BIS Working Papers

No 1097

Dampening global financial shocks: can macroprudential regulation help (more than capital controls)?

by Katharina Bergant, Francesco Grigoli, Niels-Jakob Hansen and Damiano Sandri

Monetary and Economic Department

May 2023

JEL classification: F3, F4, E5.

Keywords: macroprudential regulation, monetary policy, capital controls.

This publication is available on the BIS website (www.bis.org).

ISSN 1020-0959 (print)
ISSN 1682-7678 (online)

Dampening Global Financial Shocks: Can Macroprudential Regulation Help (More than Capital Controls)?*

Katharina Bergant IMF | Francesco Grigoli IMF | Niels-Jakob Hansen IMF | Damiano Sandri BIS and CEPR

April 19, 2023

Abstract

We show that macroprudential regulation significantly dampens the impact of global financial shocks on emerging markets. Specifically, a tighter level of regulation reduces the sensitivity of GDP growth to capital flow shocks and movements in the VIX. A broad set of macroprudential tools contributes to this result, including measures targeting bank capital and liquidity, foreign currency mismatches, and risky credit. We also find that tighter macroprudential regulation allows monetary policy to respond more countercyclically to global financial shocks. This could be an important channel through which macroprudential regulation enhances macroeconomic stability. We do not find evidence that capital controls provide similar benefits.

JEL Codes: F3, F4, E5
Keywords: Macroprudential regulation, monetary policy, capital controls.

*Katharina Bergant: International Monetary Fund, kbergant@imf.org; Francesco Grigoli: International Monetary Fund, fgrigoli@imf.org; Niels-Jakob Hansen: International Monetary Fund, nhansen@imf.org; Damiano Sandri: Bank for International Settlements and CEPR, damiano.sandri@bis.org. The views expressed herein are those of the authors and should not be attributed to the BIS, the IMF, its Executive Board, or its management. This paper benefited from insightful comments by Kristin Forbes, Linda Goldberg, Gita Gopinath, Sebnem Kalemli-Özcan, Philip Lane, Gian Maria Milesi-Ferretti, Malhar Nabar, Jonathan D. Ostry, and seminar participants at the ASSA meetings 2021, Austrian National Bank, Bank of England, Bank for International Settlements, Danish National Bank, European Central Bank, European Commission, European Stability Mechanism, International Monetary Fund, and George Washington University.

1 Introduction

A growing literature documents that fluctuations in global financial markets can severely affect financial and macroeconomic conditions in emerging markets.[1] When global financial conditions are buoyant, emerging markets tend to enjoy higher economic growth supported by abundant foreign capital inflows. Conversely, a tightening in global financial conditions can considerably depress economic activity in emerging markets.

According to conventional macroeconomic theory, emerging markets should be able to offset the impact of global financial shocks by relying on exchange rate flexibility. Empirical evidence shows that a flexible exchange rate tends to soften the impact of foreign financial shocks on the domestic economy (Obstfeld et al., 2005). However, it falls short of providing full insulation. Global financial shocks can destabilize even emerging markets with flexible exchange rates, as documented in Rey (2015) and Rey (2016) among others.[2] The vulnerability of emerging markets to global financial shocks leads to recurrent calls for policymakers to deploy additional policy tools. The discussion often centers on the role of capital controls and foreign exchange intervention because these tools directly target international financial transactions. However, there is growing awareness that macroprudential policies can also play an important role in stabilizing credit markets.

Against this backdrop, the paper examines whether macroprudential regulation can dampen the macroeconomic impact of global financial shocks on emerging markets. The hypothesis underpinning the analysis is that by reinforcing banks' and borrowers' balance sheets, preventing excessive risk taking, and limiting foreign currency exposures, macroprudential regulation strengthens the resilience of the domestic financial sector and thus enhances macroeconomic stability.

Ostry et al. (2012) provide early evidence in favor of this hypothesis, showing that countries with stronger macroprudential regulation were more resilient to the global financial crisis. Similarly, Neanidis (2019) finds that stronger bank supervision reduces the negative impact of volatile capital flows on economic growth. This paper examines the dampening effects of macroprudential regulation more systematically, using a broad set of global financial shocks and analyzing the experience of 38 emerging markets between 2000 and 2019.[3] During this time, emerging markets were exposed to highly volatile global financial conditions, driven by large swings in US policy rates, global risk aversion—proxied by the VIX—and capital inflows, as illustrated in panels 1 and 2 of Figure 1. Panel 3 in Figure 1 shows that GDP in emerging markets grew rapidly during the buoyant years before the global financial crisis and contracted sharply during it.

Meanwhile, emerging markets have gradually tightened macroprudential regulation. Panel 1 of Figure 2 shows the average number of macroprudential tightening actions per country in emerging markets using the IMF's integrated Macroprudential Policy (iMaPP) database compiled by Alam et al. (2019).[4] By

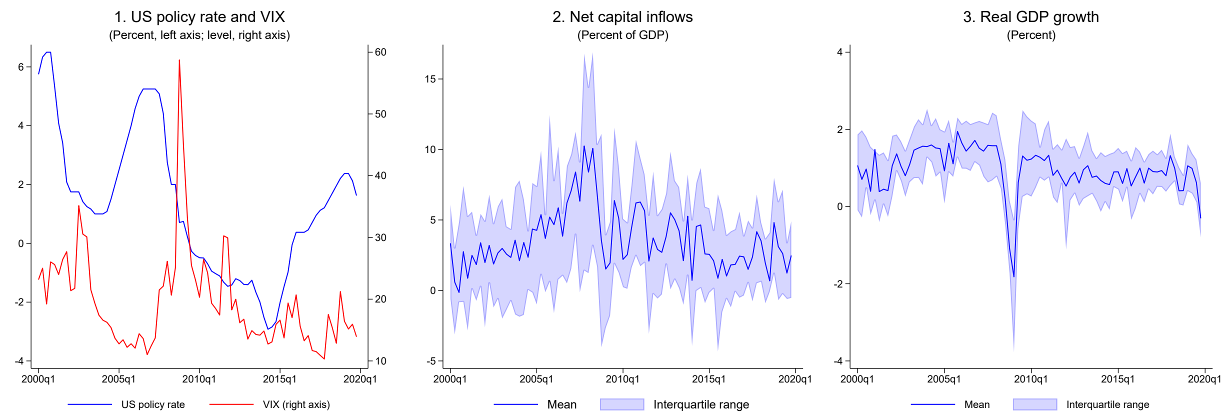
[1] See for example Canova (2005), Dedola et al. (2017), Maćkowiak (2007), Georgiadis (2016), Choi et al. (2017), Iacoviello and Navarro (2019), Bräuning and Ivashina (2020), and Vicondoa (2019).

[2] The theoretical literature finds that exchange rate flexibility becomes less effective in buffering external shocks in the presence of financial frictions (Ottonello, 2021; Farhi and Werning, 2016; Akinci and Olmstead-Rumsey, 2018; Aoki et al., 2019; Cavallino and Sandri, 2023); and trade invoicing in US dollars (Egorov and Mukhin, 2019; Gopinath et al., 2020).

[3] In the online appendix F, we show that the core results of the analysis are largely robust to including 2020. However, since GDP outcomes in 2020 were heavily shaped by the COVID-19 pandemic rather than by global financial shocks, we end the analysis in 2019.

[4] The iMaPP is the most comprehensive database on macroprudential policies available as of this writing. The database records tightening and loosening actions for 17 macroprudential tools starting in 1990. These include measures that aim to boost bank capital and liquidity, limit foreign exchange mismatches, and prevent risky lending to leveraged borrowers. We note that the iMaPP records implementation rather than announcement dates. To the extent that announcement effects drive the resilience of the financial sector because agents comply with macroprudential measures before they come into effect, this should

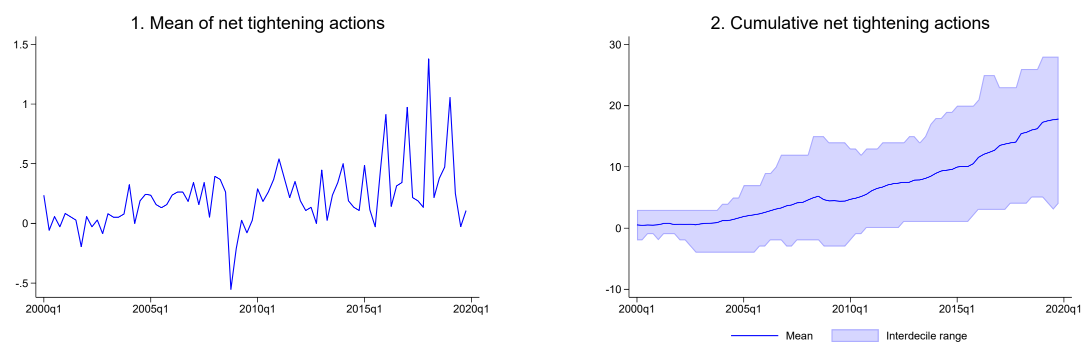
Figure 1: External and Domestic Conditions in Emerging Markets



Source: Bank for International Settlements, IMF, International Financial Statistics database; Haver Analytics; (Wu and Xia, 2016); IMF, Balance of Payments; and authors' calculations.
Notes: The US policy rate is the federal funds rate except during the zero lower bound (ZLB) period where we use the implied rate from (Wu and Xia, 2016).

cumulating the tightening actions (net of the loosening ones) for each country since 1990, we construct an approximate measure of the stringency of macroprudential regulation. Panel 2 of Figure 2 shows that macroprudential regulation was considerably tightened over the years, especially since 2005. Panel 2 also illustrates a substantial dispersion in the level of macroprudential regulation across countries. By exploiting both time-series and cross-country variation in macroprudential regulation, the core of the analysis examines whether tighter levels of regulation can dampen the effects of global financial shocks on domestic economic activity in emerging markets.

Figure 2: Macroprudential Policy



Source: IMF, integrated Macroprudential Policy (iMaPP) Database; and authors' calculations.
Notes: Panel 1 shows the cross-country average of net tightening actions; panel 2 shows the cross-country average of the cumulative net tightening actions. The shaded area in panel 2 corresponds to the interdecile range.

We find strong evidence in this favor, showing that a more stringent level of regulation significantly reduces the sensitivity of GDP growth in emerging markets to global financial shocks. These results are robust to a broad set of endogeneity tests to alleviate concerns about reverse causality and omitted variables.

bias the analysis against finding significant effects associated with implementation changes, rather than generating spurious results in their favor.

We also find evidence that the dampening effects of macroprudential regulation display decreasing marginal returns. At more stringent levels of macroprudential regulation, further macroprudential tightening becomes less effective in strengthening resilience. This may reflect concerns about circumvention, whereby tight macroprudential regulation may push financial activities outside the regulatory perimeter and increase cross-border borrowing.[5]

We further characterize the dampening affects of macroprudential regulation along several dimensions. First, we show that the dampening effects of macroprudential regulation are symmetric with respect to positive and negative global financial shocks. This implies that while a higher level of macroprudential regulation supports GDP growth when global financial shocks are adverse but it lowers economic activity when global financial conditions are favorable. Second, we document that the results are not driven by a narrow set of macroprudential tools. On the contrary, a broad range of measures contribute to enhancing macroeconomic resilience to global financial shocks, including tools that boost bank capital and liquidity, limit foreign exchange exposures, and avert overly risky forms of credit. Third, we analyze if macroprudential regulation entails adverse international spillovers. If a country shields itself against global financial volatility using macroprudential regulation, other countries may end up getting more exposed. However, we do not find evidence of such negative spillovers. Rather, we find that a higher level of macroprudential regulation in one country tends to enhance macroeconomic stability in other countries. This suggests that macroprudential regulation reduces the propagation of global financial shocks, possibly because enhanced resilience in a given country leads to more stable cross-border trade and financial flows.

Besides documenting the dampening properties of macroprudential regulation on economic activity, we investigate if macroprudential regulation allows for a more countercyclical response of monetary policy to global financial shocks. This could be an important channel through which macroprudential regulation may enhance macroeconomic stability. Central banks in emerging markets are generally reluctant to cut policy rates when global financial conditions tighten even after controlling for expected inflation (Obstfeld et al., 2005; Aizenman et al., 2016; Aizenman et al., 2020; Han and Wei, 2018; Bhattarai et al., 2020; Cavallino and Sandri, 2023). This is likely because they fear that a sharp exchange rate depreciation or large capital outflows may jeopardize financial stability. By strengthening balance sheets and limiting risk taking, macroprudential regulation should alleviate these concerns and help monetary policy to focus more squarely on macroeconomic stabilization. We find that macroprudential regulation indeed allows for a more countercyclical monetary policy response. At low levels of macroprudential regulation central banks tend to respond procyclically, by increasing rates when global financial conditions tighten. But at more stringent levels of regulation, the monetary policy response becomes countercyclical, involving a decline in policy rates when global financial conditions tighten.

Finally, to put the benefits from macroprudential regulation uncovered by the analysis into perspective, we ask how they compare to those from capital controls. The literature generally considers capital controls as the key policy instrument beyond exchange rate flexibility to protect emerging markets from global financial shocks. This view originates from the Mundell-Fleming trilemma whereby restrictions on capital flows are expected to provide countries with greater control over domestic financial and macroeconomic conditions, thus strengthening resilience to external shocks. Following the same empirical approach used to analyze macroprudential regulation, we ask whether more stringent capital controls can also dampen global financial

[5]See for example Ongena et al. (2013), Aiyar et al. (2014), Reinhardt and Sowerbutts (2015), Cerutti et al. (2017a), Ahnert et al. (2021), Bengui and Bianchi (2018), Braggion et al. (2018), Auer et al. (2022), Cizel et al. (2019), and Acharya et al. (2022).

shocks and support a more countercyclical response of monetary policy. Using a broad set of capital control indicators provided by Chinn and Ito (2008), Fernández et al. (2015), Quinn and Toyoda (2008), and Pasricha et al. (2018), we do not find evidence that tighter capital controls provide similar benefits to those of tighter macroprudential regulation.[6]

Literature review Our results relate to a growing literature on the effectiveness of macroprudential policies in controlling domestic credit and house prices. Various papers use country-level panel data as in our analysis. Cerutti et al. (2017a) find that borrower-based and financial macroprudential tools affect credit growth in emerging markets. Similarly, Fendoğlu (2017) and Akinci and Olmstead-Rumsey (2018) document that macroprudential policies can curb credit and house price growth. Several other papers confirm that macroprudential policies can stabilize real house prices (Crowe et al., 2013; Cerutti et al., 2017b; Kuttner and Shim, 2016; Wong et al., 2011). Looking at credit cycles, Dell'Ariccia et al. (2012) show that macroprudential policies can reduce the frequency of credit booms and decrease the severity of subsequent busts. Focusing on bank balance sheets, Claessens et al. (2013) find that macroprudential measures based on credit limits are effective in controlling leverage.

Micro-level studies confirm the effectiveness of macroprudential policies in affecting credit growth. Using data from Spain, Saurina (2009) and Jiménez et al. (2017) find that dynamic provisioning can mitigate credit booms and busts. Aiyar et al. (2016) and Dassatti et al. (2019) use bank-level data for Uruguay and the UK, respectively, and show that reserve and capital requirements have significant effects on credit. Igan and Kang (2011) and Tillmann (2015) use sectoral data from Korea to show that limits to loan-to-value and debt-to-income ratios moderate credit growth. Araujo et al. (2020) use data at the loan- and borrower-level for Brazil and find that individuals make higher down payments and purchase more affordable houses in response to higher loan-to-value limits. Gómez et al. (2020) use individual loan data from Colombian banks and find that dynamic provisions, countercyclical reserve requirements, and aggregate macroprudential policies can reduce credit growth, especially to riskier debtors. Gambacorta and Murcia (2020) deploy a meta-analysis to synthesize bank-loan studies from five emerging markets in Latin America and find that macroprudential policies can help stabilize credit cycles. Furthermore, they find that the effectiveness of macroprudential policy is reinforced by the use of monetary policy: macroprudential policy tightenings (loosenings) have larger effect on credit growth when used together with tightening (loosenings) in monetary policy.

In addition to financial variables, a few papers have analyzed the effects of macroprudential regulation on GDP growth. Some papers find that a tightening in macroprudential policies leads to a temporary decline in GDP (Kim and Mehrotra, 2018; Eickmeier et al., 2018; Richter et al., 2019). Other papers focus on longer-term effects, finding that macroprudential policies tend to boost average economic growth (Boar et al., 2017; Agénor et al., 2018; Neanidis, 2019).

Our paper differs from the literature because we do not analyze the impact of *changes* in macroprudential regulation on domestic conditions. We instead examine if the *level* of macroprudential regulation—and later the stringency of capital controls—affects the transmission of global financial shocks to the domestic economy. Besides providing a different perspective on the effects of macroprudential regulation, this research question is subject to less severe endogeneity concerns. While changes in regulation are likely triggered by economic developments that complicate identification, the level of regulation when global financial shocks materialize

[6] These findings are consistent with those presented in Forbes et al. (2015) and Frost et al. (2020). Using propensity score matching procedures, these studies find that macroprudential tools, especially FX-based measures, are more effective in influencing macroeconomic outcomes than capital controls.

is largely pre-determined being the outcome of easing and tightening decisions over the previous years.

Our analysis also relates to several papers that examine whether macroprudential policies affect the monetary spillovers from core countries to emerging markets. Bush et al. (2021) study how the transmission of US monetary policy to lending in Chile, Mexico, and Russia depends on macroprudential regulation. They find ambiguous results, with the effects of different macroprudential instruments varying across countries. Niepmann et al. (2021) study how stress-testing affects the transmission of US monetary policy through US bank lending to emerging markets. They find that only banks passing the stress test with comfortable margins issue more loans to emerging market borrowers in response to a monetary policy easing.[7]

The rest of paper is structured as follows. Section 2 analyzes the dampening effects macroprudential regulation against global financial shocks. Section 3 considers whether macroprudential regulation allows for a more countercyclical monetary policy response. Section 4 examines if capital controls are as effective as macroprudential regulation in dealing with global financial shocks. Section 5 concludes by summarizing the key insights of the paper and discussing avenues for future research.

2 The dampening effects of macroprudential regulation

Macroprudential regulation involves a broad set of policy tools that aim to contain the build up of systemic vulnerabilities and strengthen the resilience of the financial sector. These include measures to increase bank capital and liquidity, reduce leverage in the household and corporate sectors, and prevent currency mismatches. The hypothesis motivating the analysis in this paper is that, by buttressing financial sector stability, macroprudential regulation should also enhance macroeconomic resilience to global financial shocks. Does the empirical evidence support this reasoning?

To address this question, we estimate panel regressions of GDP growth in emerging markets over a vector of global financial shocks and their interactions with the stringency of macroprudential regulation.[8] The baseline specification is:

$$Y_{i,t} = \alpha_i + \beta\ S_{i,t} + \gamma\,(S_{i,t} \cdot MPru_{i,t}) + \delta\left(S_{i,t} \cdot MPru_{i,t}^2\right) + \zeta\ MPru_{i,t} + \theta\ MPru_{i,t}^2 + \kappa\ C_{i,t} + \varepsilon_{i,t} \tag{1}$$

where $Y_{i,t}$ denotes quarterly real GDP growth for country i at time t and α_i is a country fixed effect. The variable $S_{i,t}$ denotes the vector of global financial shocks and $MPru_{i,t}$ is the level of macroprudential regulation. To allow for nonlinear effects, the specification includes interaction terms of the shocks with the squared level of macroprudential regulation. Note that the coefficients on the interactions between the shocks and macroprudential regulation are estimated by exploiting both time-series and cross-country variation in the data. They indeed capture both if the impact of the shocks becomes less severe in a given country when the level of macroprudential regulation tightens over time; and if the impact of the shocks is less severe in countries that have a tighter level of macroprudential regulation.

The regression controls for a rich set of variables $C_{i,t}$. Following Obstfeld et al. (2019), this vector includes lagged GDP growth, lagged log of real GDP per capita, institutional quality, and a linear trend. We also add to $C_{i,t}$ the lagged output gap to control for growth dynamics over the business cycle and commodity terms

[7]See also additional studies referenced in Beck and Gambacorta (2020) and Bussière et al. (2021).

[8]Obstfeld et al. (2019) use similar regressions to examine if the impact of the VIX on emerging markets' macroeconomic conditions is influenced by the exchange rate regime.

of trade given that several emerging markets are large commodity importers or exporters.[9] We exclude time fixed effects because they would prevent us from estimating the impact of common global financial shocks on GDP and thus assess the quantitative importance of the dampening effects of macroprudential regulation. However, we will include time fixed effects in the robustness section, showing that the dampening effects of macroprudential regulation continue to hold true.

The vector $S_{i,t}$ includes three types of global financial shocks. First, we consider shocks to US monetary policy to capture changes in the international risk-free rate. We use the shocks identified by Iacoviello and Navarro (2019) that have been shown to have tangible effects on emerging markets.[10] Second, we include the Chicago Board Options Exchange's Volatility Index (VIX), which is commonly used in the literature as a proxy for shocks to international risk premia. Finally, the vector $S_{i,t}$ includes net capital inflows to capture shocks to the supply of foreign capital.[11] Since net capital flows are also affected by domestic pull factors, we isolate the variation due to global push factors by instrumenting net capital inflows to country i with gross inflows to the other emerging markets following Blanchard et al. (2017). The idea is that the total amount of foreign capital flowing to emerging markets, except the country in question, captures the general appetite of international investors for emerging markets' assets.

Most papers in the literature analyze only one of these three shocks. Our empirical framework includes all of them to capture all major sources of global financial shocks and understand which of them is more detrimental to emerging markets. Furthermore, the analysis can examine if macroprudential regulation enhances macroeconomic resilience against a broad set of shocks or only particular types. We will report the regression results throughout the paper by inverting the sign of net capital inflows, thus considering the effects of net capital outflows. In this way, all three shocks (to US rates, VIX, and net outflows) are expected to have a negative impact on emerging markets.

We construct the index of macroprudential regulation $MPru_{i,t}$ using the iMaPP database which provides the most comprehensive information on macroprudential policies to this day. The iMaPP records tightening or loosening actions for 17 macroprudential measures at the monthly frequency from 1990 onward. By cumulating the number of tightening actions—net of loosening actions—across all macroprudential measures, we construct the index $MPru_{i,t}$ which we use as a proxy for the stringency of macroprudential regulation.[12] The underlying assumption is that countries that have tightened more macroprudential measures or multiple times have reached a stronger level of macroprudential regulation. A similar approach has been used by Akinci and Olmstead-Rumsey (2018) to analyze how the stance of macroprudential regulation affects credit growth.

Our index of macroprudential regulation is subject to three measurement drawbacks which reflect the limitations of existing macroprudential data. First, it neglects possible differences in the stringency of macroprudential regulation before 1990 given the lack of data, potentially confounding cross-country rankings. Second, the iMaPP database records changes in macroprudential measures but not the intensity

[9] Compared to Obstfeld et al. (2019), the regression does not control for the contemporaneous credit to GDP ratio since a possible channel through which global financial shocks affect GDP growth (our left-hand side variable) is through the impact on domestic credit.

[10] These are computed as the residuals from a regression of the federal funds rate on US inflation, US log GDP, US corporate spreads, and the log of foreign GDP. Iacoviello and Navarro (2019) provide a time-series of the shocks until 2016:Q2 which we extended until 2019:Q4.

[11] Throughout the paper, we normalize capital flows by the HP-trend of GDP. We use the HP-trend rather than actual GDP to avoid introducing volatility driven by short-term fluctuations in the denominator.

[12] Since the index enters quadratically in the regression specification, we re-scale the index upward across all countries to ensure that values are always positive.

of those changes.[13] Third, by summing tightening actions across different macroprudential measures, the country-level index treats different macroprudential measures alike, giving equal weight to every one of them.

These measurement problems could affect the accuracy of our regression estimates but are unlikely to drive our results on the dampening effects of macroprudential regulation. As discussed in Akinci and Olmstead-Rumsey (2018) and Forbes (2018), measurement imprecision should bias the analysis against finding significant effects associated with macroprudential regulation rather than generate spurious evidence about their benefits. Nonetheless, to mitigate concerns about measurement problems, we will show that the results are robust to using both time-series and cross-sectional variation in the data. Furthermore, Section 2.4 documents that alternative indexes of macroprudential regulation constructed using subsets of the 17 measures recorded in the iMaPP are also associated with dampening effects.

2.1 Baseline results

Table 1 reports the regression results. We start in column (1) by analyzing the impact of global financial shocks on emerging markets' GDP growth without controlling for the level of macroprudential regulation. As in Obstfeld et al. (2019), an increase in the VIX is associated with a contemporaneous economic contraction in emerging markets. Capital outflows also significantly reduce economic activity. US monetary shocks have a detrimental effects on growth if the regression does not control for other global financial shocks, as shown in column (2). But they lose significance when controlling for the VIX and capital flows. Interestingly, this suggests that changes in US monetary policy affect emerging markets through changes in risk premia proxied by the VIX and the effects on the supply of foreign capital, rather than through changes in risk-free rates. Similar arguments are developed in Kalemli-Özcan (2019), who shows that US monetary policy transmits globally through changes in risk premia. Regarding the control variables, the coefficient on the lag of the output gap is negative and significant, suggesting that deviations from potential growth tend to be reduced over the following quarter. The instrumentation approach for net capital flows appears reliable since the F-statistic is well above the conventional threshold.[14]

The level of macroprudential regulation and its interactions with global financial shocks enter the regression specification in column (3). The coefficients on the VIX and net outflows remain significant. Importantly, the coefficients on the interaction terms between the shocks and macroprudential regulation are positive and highly statistically significant. This implies that a more stringent level of macroprudential regulation dampens the effects of global financial shocks on GDP growth. Column (4) shows that the results are robust to excluding periods during which countries had a fixed exchange rate.

Column (5) extends the regression specification to include the squared level of macroprudential regulation and its interactions with the shocks, following equation (1). The results corroborate the contractionary effects of VIX increases and capital outflows as well as the dampening effects of macroprudential regulation. Moreover, the interaction term of net capital outflows with the squared level of regulation is negative and statistically significant. The dampening effects of macroprudential regulation appear thus subject to decreasing marginal returns, weakening as the level of regulation tightens.

To better understand the dampening effects of macroprudential regulation, it is helpful to analyze the derivative of GDP growth with respect to a given global financial shock $s^n_{i,t} \in S_{i,t}$. Based on equation (1),

[13] The iMaPP database provides an indicator of policy intensity only for the LTV limits.

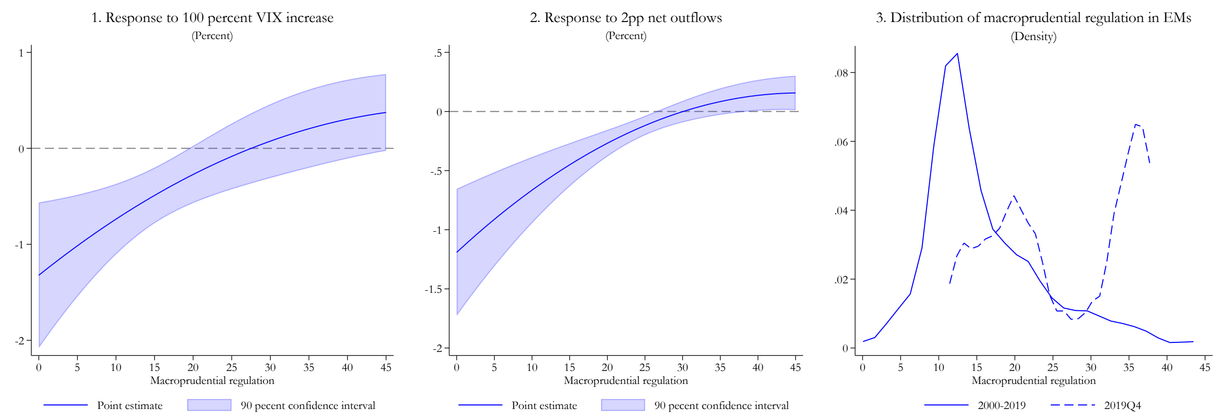
[14] In the regression results, we report the Kleibergen-Paap rk Wald F-statistic, which assumes non-iid errors and is appropriate with more than one endogenous regressors.

the derivative is equal to:

$$\frac{\partial Y_{i,t}}{\partial S^j_{i,t}} = \beta + \gamma_n MPru_{i,t} + \delta_n MPru^2_{i,t} \tag{2}$$

which is a nonlinear function of the level of macroprudential regulation.[15] The first two panels in Figure 3 illustrate the derivatives with respect to the VIX and capital outflow shocks. More specifically, the charts show the impact of these shocks on GDP in emerging markets as a function of the stringency of macroprudential regulation on the horizontal axis. The third panel in Figure 3 shows the distribution of macroprudential regulation in emerging markets in the regression sample (between 2000–2019) and at the end of 2019.

Figure 3: GDP Response in Emerging Markets to Global Financial Shocks



Source: Authors' calculations.
Notes: The x-axis denotes the level of macroprudential regulation. Panels 1 and 2 show the GDP response to global financial shocks for different levels of macroprudential regulation; panel 3 shows the probability density function of macroprudential regulation in the sample. Net capital outflows are scaled by the HP-trend of GDP. The shaded areas correspond to 90 percent confidence intervals computed with Driscoll-Kraay standard errors.

At the lowest level of macroprudential regulation in the sample, an increase in the VIX or an outflow of capital considerably reduce economic growth in emerging markets. For example, a doubling of the VIX—an increase similar to the one occurred during the global financial crisis—leads to a decline in quarterly GDP growth by 1.2 percentage points. Similar effects are triggered by a net outflow worth 2 percent of GDP. Macroprudential regulation can considerably dampen these effects. In fact, if the level of macroprudential regulation is sufficiently tight, the VIX and net capital outflows no longer have statistically significant negative effects on emerging markets' GDP.

The first two charts in Figure 3 also illustrate that the dampening effects of macroprudential regulation tend to face decreasing marginal returns. A tightening in macroprudential regulation becomes progressively less effective in strengthening resilience to global financial shocks. These nonlinearities are consistent with problems of circumvention. As the stringency of regulation increases, domestic borrowers have stronger incentives to seek credit in the unregulated shadow financial market or by foreign banks, as discussed in the

[15] The regression framework can also be used to examine the impact of macroprudential regulation on GDP growth, captured by the derivative $\partial Y_{i,t}/\partial MPru_{j,t}$. When evaluated at the average level of the global financial variables during the sample of analysis, this derivative is not statistically different from zero. Therefore, while macroprudential regulation dampens the effects of global financial shocks on GDP, it does not appear to exercise an independent effect on the growth rate.

literature referenced in the introduction to the paper. These forms of credit are likely to be more sensitive to global financial conditions and thus could weaken the dampening effects of macroprudential regulation.

2.2 Robustness

The dampening effects of macroprudential regulation are robust to a broad range of tests which are described in greater detail in the online Appendix B. We first address concerns about possible reverse causality, whereby the level of macroprudential regulation may respond to changes in GDP growth. We do so by estimating the regression using lagged levels of macroprudential regulation by one quarter and one year. Furthermore, to entirely rule out the risk of reverse causality, we estimate the regression using average levels of macroprudential regulation between 2000 and 2019. In this case, the dampening effects of macroprudential regulation are identified by relying exclusively on cross-country heterogeneity in the stringency of macroprudential regulation. Across all these specifications, the coefficient on the interaction term between macroprudential regulation and net outflows remains positive and highly statistically significant. The interaction term of macroprudential regulation with the VIX is also robust to using lagged values of macroprudential regulation, although it loses statistical significance when using only cross-country differences in the average level of macroprudential regulation.

We also find that the dampening effects of macroprudential regulation vis-à-vis both capital outflow shocks and movements in the VIX are robust to detrending the level of macroprudential regulation to address concerns about the non-stationarity of the index in some countries. Finally, we tackle concerns about omitted variable bias. The dampening effects attributed to macroprudential regulation could be driven by country characteristics or policy actions that are correlated with macroprudential regulation and have been omitted from the analysis. To address these concerns, the regression specification is augmented with interaction terms between the global financial shocks and various factors that may affect economic resilience, such as institutional quality, financial development, fiscal variables, monetary and exchange rate variables, the stringency of capital controls, and the share of foreign investors in local markets. The dampening effects of macroprudential regulation vis-à-vis both the VIX and capital outflow shocks are again robust to all the omitted variable tests.[16]

2.3 Symmetric dampening effects

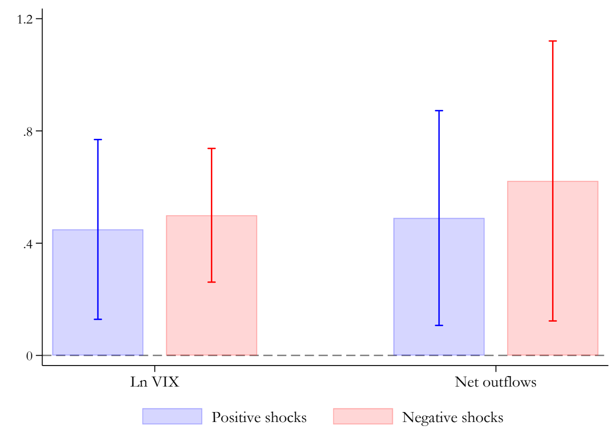
The analysis has established that macroprudential regulation reduces the sensitivity of emerging markets' GDP growth to VIX and capital outflow shocks. Do these dampening effects apply to both positive and negative shocks? To address this question, we extend the regression specification to include dummies that differentiate between an increase or decrease in the global financial shocks:

$$
\begin{aligned}
Y_{i,t} =& \alpha_i + \beta^{+} D^{+}_{i,t} s^{n}_{i,t} + \beta^{-} D^{-}_{i,t} s^{n}_{i,t} + \gamma^{+} D^{+}_{i,t} s^{n}_{i,t} MPru_{i,t} + \gamma^{-} D^{-}_{i,t} s^{n}_{i,t} MPru_{i,t} \\
& + \zeta^{+} D^{+}_{i,t} MPru_{i,t} + \zeta^{-} D^{-}_{i,t} MPru_{i,t} + \beta^{\not n} S^{\not n}_{i,t} + \gamma^{\not n} S^{\not n}_{i,t} \; MPru_{i,t} + \kappa \; C_{i,t} + \varepsilon_{i,t} \qquad (3)
\end{aligned}
$$

[16]The dampening effects of macroprudential regulation against capital flow shocks are also robust to the inclusion of time fixed effects, although in this case we can no longer estimate the impact of US monetary shocks and the VIX since they are common to all countries and thus absorbed by the time fixed effects. In the online Appendix, we also show the robustness of the results to alternative indicators of US shadow policy rates. We also experimented with adding shocks to medium and long-term yields on US government bonds and found that macroprudential regulation dampens their impacts on emerging markets' growth as well.

where $s_{i,t}^{j} \in S_{i,t}$ is a specific global shock, $D_{i,t}^{+}\left(D_{i,t}^{-}\right)$ is a dummy variable that takes value one when shock $s_{i,t}^{n}$ is positive (negative), and zero otherwise. The coefficients γ^{+} and γ^{-} measure the dampening effects of macroprudential regulation under a positive and negative shock realization, respectively. The vector $S_{i,t}^{\not{n}}$ includes the global financial shocks other than $s_{i,t}^{n}$.

Figure 4: Symmetric Dampening Effects of Macroprudential Regulation
(Percent)



Source: Authors' calculations.
Notes: The blue (red) bars show the point estimates for the coefficients on the triple interaction terms among the shock, the level of macroprudential regulation, and a dummy that identifies positive (negative) shocks, respectively. The level of macroprudential regulation is divided by 10 to ease the visualization of the coefficients. The vertical lines correspond to 90 percent confidence intervals computed with Driscoll-Kraay standard errors.

Figure 4 illustrates the γ^{+} and γ^{-} coefficients for the VIX and net capital outflows, showing that they are both positive and statistically significant.[17] Furthermore, a Wald test confirms that they are not statistically different from each other. Therefore, macroprudential regulation entails symmetric dampening effects against both positive and negative global financial shocks. This implies that, while a tighter level of macroprudential regulation supports economic growth in case of negative financial shocks, it also lowers economic activity when global financial shocks are positive. These findings call for further analysis on how to optimally adjust macroprudential regulation to maximize the dampening effects against negative shocks without unduly constraining economic activity when financial conditions are supportive.

2.4 Categories of macroprudential measures

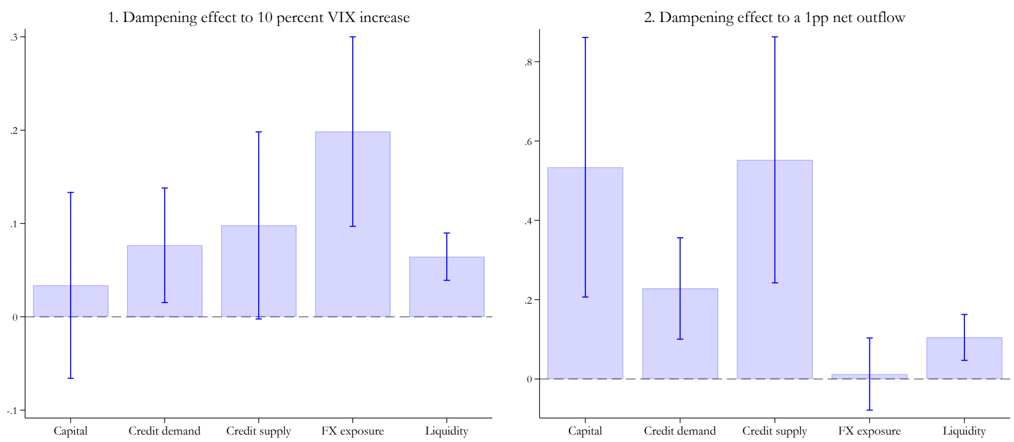
The index of macroprudential regulation used in the analysis so far combines a broad range of individual macroprudential measures recorded in the iMaPP database. We now examine if the dampening effects of macroprudential regulation are driven by specific measures. To investigate this issue, we replicate the analysis using more disaggregated categories of macroprudential regulation, distinguishing between measures targeted at bank capital and liquidity, credit demand (such as loan-to-value ratios), credit supply (such as limits on

[17] The underlying regression results are reported in the online Appendix C.

credit growth), and foreign currency exposure.[18]

Figure 5 illustrates the results, reporting the coefficient estimates on the interaction terms of each macroprudential category with the VIX (panel 1) and net capital outflows (panel 2).[19] Positive and statistically significant coefficients denote dampening effects. Measures targeted at credit demand, FX exposure, and liquidity dampen the impact on GDP growth arising from the VIX. Macroprudential measures targeted at bank capital, credit demand, credit supply, and liquidity strengthen resilience against net capital outflows.

Figure 5: Dampening Effects on GDP Growth by Categories of Macroprudential Measures
(Percent)



Source: Authors' calculations.
Notes: The bars in panels 1 and 2 show the point estimates of the coefficients on the interaction terms between the shocks and the level of macroprudential regulation. The level of macroprudential regulation is divided by 10 to ease the visualization of the coefficients. X-axis denotes five categories of macroprudential measures. The vertical lines correspond to 90 percent confidence intervals computed with Driscoll-Kraay standard errors.

These findings indicate that the dampening effects of macroprudential regulation are not driven by a narrow set of measures. In particular, they are not limited to measures targeted at foreign currency exposures that could operate more similarly to capital controls by constraining borrowing in foreign currency. Macroprudential regulation that ensures adequate bank capital and liquidity and prevents excessive risk-taking in credit provision also plays a crucial role in fostering resilience to global financial shocks. This suggests that countries that want to enhance resilience against VIX and capital flow shocks should adopt a well-rounded macroprudential framework rather than narrowly focusing on few specific measures.

2.5 Cross-country spillovers

This section examines the potential cross-country spillovers from macroprudential regulation. If a country protects itself from swings in global financial conditions through tight macroprudential regulation, other

[18]Table A.3 in the online appendix A describes the mapping from individual tools in the iMaPP database to these group categories. The analysis cannot be run on individual macroprudential tools because of the sparsity of the data.
[19]The online Appendix D reports the underlying regression results.

countries could be exposed to greater volatility.[20] For example, measures that curb risk taking in a given country could lead to the relocation of risky financial activities to other countries (Houston et al., 2012; Jiménez et al., 2017; McCann and O'Toole, 2019), thus making them more susceptible to global financial shocks. However, macroprudential regulation may also entail positive cross-country spillovers. If a country becomes more resilient to global financial shocks owing to macroprudential regulation, other countries may enjoy greater stability through less volatile trade and financial flows with that country. For example, Choi et al. (2021) find that countries tend to experience lower real credit and house price growth if their trade and financial partner countries adopt tighter macroprudential policies.

To capture possible cross-country spillovers, we extend the specification in equation (1) as follows:

$$Y_{i,t} = \alpha_i + \beta \ S_{i,t} + \gamma \left(S_{i,t} MPru_{i,t} \right) + \overline{\gamma} \left(S_{i,t} \overline{MPru}_{i,t} \right) + \overline{\zeta} \ \overline{MPru}_{i,t} + \kappa \ C_{i,t} + \varepsilon_{i,t} \tag{4}$$

Besides interacting the global financial shocks with the level of macroprudential regulation in a given country, the regression includes an interaction term of the shock vector with the average level of regulation $\overline{MPru}_{i,t}$ in emerging markets other than country i. This new interaction term captures if the sensitivity of GDP growth in a given country to global financial shocks is affected by the level of macroprudential regulation in other countries. The average level of regulation $\overline{MPru}_{i,t}$ is computed by weighting countries according to the average size of gross capital inflows that they received during the sample period. The idea is that countries that are more integrated financially are likely to generate larger spillovers.

Table 2 reports the regression results considering alternative ways to select the countries to be included in the average $\overline{MPru}_{i,t}$. In column (1), we compute $\overline{MPru}_{i,t}$ using the average level of regulation in all emerging markets other than country i. We then differentiate countries across several characteristics to account for the fact that spillovers are more likely to occur across similar economies, following Giordani et al. (2017). In column (2), $\overline{MPru}_{i,t}$ is computed using countries within the same geographical region. Columns (3) and (4) differentiate countries based on whether their GDP per capita is above or below the median of the country sample. Column (3) does so by considering the GDP levels in each quarter, so that countries move across groups over time. Column (4) considers instead the average levels of GDP during 2000–2019, in which case the group assignment is time invariant. Following the same approach used for GDP, columns (5) and (6) differentiate countries according to their risk class. We use a composite risk index provided by the Political Risk Service that captures the economic, financial, institutional, and political risks of a given country. This index has been used in Giordani et al. (2017) to analyze spillovers from capital flow management measures.

The analysis does not find evidence of negative spillovers. On the contrary, spillovers tend to be positive vis-à-vis net capital outflows. The coefficient on the interaction between net outflows and the average level of macroprudential regulation in other emerging markets is positive and significant regardless of how the average $\overline{MPru}_{i,t}$ is computed. This implies that a country becomes more resilient to capital outflow shocks if other emerging markets have a higher level of macroprudential regulation.

[20] Similar arguments have been raised regarding capital flow management measures (Lambert et al., 2011; Forbes et al., 2016; Giordani et al., 2017).

3 Macroprudential regulation and monetary policy

According to the Mundell-Fleming trilemma, countries that are open to capital flows should retain monetary independence if they have a flexible exchange rate (Fleming, 1962; Mundell, 1963). Monetary independence can be broadly defined as the ability to set interest rates and stabilize domestic macroeconomic conditions independently of swings in global monetary and financial conditions. In line with the trilemma, there is evidence that policy rates in countries with flexible exchange rates are less responsive to US monetary policy and the VIX than in countries with fixed exchange rates (Obstfeld, 2015).

However, even in emerging markets with flexible exchange rates, several central banks tend to increase policy rates in response to a US monetary tightening or a spike in the VIX, even after controlling for inflation (Obstfeld et al., 2005; Aizenman et al., 2016; Aizenman et al., 2020; Han and Wei, 2018; Bhattarai et al., 2020; Cavallino and Sandri, 2023). This is possibly to limit fluctuations in exchange rates and capital flows that may undermine financial stability. In these situations, monetary policy appears to operate procyclically, exacerbating the negative effects of tighter global financial conditions on domestic economic activity.

Against this backdrop, we ask whether macroprudential regulation—by mitigating financial stability concerns—can allow for a more countercyclical monetary policy response to global financial shocks.[21] We examine this issue by estimating the following panel specification:

$$I_{i,t} = \alpha_i + \beta\ S_{i,t} + \gamma\,(S_{i,t} \cdot MPru_{i,t}) + \zeta\ MPru_{i,t} + \kappa\ C_{i,t} + \varepsilon_{i,t} \tag{5}$$

where the dependent variable $I_{i,t}$ is the policy rate in a given emerging market i at time t. The vector of global shocks $S_{i,t}$ includes the US policy rate, the VIX, and net capital outflows which we instrument as in the previous sections. Note that we use the US policy rate rather than the US policy rate shocks as in equation (1). This is in line with the literature on the trilemma and with the fact that policy rates in emerging markets react to changes in actual US policy rates rather than to their unexpected components. The coefficients γ capture if the response of domestic monetary policy to global financial shocks is affected by the level of macroprudential regulation. Specifically, negative coefficients would indicate that monetary policy responds more countercyclically to a tightening in global financial conditions when macroprudential regulation is tighter.

The regression specification controls for a vector of variables, $C_{i,t}$, following a standard augmented Taylor rule. This vector includes expected inflation over the next 12 months, the output gap, real credit growth, and commodity terms of trade. The inclusion of expected inflation is important to show that monetary policy is not merely responding to the effects of global financial shocks on domestic inflation. We exclude periods in which countries had a fixed exchange rate to ensure that countries in the regression sample retained some degree of monetary autonomy.[22]

Table 3 reports the regression results. We start in column (1) by including only global financial shocks.

[21] Some evidence in this favor is provided by Aizenman et al. (2020) who find that tighter macroprudential policy reduces the sensitivity of policy rates in developing countries to monetary policy in major advanced economies. There is also evidence of macroprudential and monetary policies having larger effect on domestic credit growth when deployed together Gambacorta and Murcia (2020). This could deter central banks with high levels of macroprudential regulation from reacting pro-cyclically to global financial shocks.

[22] More specifically, we use the exchange rate classification by Ilzetzki et al. (2019) and exclude hard pegs as well as currencies that are freely falling or have dual exchange rate markets. A potential concern about the specification in equation (5) is that policy rates could be non-stationary. Panel unit root tests by Levin et al. (2002) and Im et al. (2003) reject this hypothesis. The test results are available upon request.

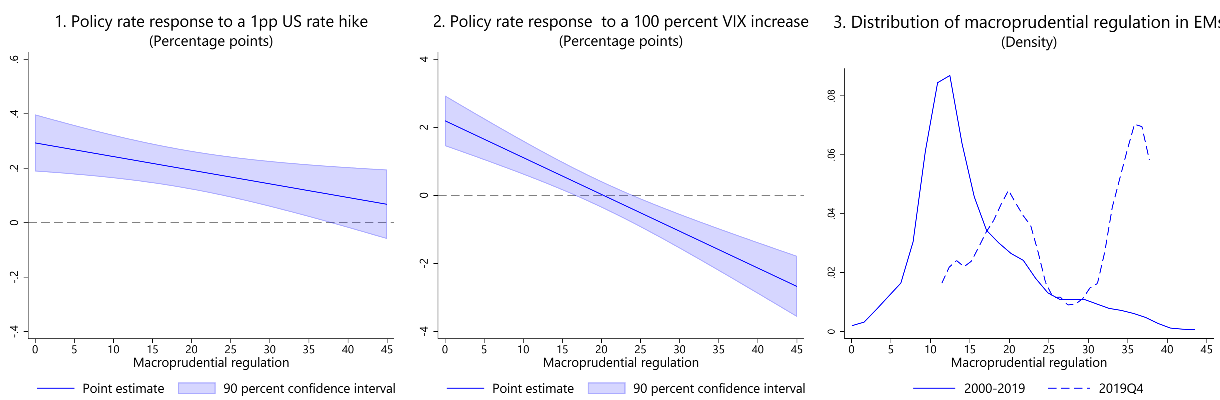
The results show that policy rates in emerging markets tend to respond pro-cyclically to a tightening in global financial conditions. Specifically, policy rates increase in response to rises in the US policy rate and the VIX. Column (2) shows that the monetary policy response remains procyclical when controlling for expected inflation and the output gap. These results are robust to controlling for real credit growth and commodity terms of trade in column (3). Across all the specifications, the F-tests suggest that the instrumentation approach for net capital flows is reliable. Column (4) reports the full regression specification, including macroprudential regulation and its interactions with global financial shocks. The estimates show that the interactions with the US policy rate and the VIX are negative and statistically significant. This implies that macroprudential regulation enables monetary policy to respond more countercyclically to global financial shocks.

We illustrate these findings in Figure 6, which shows the response of domestic policy rates in emerging markets to a global financial shock $s_{i,t}^n$ as a function of the level of domestic macroprudential regulation:

$$\frac{\partial I_{i,t}}{\partial s_{i,t}^n} = \beta + \gamma_n MPru_{i,t} \tag{6}$$

Panel 1 and 2 show that at low levels of macroprudential regulation, emerging markets tighten monetary policy in response to a hike in US monetary policy or an increase in the VIX. A more stringent level of macroprudential regulation dampens this procyclical response. In fact, at sufficiently high levels of macroprudential regulation emerging markets' policy rates no longer comove with US policy rates. Furthermore, monetary policy reacts countercyclically to increases in the VIX, by cutting rather than hiking policy rates.

Figure 6: Policy Rate Responses in Emerging Markets to Global Financial Shocks



Source: Authors' calculations.
Notes: The x-axis denotes the level of macroprudential regulation. Panels 1 to 2 show the policy rate response to global financial shocks for different levels of macroprudential regulation; panel 3 shows the probability density function of macroprudential regulation in the sample. Net capital outflows are scaled by the HP-trend of GDP. The shaded areas correspond to 90 percent confidence intervals computed with Driscoll-Kraay standard errors.

Macroprudential regulation can thus support a more countercyclical monetary policy response to US monetary policy and the VIX. However, the results in column (4) of Table 3 also show that macroprudential regulation does not have tangible effects on the monetary policy response to capital outflow shocks. This suggests that even in countries with tight macroprudential regulation, central banks continue to face important policy trade-offs when dealing with capital flow pressures. In the online Appendix E, we show that these results are robust to the same battery of robustness tests used to validate the dampening effects of monetary policy on economic activity.

4 How does macroprudential regulation fare against capital controls?

The previous analysis has shown that macroprudential regulation can significantly dampen the impact of global financial shocks on economic activity in emerging markers and allow for a more countercyclical response of monetary policy. To put these benefits in perspective, in this section we ask if capital controls can provide similar gains. The empirical and theoretical literature has placed great emphasis on the role of capital controls in dealing with global financial conditions.[23] Since these tools directly reduce capital flows, they are expected to limit the sensitivity of emerging markets to global financial shocks. Nonetheless, there are also concerns about their effectiveness. For example, capital controls may "leak", as investors try to circumvent restriction by channeling funds through alternative ways that can prove more volatile. Furthermore, countries that maintain capital controls may signal their willingness to impose new restrictions during a crisis. This could unnerve foreign investors and exacerbate rather than stem volatility.

To assess the benefits of capital controls, we replicate the analysis in the previous sections using four indicators of capital controls constructed by Chinn and Ito (2008), Fernández et al. (2015), Quinn and Toyoda (2008), and Pasricha et al. (2018).[24] The goal is to examine if there is systematic evidence that capital controls provide similar or greater benefits than those of macroprudential regulation.[25]

We start by analyzing if capital controls can dampen the effects of global financial shocks on GDP in emerging markets. To do so, we re-estimate equation (1) using the indexes of capital controls instead of macroprudential regulation. Table 4 reports the results, using specifications with and without quadratic terms for capital controls. We denote the stringency of capital controls with CC. Across all the specifications from column (1) to (8), we confirm that an increase in the VIX or a capital outflow have negative effects on GDP growth in emerging markets. For capital controls to dampen these effects, the coefficients on the interaction between capital controls and the shocks should be positive. Yet most coefficients are insignificant. Some are even negative and statistically significant, thus suggesting the capital controls may actually exacerbate the transmission of global financial shocks. The interaction coefficients are positive and statistically significant only in column (3) and (5) against the VIX but lose statistical significance once we allow for quadratic terms in columns (4) and (6). Overall, the results suggest that the stringency of capital controls does not dampen the impact of global financial shocks on economic activity in emerging markets. This is in sharp contrast with our results on macroprudential regulation.[26]

[23] See the comprehensive reviews of the literature provided by Erten et al. (2021) and Rebucci and Ma (2019).

[24] The indices by Chinn and Ito (2008), Fernández et al. (2015), and Quinn and Toyoda (2008) capture the *level* of capital controls by counting how many capital control measures are active. Since these indicators are available at annual frequency and measure the stringency of controls at the end of the year, we generate quarterly series by linearly interpolating the annual values. The index by Pasricha et al. (2018), which is available at quarterly frequency, measures instead *changes* in capital controls over time. In this case, we cumulate net tightening actions to create an index for the stringency of capital controls at each point in time. This is the same approach that we used to construct our index of macroprudential regulation.

[25] It is important to consider that some macroprudential measures may also be treated as forms of capital controls. These overlaps should bias the analysis towards finding similar effects associated with macroprudential regulation and capital controls. Yet we uncover considerable differences in the ability to dampen global financial shocks.

[26] In line with our findings, the literature finds mixed results about the effects of capital controls on macro outcomes. On the one hand, Klein (2012) finds that, after controlling for GDP per capita, countries with capital controls—no matter whether they are long-standing or used episodically—do not experience slower growth of financial variables associated with asset price bubbles.

We now turn to the question of whether capital controls enable countries to use monetary policy more countercyclically in response to global financial shocks. We re-estimate equation (5) by replacing the index of macroprudential regulation with capital control measures. If stricter capital controls allow for a more countercyclical monetary policy response, the coefficients on the interactions between capital controls and the shocks should be negative and statistically significant. On the contrary, Table 5 shows that most coefficients on the interaction terms are insignificant or positive.[27]

The lack of systematic effects of capital controls on monetary policy could appear in contradiction with earlier contributions to the literature. Shambaugh (2004) finds that capital controls reduce the comovement of domestic policy rates with the interest rate in a foreign base country using data between 1973 and 2000. Our analysis considers the period post 2000 when international capital markets have become considerably more integrated, possibly allowing investors to more easily circumvent capital controls. Han and Wei (2018) also document that capital controls reduce the comovement between policy rates in emerging and advanced economies and the US policy rate. However, their results apply especially to countries with fixed exchange rates.[28] Similarly, Aizenman et al. (2016) find that capital controls reduce the sensitivity of policy rates in emerging markets to monetary policy in major economies, but do not allow the effect to differ across exchange rate regimes. Our regression analysis considers instead only countries that retain at least a certain degree of exchange rate flexibility. In this case, capital controls do not seem to provide additional benefits for monetary policy. Furthermore, our analysis features a broader set of global financial shocks relative to the literature, including not only US monetary policy but also movements in the VIX and shocks to capital inflows.

Overall, the results suggest that tighter capital controls do not help emerging markets to dampen global financial shocks nor it supports a more countercyclical monetary policy response.[29] Against this background, the strength of the results on the benefits of macroprudential regulation appears even more striking.

5 Conclusions

The key result of the paper is that macroprudential regulation can significantly dampen the macroeconomic impacts of global financial shocks on emerging markets. More specifically, a tighter level of regulation reduces the sensitivity of GDP growth in emerging markets to fluctuations in risk premia and changes in the supply of international capital flows. The dampening effects are symmetric, reducing the effects on GDP from both positive and negative global financial shocks. Therefore, while more stringent regulation leads to a lower decline in GDP when global financial conditions tighten, it also constrains economic activity when global

Using a propensity-score matching methodology, Forbes et al. (2015) find that most capital controls have no significant effects on macro variables. On the other hand, Erten and Ocampo (2017) document that countries that tightened capital controls before the global financial crises experienced more moderate recessions. Furthermore, Zeev (2017) finds that GDP in countries with stricter controls on capital inflows responds less to global credit supply shocks.

[27] This could reflect that in countries with tighter capital controls, foreign investors are more fickle as they fear the imposition of additional controls. In turn, central banks may feel pressed to respond more countercyclically to stabilize capital flows.

[28] This can been seen in columns (3) to (6) of their Table 7 that use continuous measures of capital controls in line with our analysis. Han and Wei (2018) also find that capital controls reduce the sensitivity of policy rates to US monetary policy in countries with flexible exchange rates when using a dummy variable capturing the existence of capital controls. We can replicate their findings if we restrict the analysis to their country and period sample that stops in 2009.

[29] In the online Appendix G, we show that similar conclusions apply if we differentiate between capital controls on inflows and outflows. The fact that our regression analysis does not find significant effects associated the stringency of capital controls should not be used to dismiss possible gains from these tools. Restrictions on capital account transactions could be helpful in case of very large global shocks. Furthermore, the gains from capital controls could materialize from optimally adjusting these tools in response to shocks rather than by keeping them persistently at a more stringent level.

financial conditions are buoyant.

The dampening effects of macroprudential regulation are not driven by a narrow set of instruments. A broad range of macroprudential measures targeting liquidity, capital, foreign exchange exposures, and risky forms of credit contribute to enhancing macroeconomic resilience to global financial shocks. The effects of specific measures are heterogeneous and depend on the specific type of financial shock hitting the economy.

The analysis does not find evidence of negative cross-country spillovers from macroprudential regulation. On the contrary, a higher level of macroprudential regulation in one country appears to strengthen resilience to capital flow shocks in other countries as well. This is possibly because, if a country uses macroprudential measures to enhance macroeconomic stability, other countries benefit from more stable trade and financial linkages.

One possible channel through which macroprudential regulation strengthens macroeconomic resilience is by allowing monetary policy to respond more countercyclically to global financial shocks. The empirical evidence suggests that at low levels of macroprudential regulation, central banks in emerging markets tend to increase policy rates when global financial conditions tighten. This is likely because of financial stability concerns arising from movements in exchange rates and capital outflows. However, at higher levels of macroprudential regulation, central banks tend to lower policy rates when global financial conditions tighten, thus cushioning the impact of adverse financial shocks on domestic economic growth.

The benefits of macroprudential regulation uncovered in the analysis are particularly striking because we do not find evidence that capital controls provide similar gains. Despite using various measures of capital controls, the impact of global financial shocks on emerging markets' GDP is not systematically affected by the stringency of capital flow restrictions. Furthermore, the stringency of capital controls does not support a more countercyclical response of monetary policy to global financial conditions.

In conclusion, the findings of the analysis suggests that a sound macroprudential regulatory framework may go a long way in helping emerging markets to strengthen resilience against global financial shocks. To maximize the benefits of macroprudential regulation, policymakers should consider using a broad range of measures rather than focusing on a narrow set of tools. Imposing capital controls to limit cross-border financial transactions does not appear to be a valid substitute to adopting a solid macroprudential framework.

Table 1: Dampening Effects of Macroprudential Regulation on GDP Growth

	All EMs	All EMs	All EMs	No fixed ER	All EMs
	(1)	(2)	(3)	(4)	(5)
Lag dependent variable	0.063	0.112	0.062	0.016	0.058
	(0.056)	(0.084)	(0.048)	(0.051)	(0.045)
Lag output gap	-0.346***	-0.300***	-0.345***	-0.327***	-0.351***
	(0.032)	(0.041)	(0.030)	(0.029)	(0.030)
Lag ln real GDP per capita	-0.386	-0.002	-0.818*	-0.289	-0.602
	(0.333)	(0.325)	(0.431)	(0.417)	(0.438)
Institutional quality	-0.471	-0.576	-0.217	-0.149	-0.016
	(0.593)	(0.435)	(0.724)	(0.961)	(0.830)
Linear trend	0.003	-0.002	0.003	-0.002	-0.004
	(0.004)	(0.005)	(0.005)	(0.004)	(0.005)
Commodity terms of trade	0.049	0.050	0.041	0.081	0.036
	(0.031)	(0.035)	(0.046)	(0.055)	(0.058)
US monetary policy shock	-0.187	-0.391**	-0.160	-0.191	-0.153
	(0.142)	(0.177)	(0.251)	(0.249)	(0.320)
Ln VIX	-0.610***		-1.219***	-1.326***	-1.323***
	(0.158)		(0.295)	(0.276)	(0.460)
Net outflows	-0.174***		-0.366***	-0.363***	-0.596***
	(0.040)		(0.101)	(0.108)	(0.157)
Mpru			-0.931***	-1.124***	-0.544
			(0.332)	(0.340)	(0.959)
US monetary policy shock × Mpru			-0.019	-0.022	-0.020
			(0.087)	(0.095)	(0.179)
Ln VIX × Mpru			0.446***	0.495***	0.644*
			(0.121)	(0.120)	(0.335)
Net outflows × Mpru			0.101***	0.090**	0.295***
			(0.034)	(0.039)	(0.089)
$MPru^2$					0.037
					(0.130)
US monetary policy shock × $MPru^2$					0.005
					(0.022)
Ln VIX × $MPru^2$					-0.059
					(0.047)
Net outflows × $MPru^2$					-0.032***
					(0.011)
Observations	2,730	2,730	2,730	1,964	2,730
Countries	38	38	38	32	38
F-statistic	80.3		33.3	23.1	19.3

Source: Authors' calculations.
Notes: Net inflows (in percent of trend GDP) for each country are instrumented using gross inflows to other EMs (in percent of trend GDP). Results are presented in terms of net outflows. MPru is divided by 10 to ease the visualization of the coefficients. The estimations are based on a sample of EM from 2000Q1 to 2019Q4. All specifications include country fixed effects. Driscoll-Kraay standard errors are reported in parentheses. ***, **, and * indicate statistical significance at 1, 5, and 10 percent, respectively.

Table 2: Spillover Effects of Macroprudential Regulation on GDP Growth

	Others' Mpru computed as the average of:					
	All EMs	EMs in the same region	EMs in the same income class (time varying)	EMs in the same income class (time invariant)	EMs in the same risk class (time varying)	EMs in the same risk class (time invariant)
	(1)	(2)	(3)	(4)	(5)	(6)
Lag dependent variable	0.029	0.057	0.070	0.038	0.070	0.044
	(0.048)	(0.048)	(0.045)	(0.045)	(0.049)	(0.045)
Lag output gap	-0.377***	-0.347***	-0.352***	-0.337***	-0.316***	-0.343***
	(0.043)	(0.031)	(0.032)	(0.029)	(0.027)	(0.030)
Lag ln real GDP per capita	0.709	-0.663	-0.355	-0.794*	-2.056***	-0.334
	(0.940)	(0.490)	(0.483)	(0.479)	(0.632)	(0.510)
Institutional quality	1.988	0.371	0.693	0.468	1.510*	0.521
	(1.405)	(0.756)	(0.838)	(0.823)	(0.894)	(0.776)
Linear trend	-0.093**	0.007	-0.001	0.005	-0.009	-0.011
	(0.037)	(0.007)	(0.006)	(0.008)	(0.005)	(0.007)
Commodity terms of trade	0.076	0.064	0.030	0.016	0.061	0.061
	(0.087)	(0.045)	(0.059)	(0.049)	(0.057)	(0.046)
US monetary policy shock	-0.076	-0.208	-0.313	-0.377	-0.285	-0.258
	(0.505)	(0.290)	(0.337)	(0.382)	(0.265)	(0.283)
Ln VIX	-1.493**	-1.307***	-1.019**	-1.207***	-1.318***	-1.367***
	(0.708)	(0.410)	(0.452)	(0.439)	(0.390)	(0.436)
Net outflows	-1.036***	-0.510***	-0.570***	-0.552***	-0.580***	-0.498***
	(0.316)	(0.128)	(0.163)	(0.169)	(0.163)	(0.136)
MPru	-2.021***	-1.156***	-1.252***	-1.025***	-0.748*	-1.133***
	(0.702)	(0.373)	(0.403)	(0.395)	(0.403)	(0.362)
US monetary policy shock * MPru	-0.022	-0.006	-0.039	-0.013	-0.006	-0.009
	(0.113)	(0.084)	(0.086)	(0.088)	(0.077)	(0.080)
Ln VIX * MPru	0.647***	0.480***	0.481***	0.432***	0.361**	0.444***
	(0.234)	(0.138)	(0.147)	(0.144)	(0.157)	(0.133)
Net outflows * MPru	0.094*	0.094***	0.116**	0.114***	0.107**	0.082**
	(0.051)	(0.036)	(0.045)	(0.044)	(0.045)	(0.035)
US monetary policy shock * others' MPru	-0.028	-0.008	0.056	0.063	0.022	0.016
	(0.132)	(0.067)	(0.060)	(0.062)	(0.058)	(0.045)
Ln VIX * others' MPru	-0.007	0.016	-0.047	0.046	0.157*	0.102
	(0.289)	(0.117)	(0.122)	(0.109)	(0.092)	(0.089)
Net outflows * others' MPru	0.309***	0.109***	0.089***	0.094**	0.092***	0.083***
	(0.113)	(0.038)	(0.026)	(0.041)	(0.031)	(0.025)
Others' MPru	2.369*	0.095	0.424	0.191	0.079	0.123
	(1.237)	(0.313)	(0.390)	(0.341)	(0.289)	(0.270)
Observations	2,730	2,650	2,698	2,730	2,510	2,730
Countries	38	37	38	38	35	38
F-statistic	5.3	4.5	13.6	3.1	11.4	20.7
Wald test (p-value)	0.061	0.741	0.441	0.622	0.743	0.990

Source: Authors' calculations.

Notes: Net inflows (in percent of trend GDP) for each country are instrumented using gross inflows to other EMs (in percent of trend GDP). Results are presented in terms of net outflows. MPru is divided by 10 to ease the visualization of the coefficients. The estimations are based on a sample of EM from 2000Q1 to 2019Q4. All specifications include country fixed effects. Driscoll-Kraay standard errors are reported in parentheses. ***, **, and * indicate statistical significance at 1, 5, and 10 percent, respectively. The Wald test is for the equality between the coefficient on (net outflows $\times$ MPru) and the one on (net outflows $\times$ others' MPru).

Table 3: Macroprudential Regulation and the Monetary Policy Response to Global Financial Shocks

	(1)	(2)	(3)	(4)
US policy rate	0.443***	0.365***	0.303***	0.293***
	(0.075)	(0.027)	(0.033)	(0.064)
Ln VIX	2.145***	0.966***	0.847***	2.194***
	(0.373)	(0.238)	(0.249)	(0.454)
Net outflows	0.082	0.126**	0.195***	0.387***
	(0.102)	(0.054)	(0.067)	(0.130)
Expected inflation, next 12 months		1.131***	1.123***	1.099***
		(0.105)	(0.102)	(0.101)
Output gap		0.066	0.013	0.149**
		(0.064)	(0.055)	(0.072)
Real credit growth			0.058***	0.064***
			(0.016)	(0.017)
Commodity terms of trade			-0.086**	-0.123***
			(0.036)	(0.044)
MPru				0.225***
				(0.046)
US policy rate × MPru				-0.005**
				(0.002)
Ln VIX × MPru				-0.108***
				(0.020)
Net outflows × MPru				-0.005
				(0.004)
Observations	1,802	1,596	1,574	1,574
Country FE	Yes	Yes	Yes	Yes
Time FE	No	No	No	No
Countries	28	24	24	24
F-statistic	115.2	81.2	47.5	22.9

Source: Authors' calculations.
Notes: Net inflows (in percent of trend GDP) for each country are instrumented using gross inflows to other EMs (in percent of trend GDP). Results are presented in terms of net outflows. The US policy rate is the effective federal funds rate except during the zero lower bound period where the implied policy rate from Wu and Xia (2015) is used. The estimations are done using fixed effects on a panel of EMs, excluding countries with pegged and freely falling exchange rates (Ilzetzki et al., 2019), during 2000Q1 to 2019Q4. Driscoll-Kraay standard errors are reported in parenthesis. ***,**, and * indicate statistical significance on 1, 5, and 10, percent level, respectively.

Table 4: Dampening Effects of Capital Controls on GDP Growth

	Chinn and Ito (2008)		Fernández et al. (2015)		Quinn and Toyoda (2008)		Pasricha et al. (2018)	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Lag dependent variable	0.060	0.060	0.122**	0.125***	0.160***	0.176***	0.105	0.101
	(0.050)	(0.051)	(0.049)	(0.048)	(0.057)	(0.054)	(0.088)	(0.086)
Lag output gap	-0.373***	-0.371***	-0.309***	-0.315***	-0.305***	-0.312***	-0.294***	-0.297***
	(0.033)	(0.033)	(0.027)	(0.029)	(0.024)	(0.025)	(0.032)	(0.032)
Lag ln real GDP per capita	-0.116	-0.116	-0.144	-0.100	-0.290	0.114	0.244	0.265
	(0.420)	(0.420)	(0.375)	(0.376)	(0.471)	(0.412)	(0.584)	(0.754)
Institutional quality	-0.543	-0.583	-0.064	-0.002	0.387	-0.040	-0.328	-0.156
	(0.709)	(0.750)	(0.721)	(0.787)	(0.449)	(0.477)	(1.253)	(1.248)
Linear trend	-0.005	-0.005	-0.001	-0.000	-0.006	-0.011***	-0.028***	-0.029**
	(0.004)	(0.005)	(0.004)	(0.004)	(0.004)	(0.004)	(0.010)	(0.012)
Commodity terms of trade	0.038	0.036	0.030	0.032	-0.070	-0.058	-0.141	-0.130
	(0.038)	(0.039)	(0.038)	(0.045)	(0.058)	(0.057)	(0.128)	(0.124)
US monetary policy shock	-0.119	-0.136	-0.212	-0.215	-0.076	-0.136	-0.049	0.002
	(0.166)	(0.102)	(0.143)	(0.153)	(0.179)	(0.165)	(0.228)	(0.224)
Ln VIX	-0.820***	-0.764***	-0.998***	-0.944***	-0.972***	-0.938***	-0.727***	-0.606**
	(0.240)	(0.204)	(0.179)	(0.265)	(0.223)	(0.198)	(0.241)	(0.270)
Net outflows	-0.106***	-0.096***	-0.119***	-0.093***	-0.072*	-0.105***	-0.370***	-0.377***
	(0.037)	(0.033)	(0.030)	(0.024)	(0.037)	(0.039)	(0.116)	(0.114)
CC	-3.048*	-2.489	-3.506**	-8.364	-4.059*	3.770	0.012	0.249
	(1.594)	(3.845)	(1.481)	(5.357)	(2.177)	(4.071)	(0.097)	(0.200)
US monetary policy shock × CC	-0.086	0.037	0.021	-0.035	-0.370	0.397	-0.013	-0.033*
	(0.144)	(0.870)	(0.153)	(0.511)	(0.232)	(0.538)	(0.008)	(0.017)
Ln VIX × CC	0.444	0.054	0.958**	1.440	1.302**	-1.445	0.016	-0.059
	(0.518)	(1.071)	(0.397)	(1.589)	(0.660)	(1.371)	(0.033)	(0.064)
Net outflows × CC	-0.258***	-0.360	-0.153	-0.546	-0.350**	0.386	0.011*	0.015
	(0.095)	(0.313)	(0.094)	(0.410)	(0.157)	(0.315)	(0.006)	(0.014)
CC^2		-0.587		5.444		-13.395		-0.010
		(4.448)		(5.490)		(8.834)		(0.007)
US monetary policy shock × CC^2		-0.124		0.080		-1.218		0.001
		(0.992)		(0.530)		(0.931)		(0.000)
Ln VIX × CC^2		0.418		-0.663		4.987*		0.003
		(1.295)		(1.629)		(2.928)		(0.002)
Net outflows × CC^2		0.123		0.453		-1.201*		-0.000
		(0.414)		(0.471)		(0.721)		(0.001)
Observations	2,394	2,394	2,280	2,280	1,971	1,971	918	918
Countries	37	37	31	31	30	30	16	16
F-statistic	34.7	10.3	24.4	15.3	14.8	3.5	12.3	2.3

Source: Authors' calculations.
Notes: Net inflows (in percent of trend GDP) for each country are instrumented using gross inflows to other EMs (in percent of trend GDP). Results are presented in terms of net outflows. The estimations are based on a sample of EM from 2000Q1 to 2019Q4. All specifications include country fixed effects. Driscoll-Kraay standard errors are reported in parentheses. ***, **, and * indicate statistical significance at 1, 5, and 10 percent, respectively.

Table 5: Capital Controls and the Monetary Policy Response to Global Financial Shocks

	Chinn and Ito (2008)	Fernández et al. (2015)	Quinn and Toyoda (2008)	Pasricha et al. (2018)
	(1)	(2)	(3)	(4)
US policy rate	0.165***	0.118***	0.247***	0.305***
	(0.048)	(0.040)	(0.053)	(0.058)
Ln VIX	1.123***	-0.145	1.043**	0.616
	(0.310)	(0.402)	(0.488)	(0.375)
Net outflows	-0.023	0.004	0.074	0.329***
	(0.058)	(0.056)	(0.069)	(0.122)
Expected inflation, next 12 months	0.967***	1.096***	1.089***	1.036***
	(0.116)	(0.107)	(0.117)	(0.146)
Output gap	0.107	0.054	0.135	0.218*
	(0.071)	(0.051)	(0.089)	(0.130)
Real credit growth	0.036***	0.050***	0.050***	0.065***
	(0.012)	(0.012)	(0.016)	(0.017)
Commodity terms of trade	-0.058	-0.079**	-0.029	-0.060
	(0.036)	(0.033)	(0.048)	(0.072)
CFM	9.464***	-1.869	14.178**	0.007
	(2.575)	(2.985)	(6.958)	(0.147)
CFM × US policy rate	0.267***	0.268***	-0.242	-0.023**
	(0.096)	(0.069)	(0.236)	(0.012)
CFM × Ln VIX	-1.071*	1.129	-2.064	-0.023
	(0.644)	(0.916)	(1.969)	(0.044)
CFM × Net outflows	0.505***	0.480***	0.777**	-0.039
	(0.146)	(0.145)	(0.393)	(0.073)
Observations	1404	1505	1317	809
Countries	24	23	22	15
F-statistic	18.6	32.5	7.3	2.6

Source: Authors' calculations.
Notes: Net inflows (in percent of trend GDP) for each country are instrumented using gross inflows to other EMs (in percent of trend GDP). Results are presented in terms of net outflows. The US policy rate is the effective federal funds rate except during the zero lower bound period where the implied policy rate from Wu and Xia (2015) is used. The estimations are done using fixed effects on a panel of EMs, excluding countries with pegged and freely falling exchange rates (Ilzetzki et al., 2019), during 2000Q1 to 2019Q4. Driscoll-Kraay standard errors are reported in parenthesis. ***,**, and * indicate statistical significance on 1, 5, and 10, percent level, respectively.

References

Acharya, Viral, Katharina Bergant, Matteo Crosignani, Fergal McCann, and Tim Eisert (2022). "The Anatomy of the Transmission of Macroprudential Policy". *Journal of Finance* 77.5, pp. 2533–2575.

Agénor, Pierre-Richard, Leonardo Gambacorta, Enisse Kharroubi, and Luiz A. Pereira da Silva (2018). "The Effects of Prudential Regulation, Financial Development, and Financial Openness on Economic Growth". *BIS Working Paper* 752.

Ahnert, Toni, Kristin J. Forbes, and Dennis Reinhardt (2021). "Macroprudential FX Regulations: Shifting the Snowbanks of FX Vulnerability?" *Journal of Financial Economics* 140.1, pp. 145–174.

Aiyar, Shekhar, Charles W. Calomiris, and Tomasz Wieladek (2014). "Does Macro-pru Leak? Evidence from a UK Policy Experiment". *Journal of Money, Credit and Banking* 46.1, pp. 368–82.

— (2016). "How does credit supply respond to monetary policy and bank minimum capital requirements?" *European Economic Review* 82, pp. 142–165.

Aizenman, Joshua, Menzie D. Chinn, and Hiro Ito (2016). "Monetary Policy Spillovers and the Trilemma in the New Normal: Periphery Country Sensitivity to Core Country Conditions". *Journal of International Money and Finance* 68, pp. 298–330.

— (2020). "Financial Spillovers and Macroprudential Policies". *Open Economic Review* 31, pp. 529–563.

Akinci, Ozge and Jane Olmstead-Rumsey (2018). "How Effective are Macroprudential Policies? An Empirical Investigation". *Journal of Financial Intermediation* 33, pp. 33–57.

Alam, Zohair, Adrian Alter, Jesse Eiseman, Gaston Gelos, Heedon Kang, Machiko Narita, Erlend Nier, and Naixi Wang (2019). "Digging Deeper–Evidence on the Effects of Macroprudential Policies from a New Database". *IMF Working Paper* 19/66.

Aoki, Kosuke, Gianluca Benigno, and Nobuhiro Kiyotaki (2019). "Monetary and Financial Policies in Emerging Markets". *Working Paper* 19.

Araujo, Douglas Kiarelly Godoy de, Joao Barata Ribeiro Blanco Barroso, and Rodrigo Barbone Gonzalez (2020). "Loan-to-value policy and housing finance: Effects on constrained borrowers". *Journal of financial intermediation* 42, p. 100830.

Arslanalp, Serkan and Takahiro Tsuda (2014). "Tracking Global Demand for Advanced Economy Sovereign Debt". *IMF Economic Review* 62.3, pp. 430–464.

Auer, Raphael, Alexandra Matyunina, and Steven Ongena (2022). "The Countercyclical Capital Buffer and the Composition of Bank Lending". *Journal of Financial Intermediation* 52, p. 100965.

Beck, Thorsten and Leonardo Gambacorta (2020). "New evidence on the effectiveness of macroprudential policies". *Journal of Financial Intermediation* 42. Macroprudential policies in the Americas, p. 100834. ISSN: 1042-9573. DOI: https://doi.org/10.1016/j.jfi.2019.100834. URL: https://www.sciencedirect.com/science/article/pii/S1042957319300506.

Bems, Rudolfs, Francesca G. Caselli, Francesco Grigoli, Bertrand Gruss, and Weicheng Lian (2021). "Expectations' Anchoring and Inflation Persistence". *Journal of International Economics* 132, p. 103516.

Bengui, Julien and Javier Bianchi (2018). "Macroprudential policy with leakages". 25048.

Bhattarai, Saroj, Arpita Chatterjee, and Woong Yong Park (2020). "Global Spillover Effect of US Uncertainty". *Journal of Monetary Economics* forthcoming.

Blanchard, Olivier, Jonathan D. Ostry, Atish Ghosh, and Marcos Chamon (2017). "Are Capital Inflows Expansionary or Contractionary? Theory, Policy Implications, and Some Evidence". *IMF Economic Review* 65.3, pp. 563–85.

Boar, Codruta, Leonardo Gambacorta, Giovanni Lombardo, and Luiz A. Pereira da Silva (2017). "What are the effects of macroprudential policies on macroeconomic performance?" *BIS Quarterly Review September* September, pp. 71–99.

Braggion, Fabio, Alberto Manconi, and Haikun Zhu (2018). "Can technology undermine macroprudential regulation? Evidence from peer-to-peer credit in China". *CEPR Discussion Paper* DP12668.

Bräuning, Falk and Victoria Ivashina (2020). "Monetary Policy and Global Banking". *Journal of Finance* forthcoming.

Bush, Georgia, Tomás Gómez, Alejandro Jara, David Moreno, Konstantin Styrin, and Yulia Ushakova (2021). "Macroprudential policy and the inward transmission of monetary policy: The case of Chile, Mexico, and Russia". *Review of International Economics* 29.1, pp. 37–60.

Bussière, Matthieu, Jin Cao, Jakob de Haan, Robert Hills, Simon Lloyd, Baptiste Meunier, Justine Pedrono, Dennis Reinhardt, Sonalika Sinha, Rhiannon Sowerbutts, et al. (2021). "The interaction between macroprudential policy and monetary policy: Overview". *Review of International Economics* 29.1, pp. 1–19.

Canova, Fabio (2005). "The Transmission of US Shocks to Latin America". *Journal of Applied Econometrics* 20.2, pp. 229–251.

Cavallino, Paolo and Damiano Sandri (2023). "The Open-Economy ELB: Contractionary Monetary Easing and the Trilemma". *Journal of International Economics* 140, p. 103691.

Cerutti, Eugenio, Stijn Claessens, and Luc Laeven (2017a). "The use and effectiveness of macroprudential policies: New evidence". *Journal of Financial Stability* 28, pp. 203–224.

Cerutti, Eugenio, Jihad Dagher, and Giovanni Dell'ariccia (2017b). "Housing Finance and Real-Estate Booms; A Cross-Country Perspective". *Journal of Housing Economics* 38, pp. 1–13.

Chinn, Menzie D. and Hiro Ito (2008). "A new measure of financial openness". *Journal of comparative policy analysis* 10.3, pp. 309–322.

Choi, Seung M., Laura E. Kodres, and Jing Lu (2021). "Friend or Foe? Cross-Border Linkages, Contagious Banking Crises, and "Coordinated" Macroprudential Policies". *Journal of Financial Services Research*.

Choi, Woon Gyu, Taesu Kang, Geun-Young Kim, and Byongju Lee (2017). "Divergent emerging market economy responses to global and domestic monetary policy shocks". *ADB Economics Working Paper* 532.

Cizel, Janko, Jon Frost, Aerdt Houben, and Peter Wierts (2019). "Effective Macroprudential Policy: Cross-Sector Substitution from Price and Quantity Measures". *Journal of Money, Credit and Banking* 51.5, pp. 1209–1235.

Claessens, Stijn, Swati R Ghosh, and Roxana Mihet (2013). "Macroprudential policies to mitigate financial system vulnerabilities". *Journal of International Money and Finance* 39, pp. 153–185.

Crowe, Christopher, Giovanni Dell'Ariccia, Deniz Igan, and Pau Rabanal (2013). "How to deal with real estate booms: Lessons from country experiences". *Journal of Financial Stability* 9.3, pp. 300–319.

Dassatti, Cecilia Camors, José-Luis Peydró, Francesc Rodriguez-Tous, and Sergio Vicente (2019). "Macroprudential and monetary policy: loan-level evidence from reserve requirements". *Working Paper*.

De Rezende, Rafael B and Annukka Ristiniemi (2023). "A shadow rate without a lower bound constraint". *Journal of Banking & Finance* 146, p. 106686.

Dedola, Luca, Giulia Rivolta, and Livio Stracca (2017). "If the Fed sneezes, who catches a cold?" *Journal of International Economics* 108, pp. 23–41.

Dell'Ariccia, Giovanni, Deniz Igan, Luc Laeven, and Hui Tong (2012). "Policies for Macrofinancial Stability: How to Deal with Credit Booms". *IMF Staff Discussion Note* 12.06.

Egorov, Konstantin and Dmitry Mukhin (2019). "Optimal monetary policy under dollar pricing". *Meeting Papers 1510, Society for Economic Dynamics.*

Eickmeier, Sandra, Benedikt Kolb, and Esteban Prieto (2018). "Macroeconomic effects of bank capital regulation". *Deutsche Bundesbank Discussion Paper* 44/2018.

Erten, Bilge, Anton Korinek, and José Antonio Ocampo (2021). "Capital Controls: Theory and Evidence". *Journal of Economic Literature* 59.1, pp. 45–89.

Erten, Bilge and José Antonio Ocampo (2017). "Macroeconomic effects of capital account regulations". *IMF Economic Review* 65.2, pp. 193–240.

Farhi, Emmanuel and Iván Werning (2016). "A theory of macroprudential policies in the presence of nominal rigidities". *Econometrica* 84.5, pp. 1645–1704.

Fendoğlu, Salih (2017). "Credit cycles and capital flows: Effectiveness of the macroprudential policy framework in emerging market economies". *Journal of Banking & Finance* 79, pp. 110–128.

Fernández, Andrés, Michael W. Klein, Alessandro Rebucci, Martin Schindler, and Martin Uribe (2016). "Capital control measures: A new dataset". *IMF Economic Review* 64.3, pp. 548–574.

Fernández, Andrés, Alessandro Rebucci, and Martín Uribe (2015). "Are capital controls countercyclical?" *Journal of Monetary Economics* 76, pp. 1–14.

Fleming, J. Marcus (1962). "Domestic financial policies under fixed and under floating exchange rates". *IMF Staff Papers* 9.3, pp. 369–380.

Forbes, Kristin J. (2018). "Macroprudential policy after the crisis: Forging a Thor's hammer for financial stability in Iceland". *Report prepared for the Task Force to review monetary policy in Iceland.*

Forbes, Kristin, Marcel Fratzscher, Thomas Kostka, and Roland Straub (2016). "Bubble thy neighbour: Portfolio effects and externalities from capital controls". *Journal of International Economics* 99, pp. 85–104.

Forbes, Kristin, Marcel Fratzscher, and Roland Straub (2015). "Capital-flow management measures: What are they good for?" *Journal of International Economics* 96, S76–S97.

Frost, Jon, Hiro Ito, and René van Stralen (2020). "The effectiveness of macroprudential policies and capital controls against volatile capital inflows". *BIS Working Papers No 867.*

Gambacorta, Leonardo and Andrés Murcia (2020). "The impact of macroprudential policies in Latin America: An empirical analysis using credit registry data". *Journal of Financial Intermediation* 42, p. 100828.

Georgiadis, Georgios (2016). "Determinants of global spillovers from US monetary policy". *Journal of International Money and Finance* 67, pp. 41–61.

Giordani, Paolo E, Michele Ruta, Hans Weisfeld, and Ling Zhu (2017). "Capital flow deflection". *Journal of International Economics* 105, pp. 102–118.

Gómez, Esteban, Andrés Murcia, Angélica Lizarazo, and Juan Carlos Mendoza (2020). "Evaluating the impact of macroprudential policies on credit growth in Colombia". *Journal of Financial Intermediation* 42, p. 100843.

Gopinath, Gita, Emine Boz, Camila Casas, Federico J Déz, Pierre-Olivier Gourinchas, and Mikkel Plagborg-Møller (2020). "Dominant currency paradigm". 110.3, pp. 677–719.

Gruss, Bertrand and Suhaib Kebhaj (2019). “Commodity terms of trade: a new database”. 21.

Han, Xuehui and Shang-Jin Wei (2018). “International transmissions of monetary shocks: Between a trilemma and a dilemma”. *Journal of International Economics* 110, pp. 205–219.

Houston, Joel F, Chen Lin, and Yue Ma (2012). “Regulatory arbitrage and international bank flows”. *The Journal of Finance* 67.5, pp. 1845–1895.

Iacoviello, Matteo and Gaston Navarro (2019). “Foreign effects of higher US interest rates”. *Journal of International Money and Finance* 95, pp. 232–250.

Igan, Deniz and Heedon Kang (2011). “Do loan-to-value and debt-to-income limits work? Evidence from Korea”. *IMF Working Papers*, pp. 1–34.

Ilzetzki, Ethan, Carmen M. Reinhart, and Kenneth S. Rogoff (2019). “Exchange arrangements entering the twenty-first century: Which anchor will hold?” *The Quarterly Journal of Economics* 134.2, pp. 599–646.

Im, Kyung So, M Hashem Pesaran, and Yongcheol Shin (2003). “Testing for unit roots in heterogeneous panels”. *Journal of Econometrics* 115.1, pp. 53–74.

Jiménez, Gabriel, Steven Ongena, José-Luis Peydró, and Jesús Saurina (2017). “Macroprudential policy, countercyclical bank capital buffers, and credit supply: evidence from the Spanish dynamic provisioning experiments”. *Journal of Political Economy* 125.6, pp. 2126–2177.

Jones, Callum, Mariano Kulish, and James Morley (2021). “A Structural Measure of the Shadow Federal Funds Rate”. *Finance and Economics Discussion Series 2021-064*.

Kalemli-Özcan, Sebnem (2019). “US monetary policy and international risk spillovers”. *NBER Working Paper* 26297.

Kim, Soyoung and Aaron Mehrotra (2018). “Effects of Monetary and Macroprudential Policies—Evidence from Four Inflation Targeting Economies”. *Journal of Money, Credit and Banking* 50.5, pp. 967–992.

Klein, Michael W (2012). “Capital controls: gates versus walls”. *Brookings Papers on Economic Activity*, pp. 349–368.

Kuttner, Kenneth N and Ilhyock Shim (2016). “Can non-interest rate policies stabilize housing markets? Evidence from a panel of 57 economies”. *Journal of Financial Stability* 26, pp. 31–44.

Lambert, Frederic J., Julio Ramos-Tallada, and Cyril Rebillard (2011). “Capital controls and spillover effects: evidence from Latin-American countries”.

Levin, Andrew, Chien-Fu Lin, and Chia-Shang James Chu (2002). “Unit root tests in panel data: asymptotic and finite-sample properties”. *Journal of econometrics* 108.1, pp. 1–24.

Maćkowiak, Bartosz (2007). “External shocks, US monetary policy and macroeconomic fluctuations in emerging markets”. *Journal of monetary economics* 54.8, pp. 2512–2520.

McCann, Fergal and Conor O’Toole (2019). “Cross-Border Macroprudential Policy Spillovers and Bank Risk-Taking”. *International Journal of Central Banking* 15.4, pp. 267–311.

Mundell, Robert A. (1963). “Capital mobility and stabilization policy under fixed and flexible exchange rates”. *Canadian Journal of Economics and Political Science* 29.4, pp. 475–485.

Neanidis, Kyriakos C. (2019). “Volatile capital flows and economic growth: The role of banking supervision”. *Journal of Financial Stability* 40, pp. 77–93.

Niepmann, Friederike, Tim Schmidt-Eisenlohr, and Emily Liu (2021). “The effect of US stress tests on monetary policy spillovers to emerging markets”. *Review of international Economics* 29.1, pp. 165–194.

Obstfeld, Maurice (2015). "Trilemmas and Tradeoffs: Living with Financial Globalization". *Global Liquidity Spillovers to Emerging Markets and Policy Responses*. Ed. by Claudio Raddatz, Diego Saravia, and Jaume Ventura. Central Bank of Chile.

Obstfeld, Maurice, Jonathan D. Ostry, and Mahvash S. Qureshi (2019). "A tie that binds: Revisiting the trilemma in emerging market economies". *Review of Economics and Statistics* 101.2, pp. 279–293.

Obstfeld, Maurice, Jay C. Shambaugh, and Alan M. Taylor (2005). "The trilemma in history: tradeoffs among exchange rates, monetary policies, and capital mobility". *Review of Economics and Statistics* 87.3, pp. 423–438.

Ongena, Steven, Alexander Popov, and Gregory F Udell (2013). ""When the cat's away the mice will play": Does regulation at home affect bank risk-taking abroad?" *Journal of Financial Economics* 108.3, pp. 727–750.

Ostry, Jonathan D., Atish R. Ghosh, Marcos Chamon, and Mahvash S. Qureshi (2012). "Tools for managing financial-stability risks from capital inflows". *Journal of International Economics* 88.2, pp. 407–421.

Ottonello, Pablo (2021). "Optimal exchange rate policy under collateral constraints and wage rigidity". *Journal of International Economics* 131, p. 103478.

Pasricha, Gurnain K., Matteo Falagiarda, Martin Bijsterbosch, and Joshua Aizenman (2018). "Domestic and multilateral effects of capital controls in emerging markets". *Journal of International Economics* 115, pp. 48–58.

Quinn, Dennis P. and A. Maria Toyoda (2008). "Does capital account liberalization lead to growth?" *The Review of Financial Studies* 21.3, pp. 1403–1449.

Rebucci, Alessandro and Chang Ma (2019). "Capital Controls: A Survey of the New Literature". *NBER Working Paper No. 26558*.

Reinhardt, Dennis and Rhiannon Sowerbutts (2015). "Regulatory arbitrage in action: evidence from banking flows and macroprudential policy".

Rey, Hélène (2015). "Dilemma not trilemma: the global financial cycle and monetary policy independence". *NBER Working Paper* 10591.

— (2016). "International channels of transmission of monetary policy and the Mundellian trilemma". *IMF Economic Review* 64.1, pp. 6–35.

Richter, Björn, Moritz Schularick, and Ilhyock Shim (2019). "The Cost of Macroprudential Policy". *Journal of International Economics* 118.2, pp. 263–82.

Sahay, Ratna, M Čihák, Papa N'Diaye, Adolfo Barajas, Ran Bi, Diana Ayala, Yuan Gao, Annette Kyobe, Lam Nguyen, and Christian Saborowski (2015). "Rethinking financial deepening: stability and growth in emerging markets". *IMF Staff Discussion Note* 08.

Saurina, Jesús (2009). "Dynamic provisioning: the experience of Spain". *Crisis Response Note* 7.

Shambaugh, Jay C (2004). "The effect of fixed exchange rates on monetary policy". *The Quarterly Journal of Economics* 119.1, pp. 301–352.

Tillmann, Peter (2015). "Estimating the effects of macroprudential policy shocks: A Qual VAR approach". *Economics Letters* 135, pp. 1–4.

Vicondoa, Alejandro (2019). "Monetary news in the United States and business cycles in emerging economies". *Journal of International Economics* 117, pp. 79–90.

Wong, Eric, Tom Fong, Kafai Li, and Henry Choi (2011). “Loan-to-Value Ratio as a Macro-Prudential Tool - Hong Kong’s Experience and Cross-Country Evidence”. *Hong Kong Monetary Authority Working Paper* 1101.

Wu, Jing Cynthia and Fan Dora Xia (2016). “Measuring the macroeconomic impact of monetary policy at the zero lower bound”. *Journal of Money, Credit and Banking* 48.2-3, pp. 253–291.

Zeev, Nadav Ben (2017). “Capital controls as shock absorbers”. *Journal of International Economics* 109, pp. 43–67.

Previous volumes in this series

1096 May 2023	Money Market Funds and the Pricing of Near-Money Assets	Sebastian Doerr, Egemen Eren and Semyon Malamud
1095 April 2023	Sectoral shocks, reallocation, and labor market policies	Joaquín García-Cabo, Anna Lipińska and Gastón Navarro
1094 April 2023	The foreign exchange market	Alain Chaboud, Dagfinn Rime and Vladyslav Sushko
1093 April 2023	Sovereign risk and bank lending: evidence from the 1999 Turkish earthquake	Yusuf Soner Başkaya, Bryan Hardy, Şebnem Kalemli-Özcan and Vivian Yue
1092 April 2023	Mobile Payments and Interoperability: insights from the academic literature	Milo Bianchi, Matthieu Bouvard, Renato Gomes, Andrew Rhodes and Vatsala Shreeti
1091 April 2023	FinTech, investor sophistication and financial portfolio choices	Leonardo Gambacorta, Romina Gambacorta and Roxana Mihet
1090 April 2023	Tackling the fiscal policy-financial stability nexus	Claudio Borio, Marc Farag and Fabrizio Zampolli
1089 April 2023	Intraday liquidity around the world	Biliana Alexandrova Kabadjova, Anton Badev, Saulo Benchimol Bastos, Evangelos Benos, Freddy Cepeda-Lopéz, James Chapman, Martin Diehl, Ioana Duca-Radu, Rodney Garratt, Ronald Heijmans, Anneke Kosse, Antoine Martin, Thomas Nellen, Thomas Nilsson, Jan Paulick, Andrei Pustelnikov, Francisco Rivadeneyra, Mario Rubem do Coutto Bastos and Sara Testi
1088 April 2023	Big techs and the credit channel of monetary policy	Fiorella De Fiore, Leonardo Gambacorta and Cristina Manea
1087 April 2023	Crypto carry	Maik Schmeling, Andreas Schrimpf and Karamfil Todorov
1086 April 2023	CBDC policies in open economies	Michael Kumhof, Marco Pinchetti, Phurichai Rungcharoenkitkul and Andrej Sokol
1085 March 2023	Supervisory policy stimulus: evidence from the Euro area dividend recommendation	Ernest Dautović, Leonardo Gambacorta and Alessio Reghezza

All volumes are available on our website www.bis.org.