteristics (Gori et al., 2020).

3.3.4 Empirical evidence on the joint use of tools

A very recent body of literature is geared towards reviewing the joint use of capital flow management tools. This focus on new research is both appropriate and timely given that central banks in EMDEs often use several instruments in parallel. For example, Cordella et al. (2014) show that, in response to negative shocks, central banks in EMDEs increase the policy rate to defend the currency while at the same time reducing reserve requirements to mitigate contractionary output effects.

A positive side effect of using a combination of tools may be greater room for monetary policy to focus on domestic stability objectives (policy claim #18). Brandao-Marques et al. (2020) find that, during exogenous global portfolio flow shocks, the use of targeted MPMs and CFMs can help "free the hands" of monetary policy in EMDEs by allowing central banks to focus on domestic cyclical developments. The authors also find that MPMs help contain financial vulnerabilities and do this at little cost, in contrast to monetary policy leaning against the wind, which causes sizeable welfare losses.

More generally, studies on the joint use of tools suggest that capital flow management policies can interact in various ways (policy claim #19), leading to important implications for financial stability and FXI effectiveness. For example, Nier et al. (2020) show that an appreciation of the exchange rate can be associated with a loosening of domestic financial conditions and a rise in domestic credit, while a prior tightening of macroprudential policies dampens this effect. This may reduce the need for FXIs to lean against appreciation for financial-stability purposes. Likewise, in a sample of Latin American countries, Adler and Tovar (2014) show that FXIs have more traction in countries with a less open capital account. Poirson Ward et al. (2020) also find that the impact of FXIs is larger for countries with CFMs, as the latter tend to reduce offsetting private capital flows.

Some studies suggest that combinations of policy tools may be more effective than using a single instrument (policy claim #20). For example, Brandao-Marques et al. (2020) show that, when it comes to containing the effects of easing global financial conditions on tail risks to GDP, macroprudential tightening in combination with monetary accommodation is more effective than macroprudential policy alone. Likewise, Poirson Ward et al. (2020) find that combinations of monetary policy and FXIs can help smooth the impact of external financing shocks better than either instrument individually.

In addition, the benefits of additional instruments may increase at the zero lower bound (policy claim #21), as FXIs can be used to fight against deflationary pressures (Poirson Ward et al., 2020). Such findings are line with older literature, including Svensson (2000) and McCallum (2000), suggesting that FXIs should be used when interest rate policy is no longer effective.

Overall, while there is a case for considering CFMs, MPMs and FXIs under some circumstances without a pre-set hierarchy of policy tools, it appears that the empirical literature on the joint use of capital flow management tools is still in its infancy. This is especially so when the empirical literature on the joint use of tools is compared against studies which look at the effects of a single instrument, as evident from the relatively low publication score and the high share of unpublished work in the meta-study of the previous section. Accordingly, overly strong conclusions based on this limited body of literature should be avoided.

3.4 Long-term effects

As regards long-term effects of capital flow management tools, the literature has largely focused on the potential adverse side effects of FXIs and sustained use of CFMs.

Many studies suggest that sustained FXIs may encourage overall corporate leverage and foreign currency borrowing in EMDEs (policy claim #22). In this largely empirical literature, the existence of currency pegs, intensive use of FXIs and foreign reserve accumulation are associated with higher levels of corporate foreign currency debt (Hofman et al., 2020). These higher levels of leverage are also associated with greater macroeconomic, financial and corporate vulnerabilities.

There is little evidence that FXIs negatively affect long-term financial development (policy claim #23). It is conceivable that the degree of exchange rate flexibility affects economic agents' incentive to hedge against exchange rate risk.[26] Nevertheless, the impact of FXIs and thus the lack of exchange rate flexibility in response to the depth of foreign exchange and hedging markets remain unclear, as many other factors – which are not controlled, e.g. in Mohanty (2013) – also appear to play a role.

FXIs could also potentially weaken central bank credibility in the long term (policy claim #24), though evidence is limited. Central banks that have multiple objectives – including price stability and exchange rates, for example – and that also use multiple instruments such as the policy rate and FXIs are often perceived as less transparent and credible in terms of delivering price stability. In some inflation-targeting countries, for instance, policy formulation has deviated from focusing on inflation, with other objectives playing an important role in the absence of a clear framework (Unsal et al., 2022). However, evidence for a set of more sophisticated inflation-targeting emerging market central banks suggests that the cost of interventions to the credibility of policy frameworks may be smaller than often assumed (Hofman et al., 2020).

The direct impact of CFMs on growth appears to be limited (policy claim #25), according to preliminary findings in the literature. Recent unpublished albeit

[26] In particular, one-sided exchange rate movements can reduce the incentive to hedge foreign exchange risks, thereby leading to speculative capital flows, with adverse consequences for market volatility and financial development.

promising work suggests that (i) CFMs responding to easy global financial conditions have minimal effects on future growth and (ii) countries that use outflow CFMs in a crisis see sharper declines in sovereign ratings yet recover their rating as fast as countries that did not rely on CFMs (Brandao-Marques et al., 2020; Bhargava et al., 2023). By contrast, other studies suggest that CFMs may lead to reduced discipline in financial markets and public finances (e.g. Aizenman and Glick, 2009).[27]

There is, however, solid empirical evidence for a positive effect of financial liberalisation on long-term growth, which tends to argue against the claim that long-term use of CFMs has few long-term adverse effects. Many papers find a robust positive effect of capital flows on growth and productivity, especially when non-debt-creating flows are considered. For example, Henry (2007) assesses the growth effects of financial liberalisation, while Chari and Henry (2008) provide firm-level evidence that stock market liberalisations lower the cost of equity of listed EME firms.[28] Desai et al. (2006) show that the liberalisation of capital account restrictions lowers the borrowing costs of multinational firms. Moreover, there are studies which find robust evidence of a positive link between financial integration and growth using microdata. For example, Arnold and Javorcik (2009) conduct a case study for Indonesia and find that FDI is beneficial through a transfer of skills and know-how from foreign parent firms to their subsidiaries. While the use of CFMs is not necessarily the exact opposite of financial liberalisation, as both concepts are broader, this literature still raises some concerns about the adverse long-term effects on growth.

The evidence is, however, less clear for debt-creating capital flows and countries with institutional deficiencies. As debt-creating capital flows can lead to boom-and-bust cycles and sudden stops, the case for financial liberalisation is less clear-cut in this case (Jeanne et al., 2012). There is also older literature casting some doubt on a positive link between capital flows and growth below a threshold of institutional developments (Kose et al., 2011).

Overall, it appears reasonable nevertheless to conclude that capital flow management tools, while useful in mitigating risks from financial integration and volatile capital flows, cannot safeguard long-term economic performance, which will ultimately depend on many policy dimensions (policy claim #26). In fact, there is solid empirical evidence for the importance of strong institutional frameworks (North, 1990; 1991) which tend to "trump" the effect of economic integration on cross-country income levels (Rodrik et al., 2002).

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[27] Even if there is no evidence of a negative impact of CFMs on growth, improving a country's institutions should constitute a first line of defence, as strong institutions and structural policies remain crucial to reaping the full benefits and mitigating the risks from international financial flow volatility. In fact, Ferrero et al. (2021) find that countries which have a better quality of institutions (and a stronger external position) suffer due to foreign financial shocks to a lesser extent.

[28] Bekaert et al. (2005), Gupta and Yuan (2009) use policy changes such as equity market liberalisations as natural experiments, albeit there is a debate about whether such changes can be considered to be fully exogenous events.

4 Conclusions and policy implications

This literature survey has reviewed recent theoretical and empirical advances in the area of capital flow management, building on an assessment of the academic quality of scientific publications. While this survey does not claim to cover every single study in this fast-growing literature, its focus is on highlighting (i) key findings since the global financial crisis, which brought new insights into how and when to manage volatile capital flows; and (ii) how publications of varying academic quality should be taken into account when deriving concrete policy recommendations and actions from the most recent findings.

Overall, recent literature advances in the modelling of capital flow management policies partly confirm the key aspects of the IMF's original IV on capital flow management. In the empirical literature, the strongest evidence is found to support the effectiveness of capital flow management policies in addressing certain risks in the short term. There is also increasingly robust evidence for the more general notion that there may be limitations to monetary policy and exchange rate flexibility as the importance of a "global financial cycle" has been documented in numerous high-quality papers. At the same time, the growing literature on the joint use of capital flow management and monetary policy tools is still in its infancy. The evidence found in the literature on the long-term effects of capital flow management policies, which relies on a somewhat older strand of literature compared to the other categories, stands out as being less solid. This shows that further research is necessary to better understand the costs of longer lasting CFMs.

Despite new evidence on the effectiveness of capital flow management tools in addressing certain risks, policymakers may continue to face a trade-off between open financial markets and macroeconomic and financial stability. While open financial markets are associated with high growth, yet interrupted by frequent crises, less global financial integration and thus lower volatility comes at the cost of lower growth. Moreover, as noted by IMF (2022), when it comes to addressing a number of important issues such as the use of outflow CFMs outside of (imminent) crisis circumstances, the currently available empirical evidence is insufficient.

In policymakers' toolkits, the balance between maintaining open financial markets and managing financial flows for financial stability purposes appears to have slightly shifted towards a more active role of CFMs under some circumstances that are most relevant for EMDEs. For the pre-emptive use of certain capital flow management policies, which has recently been endorsed by the IMF, it is essential to better understand which countries would apply them in the future so that a full cost-benefit analysis may be performed and overly wide use can be avoided. Recently revealed policy preferences, however, do not suggest that EMDEs have made extensive use of such measures, either during the sudden-stop episode at the beginning of the pandemic or since the start of the Russian invasion in Ukraine, which has also led to capital flow volatility in EMDEs. At the same time,

geo-economic fragmentation has become a concern, which may also contribute to financial deglobalisation and more frequent use of CFMs for non-economic reasons (IMF, 2023).

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Annex 1

A1 Table 1: Effectiveness of macroprudential policy measures (MPMs)

Table A

Recent advances in assessing the international dimension of MPMs

Author(s)		Ahnert et al.
Year		2021
Type of publication		Journal of Financial Economics
Sample coverage: region		48 countries (17 AEs, 31 EMs)
Sample coverage: time		1996-2014
Investigated MPMs		Macroprudential FX regulation of banks
Domestic focus	Credit	X
	Housing markets	
	Output/ Macroeconomy	
International focus	Resilience to intl. shocks	
	Cross-broder spillovers	
Other focus		Cross-sectoral spillovers
Response variables		Domestic banks' FX borrowing; domestic firms' FX bond issuance
Empirical methodology		Cross-country panel regression framework with country and time-fixed effects, controlling for domestic and global factors
Major findings		Macroprudential FX regulation of banks is effective in reducing banks' FX borrowing but also has the unintended consequence of simultaneously causing firms to increase FX bond issuance and thus shifting FX exposure to other sectors of the economy.

Author(s)		Aikman et al.
Year		2013
Type of publication		The Economic Journal
Sample coverage: region		14 advanced economies
Sample coverage: time		1880-2008
Investigated MPMs		Parameterisation of MPMs in the conceptual model analogously to a counter-cyclical capital buffer
Domestic focus	Credit	X
	Housing markets	
	Output/ Macroeconomy	
International focus	Resilience to intl. shocks	
	Cross-broder spillovers	
Other focus		
Response variables		Credit cycles (measured by variation in the ratio of bank lending to GDP)
Empirical methodology		Empirical evidence on the credit cycle across countries; conceptual model studying the impact of micro- and macroprudential policies on credit cycles
Major findings		Sustained growth in the ratio of bank lending to GDP has been strongly correlated with subsequent banking crises. The synchronisation of credit cycles across countries has increased; national policy frameworks could thus open up arbitrage opportunities for international banks. Macroprudential policy could curb credit cycles, both through raising the cost of maintaining risky portfolios and through an expectations channel that operates via banks' perceptions of other banks' actions.

Author(s)		Alam et al.
Year		2019
Type of publication		IMF Working Paper
Sample coverage: region		134 countries (34 AEs and 29 EMs)
Sample coverage: time		January 1990 to December 2016
Investigated MPMs		IMF's iMaPP database: various measures
Domestic focus	Credit	X
	Housing markets	X
	Output/ Macroeconomy	X
International focus	Resilience to intl. shocks	
	Cross-broder spillovers	
Other focus		
Response variables		Year-on-year growth rate of real household credit, real house prices, real private consumption and real GDP
Empirical methodology		Cross-country panel regression framework with country and time-fixed effects, controlling for lagged domestic control variables; propensity score matching and GMM panel estimates (robustness check)
Major findings		Loan-targeted instruments have a significant impact on real household credit and a milder dampening effect on house prices and consumption. Loan-to-value (LTV) limits affect credit non-linearly, with a declining impact for larger tightening measures; when LTV limits are already tight, the effects of additional tightening on credit is dampened, while those on consumption are strengthened.

Author(s)		Araujo et al.
Year		2020
Type of publication		IMF Working Paper
Sample coverage: region		58 papers (mixture of cross-country and country studies using either macro-level or micro-level data)
Sample coverage: time		
Investigated MPMs		Limits to loan-to-value ratio; reserve requirements; limits to debt service-to-income ratio; loan loss provisions; capital requirements; other measures; limits on credit growth; taxes and levies; limits on foreign currency loans; liquidity coverage; counter-cyclical capital buffer; limits on use of debt to finance transactions; measures on systematically important financial institutions; loan restrictions; limits on FX positions; conservation buffer
Domestic focus	Credit	X
	Housing markets	X
	Output/ Macroeconomy	X
International focus	Resilience to intl. shocks	
	Cross-broder spillovers	
Other focus		Meta-analysis
Response variables		Household credit, house price, total credit, bank balance sheet fragility, economic activity, capital flows, corporate credit, bank default risk, non-bank credit
Empirical methodology		Meta-regression framework controlling for peer-reviewed publications and the completeness of studies' specification
Major findings		Statistically significant effects of macroprudential policies on total credit but with considerable heterogeneity across instruments; weaker and more imprecise effects on house prices; quantitatively stronger effects in emerging markets and among studies using micro-level data; statistically significant evidence of leakages and spillovers; relatively stronger impacts for tightening than loosening actions and negative effects on economic activity in the near term. The effects on credit peak on a 1 to 2-year horizon, while those for macroeconomic variables (GDP, consumption, prices) peak after 2-3 years.

Author(s)		Avdjiev et al.
Year		2017
Type of publication		International Journal of Central Banking
Sample coverage: region		16 banking systems and 53 counterparty countries
Sample coverage: time		Q1/2000 to Q4/2014
Investigated MPMs		Prudential index, general capital requirements, sector-specific capital buffer, loan-to-value ratio limits, reserve requirements: local, interbank exposure limit, concentration ratio
Domestic focus	Credit	
	Housing markets	
	Output/ Macroeconomy	
International focus	Resilience to intl. shocks	
	Cross-broder spillovers	X
Other focus		
Response variables		International lending
Empirical methodology		Bilateral panel regressions, controlling for bank-specific characteristics and studying country sub-samples
Major findings		Changes in macroprudential policy via loan-to-value limits and local-currency reserve requirements have a significant impact on international bank lending. Better capitalised banking systems and those with more liquid assets and less core deposit funding react more.

Author(s)		Aysan et al.
Year		2015
Type of publication		The Singapore Economic Review
Sample coverage: region		46 countries (29 AEs, 17 developing)
Sample coverage: time		Q1/2004 to Q4/2012; Q1/1996 - Q1/2012 (upon request)
Investigated MPMs		Reserve requirements, caps on foreign exchange operations, other capital controls
Domestic focus	Credit	
	Housing markets	
	Output/ Macroeconomy	
International focus	Resilience to intl. shocks	X
	Cross-broder spillovers	
Other focus		
Response variables		Cross-border banking capital flows
Empirical methodology		Panel regression framework, controlling for real exchange rate, world money supply, real GDP growth, change in government debt to GDP, interbank office assets of foreign banks in the US, log of end-quarter VIX index
Major findings		After controlling for a set of domestic and external variables and relative to a group of advanced and emerging countries, cross-border capital flows to Turkey have been less sensitive to changes in global banking activities, world money supply and domestic GDP growth compared to the rest of the economies.

Author(s)		Beirne and Friedrich
Year		2017
Type of publication		Journal of International Money and Finance
Sample coverage: region		66 countries (26 developed and 40 developing)
Sample coverage: time		1999-2012
Investigated MPMs		Restrictions on: borrowing abroad, lending locally in foreign exchange, maintenance of accounts abroad, use of foreign currency, purchase of locally issued securities denominated in foreign exchange, open foreign exchange positions
Domestic focus	Credit	
	Housing markets	
	Output/ Macroeconomy	
International focus	Resilience to intl. shocks	
	Cross-broder spillovers	X
Other focus		
Response variables		International banking flows
Empirical methodology		Ordinary least squares with heteroskedasticity-robust standard errors, clustered at the country level, year FE and financial and macroeconomic control variables
Major findings		Higher regulatory quality and a higher credit-to-deposit ratio increases the effectiveness of MPPs, while a higher cost-to-income ratio has the opposite effect. The structure of the domestic banking sector determines spillovers from MPPs across asset classes, while spillovers from MPPs across countries are a function of banking sector conditions both at home and abroad.

Author(s)		Brandao-Marques et al.
Year		2020
Type of publication		IMF Working Paper
Sample coverage: region		37 countries (20 developed, 17 developing)
Sample coverage: time		1990 to 2016 (quarterly data)
Investigated MPMs		IMF's iMaPP database: overall category and sub-categories of borrower-based and financial institution-based measures
Domestic focus	Credit	X
	Housing markets	
	Output/ Macroeconomy	X
International focus	Resilience to intl. shocks	
	Cross-broder spillovers	
Other focus		Comparison to monetary policy shocks
Response variables		Future real GDP growth and inflation
Empirical methodology		FE quantile regressions controlling for a financial condition index, current GDP growth, inflation and credit growth
Major findings		Tightening macroprudential policy dampens downside risks to growth stemming from loose financial conditions and is beneficial in net terms, especially the tightening of borrower-based tools such as caps on LTV and DSTI, when vulnerabilities are high. In contrast, tightening monetary policy entails net losses. These findings hold when policies are used in response to easing global financial conditions. When a tightening of macroprudential policies is accompanied by looser monetary policy, it translates into a larger reduction in the central bank's loss function than when macroprudential tightening is conducted on its own. Buying foreign exchange or tightening capital controls has small net benefits.

Author(s)		Buch and Goldberg
Year		2017
Type of publication		International Journal of Central Banking
Sample coverage: region		64 countries
Sample coverage: time		2000 to 2014
Investigated MPMs		General capital requirements, sector-specific capital buffers, loan-to-value ratios, local reserve requirements, foreign reserve requirements, interbank exposure limits, concentration ratios
Domestic focus	Credit	X
	Housing markets	
	Output/ Macroeconomy	
International focus	Resilience to intl. shocks	
	Cross-broder spillovers	X
Other focus		Meta-analysis
Response variables		Domestic and international bank lending growth
Empirical methodology		Meta-analysis; statistical significance is the 10% significance of the summed effect on lending growth over linear combinations of all regression terms that include each specific prudential instrument.
Major findings		First, the effects of prudential instruments sometimes spill over borders through bank lending. Second, international spillovers vary across prudential instruments and are heterogeneous across banks. Bank-specific factors like balance sheet conditions and business models drive the amplitude and direction of spillovers to lending growth rates. Third, the effects of international spillovers of prudential policy on loan growth rates have not been large on average.

Author(s)		Cerutti and Zhou
Year		2018
Type of publication		IMF Working Paper
Sample coverage: region		29 BIS reporting countries (lenders) and over 160 borrowers
Sample coverage: time		2006-2015
Investigated MPMs		Joint impact of MPMs and CCs (capital control). Overall macroprudential index based on 12 types of MPMs (database by Cerutti, Claessens and Laeven, 2017). Capital control measure based on the capital outflow/inflow restriction index of Fernandez et al. (2015)
Domestic focus	Credit	
	Housing markets	
	Output/ Macroeconomy	
International focus	Resilience to intl. shocks	
	Cross-broder spillovers	X
Other focus		
Response variables		Cross-border banking flows
Empirical methodology		First-stage (Probit) estimation and second-stage (maximum likelihood) estimation, both with lender/ borrower / year fixed effects
Major findings		Tighter MPPs in lender countries reduce direct cross-border banking outflows but are associated with larger outflows via local affiliates. Tighter MPPs in borrower countries, on the other hand, are associated with larger direct cross-border banking inflows, likely due to circumvention motives.

Author(s)		Cesa-Bianchi et al.
Year		2018
Type of publication		Journal of International Economics
Sample coverage: region		50 (24 AEs and 26 EMs)
Sample coverage: time		1985 to 2012 (quarterly)
Investigated MPMs		Limits on FX borrowing, maximum loan-to-value ratio, capital controls (inflows)
Domestic focus	Credit	
	Housing markets	
	Output/ Macroeconomy	
International focus	Resilience to intl. shocks	X
	Cross-broder spillovers	
Other focus		
Response variables		Use of debt to finance transactions, cross-border credit, consumption, house price, real exchange rate, current account
Empirical methodology		Model of collateralised borrowing in domestic and foreign currency with international financial intermediation; panel VAR model
Major findings		Countries featuring lower LTV ratios and stricter limits on foreign currency borrowing are less vulnerable to global credit supply shocks.

Author(s)		Cizel et al.
Year		2019
Type of publication		Journal of Money, Credit and Banking
Sample coverage: region		37 countries (28 AEs, 9 EMs)
Sample coverage: time		1997 to 2014
Investigated MPMs		Loan-to-value ratio, debt-to-income ratio, time-varying/dynamic loan-loss provisioning, general countercyclical capital buffer requirement, leverage ratio, capital surcharges on SIFIs, limits on interbank exposures, concentration limits, limits on foreign currency loans, reserve requirement ratios, limits on domestic currency loans, levy/tax on financial institutions, sector-specific capital requirements
Domestic focus	Credit	X
	Housing markets	
	Output/ Macroeconomy	
International focus	Resilience to intl. shocks	
	Cross-broder spillovers	
Other focus		
Response variables		Bank credit to private sector and nonbank credit to private sector – % of GDP and annual growth
Empirical methodology		Panel regressions controlling for the central bank policy rate, systemic banking crises, contemporaneous bank credit growth and country FE; propensity score matching
Major findings		In EMDEs, bank and non-bank credit appear to co-move in the long run; a banking crisis appears to limit non-bank credit growth. Macroprudential policies are associated with a substitution out of bank credit toward non-bank credit. Substitution toward non-bank credit is stronger when policy measures are binding and implemented in economies with well-developed non-bank credit markets. This substitution partially offsets the fall in bank credit, dampening the policies' effect on total credit.

Author(s)		Coman and Lloyd
Year		2019
Type of publication		ECB Working Paper
Sample coverage: region		29 EMs
Sample coverage: time		2000 to 2017
Investigated MPMs		Capital and reserve requirements, LTV ratio limits, interbank exposure limits and concentration limits
Domestic focus	Credit	X
	Housing markets	X
	Output/ Macroeconomy	
International focus	Resilience to intl. shocks	X
	Cross-broder spillovers	
Other focus		
Response variables		Domestic lending (total and bank credit) and house prices
Empirical methodology		Panel local projections with capital and country FEs and controlling for global financial cycle variables
Major findings		Tighter LTV limits and reserve requirements appear to be particularly effective measures to shield total credit in emerging markets from negative spillover effects of US monetary policy and the associated global financial cycle even when accounting for capital controls.

Author(s)		Darracq Pariès et al.
Year		2019
Type of publication		ECB Working Paper
Sample coverage: region		Model calibrated to Spain, Germany, France, Italy
Sample coverage: time		NA
Investigated MPMs		Increase in system-wide capital requirements, in sectoral capital requirements for loans to households and tighter loan-to-value ratio caps
Domestic focus	Credit	
	Housing markets	
	Output/ Macroeconomy	X
International focus	Resilience to intl. shocks	
	Cross-broder spillovers	X
Other focus		Comparison to monetary policy shocks
Response variables		Domestic and foreign real GDP, inflation, lending rates on new credit to NFCs and HHs, policy rate
Empirical methodology		Two-country DSGE model with financial frictions and cross-border spillover effects
Major findings		Counter-cyclical macroprudential interventions are supportive of monetary policy conduct through the cycle (reinforced when there are asymmetric financial cycles across the monetary union); important cross-border spillovers of MPMs

Author(s)		Eller et al.
Year		2021
Type of publication		Journal of International Money and Finance
Sample coverage: region		11 CESEE EU Member States
Sample coverage: time		Q1/2000 to Q4/2018
Investigated MPMs		Intensity-adjusted MPM index
Domestic focus	Credit	X
	Housing markets	
	Output/ Macroeconomy	
International focus	Resilience to intl. shocks	X
	Cross-broder spillovers	
Other focus		
Response variables		Domestic credit growth, capital inflows (levels and volatility)
Empirical methodology		Country-specific regime-switching FAVAR model
Major findings		Studies dynamic effects of MPMs on macro-financial variables; uses novel regime-switching factor-augmented VAR model to identify policy shifts; includes intensity-adjusted index for MPMs tracking strength of adjustments. Credit growth and capital inflows decrease following a tightening MPM shock. Reactions to MPM tightening are stronger in a low-interest rate environment, suggesting that MPMs would be more effective when conventional monetary policy faced constraints.

Author(s)		Fendoglu
Year		2017
Type of publication		Journal of Banking & Finance
Sample coverage: region		18 major emerging market economies
Sample coverage: time		Q1/2000 to Q2/2013
Investigated MPMs		Compiled index: (i) borrower-related measures (caps on loan-to-value (LTV) ratio and caps on debt-to-income (DTI) ratio), and (ii) financial institution-related measures (counter-cyclical capital requirements (CCR), time-varying/dynamic loan loss provisioning, restrictions on foreign currency lending and limits on net open currency position (NOP)), prudential taxes (e.g. capital gains taxes) and some 'other' measures such as limits on credit growth or limits on maturity mismatch
Domestic focus	Credit	X
	Housing markets	
	Output/ Macroeconomy	X
International focus	Resilience to intl. shocks	X
	Cross-broder spillovers	
Other focus		
Response variables		Credit-to-GDP gap
Empirical methodology		Dynamic panel model controlling for country FEs, portfolio flow measures, the lagged value of the credit cycle, monetary policy stance, aggregate demand conditions, balance sheet instruments, GMM estimator
Major findings		The results suggest that an overall tightening in the macroprudential policy stance (MPI) is effective in containing the credit cycles per se or the impact of portfolio inflows on the credit cycles. Borrower-based tools or measures with a domestic focus appear more effective and robust. Macroprudential policies during the recent period are generally effective in containing the impact of portfolio inflows, particularly cross-border banking inflows, on the probability of a credit boom.

Author(s)		Finger and Lopez Murphy
Year		2019
Type of publication		IMF Departmental Paper
Sample coverage: region		13 Asian EMs
Sample coverage: time		2000 to 2018
Investigated MPMs		Aggregate measure by summing the net tightening actions across 17 different types of MPMs contained in the IMF's iMaPP database
Domestic focus	Credit	
	Housing markets	
	Output/ Macroeconomy	
International focus	Resilience to intl. shocks	
	Cross-broder spillovers	
Other focus		
Response variables		Aggregate net MPP tightening
Empirical methodology		Probit estimations of policy reaction functions ("augmented" Taylor rules) Explanatory variables: net capital flows, global factors, domestic control variables (such as the output gap, inflation, credit growth, etc.)
Major findings		MPMs in Asian EMs seem to respond to an array of domestic macro-financial risks and external influences, including capital flows and US policy rates.

Author(s)		Forbes
Year		2019
Type of publication		AEA Papers & Proceedings
Sample coverage: region		Developed and developing countries
Sample coverage: time		2008 to 2020; focus on the 2008-2009 global financial crisis
Investigated MPMs		(i) capital and reserve instruments, (ii) liquidity instruments, (iii) credit instruments and (iv) structural institutions
Domestic focus	Credit	X
	Housing markets	
	Output/ Macroeconomy	X
International focus	Resilience to intl. shocks	X
	Cross-broder spillovers	X
Other focus		Literature review
Response variables		Aggregate and household credit growth, bank borrowing and lending in foreign currency, financial resilience, supply of credit during downturns, crises, and/or recoveries, unemployment
Empirical methodology		Literature review
Major findings		Many macroprudential tools can successfully accomplish their specific goals, albeit often with unintended leakages and spillovers. The magnitude of these leakages (and especially spillovers) tends to be meaningfully smaller than the direct effects of the macroprudential policies, but the unintended effects can still be meaningful when assessed relative to the size of the sector in which the risks shift.

Author(s)		Forbes
Year		2020
Type of publication		NBER Working Paper
Sample coverage: region		134 countries
Sample coverage: time		1990-2020 (literature review); from end-2019 to Q1/2020 (Corona crisis regression analysis)
Investigated MPMs		IMF's iMaPP database: aggregate stance, distinguishing between moderate and aggressive tightening
Domestic focus	Credit	
	Housing markets	
	Output/ Macroeconomy	
International focus	Resilience to intl. shocks	X
	Cross-broder spillovers	
Other focus		Literature review, resilience to COVID-19 shock
Response variables		Measures for country resilience: broad equity index, 5-year credit default swap rate, USD exchange rate and the IMF's forecast for 2020 GDP growth
Empirical methodology		(1) Literature review (2) Panel regressions of the change in country resilience in the first quarter of the COVID-19 crisis, on the macroprudential policy stance pre-COVID and various controls for the immediate impact of the COVID shock and other pre-COVID characteristics
Major findings		A growing body of evidence suggests that MPMs can accomplish specific domestic goals and should reduce country vulnerability to many domestic and international shocks. However, MPMs will not insulate economies from volatility, and they generate leakages to the non-bank financial system and spillovers through international borrowing, lending and other cross-border exposures. COVID crisis: Countries with tighter pre-crisis macroprudential stances appear to have had greater resilience in their equity markets but not in their credit default swaps, exchanges rates or GDP growth.

Author(s)		Forbes et al.
Year		2015
Type of publication		Journal of International Economics
Sample coverage: region		60 countries
Sample coverage: time		2009-2011
Investigated MPMs		Weekly changes in controls on capital inflows, capital outflows and macroprudential measures related to international exposures: reporting requirements and limitations on maturity structure of liabilities and assets, restrictions on off-balance-sheet activities and derivatives contracts, limits on asset acquisition, limits on banks' FX positions, limits on banks' lending in FX, asset classification and provisioning rules, taxes on FX transactions, capital requirements on FX assets, differential reserve requirements on liabilities in local and FX currencies
Domestic focus	Credit	X
	Housing markets	
	Output/ Macroeconomy	
International focus	Resilience to intl. shocks	X
	Cross-broder spillovers	
Other focus		
Response variables		Various measures of financial fragility: exchange rate, portfolio flows, interest rate differentials, equity markets, inflation, financial market volatilities and other financial vulnerabilities
Empirical methodology		Logit models to predict national changes in CCs and MPMs, propensity score matching methodology to account for selection bias
Major findings		Tightened macroprudential measures significantly reduce bank use of debt to finance transactions, inflation expectations, bank credit growth and exposure to portfolio liabilities relative to the counterfactual (although the effect on portfolio liabilities reverses within a year). Tightened controls on capital inflows reduce private credit growth over several months. In contrast to these robust results, there is limited evidence that CFMs affect other primary goals, including exchange rates and net capital flows. One exception is that removing controls on capital outflows may reduce real exchange rate appreciation.

Author(s)		Frost et al.
Year		2020
Type of publication		BIS Working Paper
Sample coverage: region		83 countries
Sample coverage: time		2000-2017
Investigated MPMs		FX-based reserve requirements, limits on FX lending, other measures in Boar et al. (2017), openness of a country's capital account to different categories of inflows and outflow
Domestic focus	Credit	
	Housing markets	
	Output/ Macroeconomy	
International focus	Resilience to intl. shocks	X
	Cross-broder spillovers	
Other focus		
Response variables		Volume and composition of gross capital inflows (% of GDP); probability of a capital inflow surge, banking crisis or currency crisis in the subsequent three years
Empirical methodology		Propensity score matching model controlling for growth, bank resilience, reserves, financial development, recent crises
Major findings		The activation of FX-based MPPs reduces capital inflow volumes by nearly 5% of GDP and is linked to a lower probability of banking crisis and capital flow surges in the subsequent three years.

Author(s)		IMF
Year		2020
Type of publication		IMF World Economic Outlook chapter 3
Sample coverage: region		38 emerging markets
Sample coverage: time		2000 to 2016
Investigated MPMs		IMF's iMaPP database: measures to boost bank capital and liquidity, limit foreign exchange mismatches and prevent risky lending to leveraged borrowers
Domestic focus	Credit	X
	Housing markets	
	Output/ Macroeconomy	X
International focus	Resilience to intl. shocks	X
	Cross-broder spillovers	
Other focus		
Response variables		Real GDP growth
Empirical methodology		Panel regression of real GDP growth in EMs on a vector of global financial shocks and their interactions with the stringency of macroprudential regulation and country fixed effects
Major findings		A tighter level of macroprudential regulation reduces the sensitivity of GDP growth in EMs to fluctuations in risk premia and changes in foreign capital flows. Effects are heterogenous and depend on the particular type of global financial shock hitting an economy. Macroprudential regulation can also help stabilise real credit growth and the nominal and real exchange rates. MPMs attenuate the negative impact on GDP from a tightening in global financial conditions but also limit GDP growth when financial conditions are loose.

Author(s)		Kim and Mehrotra
Year		2018
Type of publication		Journal of Money Credit and Banking
Sample coverage: region		Australia, Thailand, Indonesia, Korea
Sample coverage: time		From 2000, 2002 or 2005 (depending on the country) to Q2/2012
Investigated MPMs		Index of macroprudential policies (PP) based on Shim et al. (2013) applied for housing markets
Domestic focus	Credit	
	Housing markets	
	Output/ Macroeconomy	X
International focus	Resilience to intl. shocks	
	Cross-broder spillovers	
Other focus		Comparison to monetary policy shocks
Response variables		Real GDP, price level, total credit, policy interest rate
Empirical methodology		Structural panel vector auto-regressions with country FEs
Major findings		Tighter macroprudential policies that are used to contain credit growth also have a significant negative impact on macroeconomic aggregates such as real GDP and price level. The similar effects of monetary and macroprudential policies may suggest a complementary use of the two policies in normal times. However, they could also create challenges for policymakers, especially during times when low inflation coincides with buoyant credit growth.

Author(s)		Kim and Mehrotra
Year		2019
Type of publication		BIS Working Paper
Sample coverage: region		32 AEs and EMs
Sample coverage: time		
Investigated MPMs		Changes in capital buffers, interbank exposure limits, concentration limits, loan-to-value ratios and reserve requirements; overall index of macroprudential policies (PP) based on Cerutti et al. (2017)
Domestic focus	Credit	X
	Housing markets	
	Output/ Macroeconomy	X
International focus	Resilience to intl. shocks	
	Cross-broder spillovers	
Other focus		Comparison to monetary policy shocks
Response variables		Real GDP, price level, total credit, policy interest rate, residential and business investment, household and corporate credit, lending rate
Empirical methodology		Panel vector auto-regressions with country FEs
Major findings		Macroprudential policy shocks have effects on real GDP, price level and credit that are very similar to those of monetary policy shocks, but the detailed transmission of the two policies is different. Whereas macroprudential policy shocks mostly affect residential investment and household credit, monetary policy shocks have more widespread effects on the economy. Moreover, while positive credit shocks are generally met with tighter macroprudential policy, macro-financial country characteristics such as the exchange rate regime and level of financial development affect the policy response.

Author(s)		McCann and O'Tool
Year		2019
Type of publication		International Journal of Central Banking
Sample coverage: region		Ireland (and spillovers to UK)
Sample coverage: time		January 2013 and June 2016
Investigated MPMs		Limits on loan-to-value (LTV), loan-to income (LTI) and debt service-to-income (DSTI) ratios
Domestic focus	Credit	X
	Housing markets	X
	Output/ Macroeconomy	
International focus	Resilience to intl. shocks	
	Cross-broder spillovers	X
Other focus		
Response variables		Effective loan-to-value (LTV) and loan-to-income (LTI) of mortgages; probability of issuance of high-risk loans
Empirical methodology		Cross-sectional difference-in-difference; multinomial logit inverse probability weighting technique to deal with selection on observables and to restore the sample composition to be comparable to the pre-policy treatment group
Major findings		Evidence for risk spillovers: Irish banks increased their LTV and LTI ratios on lending abroad in response to the regulatory macroprudential tightening at home.

Author(s)		Nier et al.
Year		2020
Type of publication		IMF Working Paper
Sample coverage: region		62 economies (35 AEs, 27 EMs)
Sample coverage: time		Q1/2000 to Q4/2016
Investigated MPMs		iMaPP database: aggregate measure, borrower-based tools and financial institution-based tools; separate analysis of the effects of tightening and loosening actions
Domestic focus	Credit	X
	Housing markets	
	Output/ Macroeconomy	
International focus	Resilience to intl. shocks	X
	Cross-broder spillovers	
Other focus		
Response variables		Domestic credit relative to GDP
Empirical methodology		Dynamic panel regressions with country and time FE controlling for changes in the real exchange rate, monetary policy stance and forecast year-on-year real GDP growth
Major findings		An appreciation of the local exchange rate is associated with a subsequent increase in the domestic credit gap, while a prior tightening of macroprudential policies dampens this effect. Evidence for a feedback effect: strong domestic credit pulls in additional cross-border funding, potentially further increasing systemic risk; targeted capital controls can play a complementary role in alleviating this effect.

Author(s)		Reinhardt and Sowerbutts
Year		2015
Type of publication		BoE Staff Working Paper
Sample coverage: region		37 countries (23 developed, 14 developing)
Sample coverage: time		Q1/2005 to Q3/2014
Investigated MPMs		Capital regulation, lending standards, reserve requirements
Domestic focus	Credit	
	Housing markets	
	Output/ Macroeconomy	
International focus	Resilience to intl. shocks	
	Cross-broder spillovers	X
Other focus		
Response variables		Cross-border banking flows; quarterly percentage change in cross-border and/or local borrowing of non-banks in country i from country j
Empirical methodology		Panel regression with country and country/quarter FE, controlling for domestic credit growth extended by domestic resident banks, exchange rate depreciation, inflation and real GDP growth
Major findings		They found evidence that borrowing by the domestic non-bank sector from foreign banks increases after home authorities undertake a macroprudential capital action. They found no increase in borrowing from foreign banks after an action which tightens lending standards (such as limits on loan-to-value ratios for house purchases). Evidence on reserve requirements is mixed.

Author(s)		Richter et al.
Year		2019
Type of publication		Journal of International Economics
Sample coverage: region		56 countries (developing and developed)
Sample coverage: time		Q1/1990 to Q2/2012
Investigated MPMs		Maximum loan-to-value (LTV) ratios (introduction, tightening, loosening or abolition)
Domestic focus	Credit	X
	Housing markets	X
	Output/ Macroeconomy	X
International focus	Resilience to intl. shocks	
	Cross-broder spillovers	
Other focus		
Response variables		Real GDP and consumer price index level
Empirical methodology		Local projection methods controlling for county and year FE, GDP growth, inflation; inverse propensity weights to re-randomise LTV action and policy rate changes
Major findings		MPMs tend to have little effect on output and inflation (neither stabilising nor destabilising). Over a four-year horizon, a 10 percentage point decrease in the maximum LTV ratio leads to a 1.1% reduction in output. However, the effects are estimated imprecisely, and the effect is present only in emerging market economies. They found that tightening LTV limits has larger economic effects than loosening them. They also assessed the treatment effects of tightening LTV limits on financial variables using inverse propensity weighting and found that credit and house prices fall after a tightening.

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