BOFIT Discussion Papers
3 • 2025

Mika Nieminen and Anni Norring

What motives and conditions drive countries to adopt macroprudential and capital management measures?

BOFIT
THE BANK OF FINLAND
INSTITUTE FOR
EMERGING ECONOMIES

BOFIT Discussion Papers
Editor-in-Chief Zuzana Fungáčová

BOFIT Discussion Papers 3/2025
11 April 2025

Mika Nieminen and Anni Norring:
What motives and conditions drive countries to adopt macroprudential and capital management measures?

ISSN 1456-5889, online

Bank of Finland
Helsinki 2025

Mika Nieminen and Anni Norring

What motives and conditions drive countries to adopt macroprudential and capital management measures?

Abstract

Countries choose diverse policy mixes of macroprudential and capital flow management measures, yet the drivers behind these policy choices remain largely unexplored. We identify potential conditions for the adoption and determinants of the use of macroprudential and capital flow management measures from the theoretical literature and test them empirically. Rich and high-growth economies tend to rely on macroprudential policy measures, while the use of capital flow management measures decreases as the regulatory environment improves. Countries with a large foreign bank presence tend to implement fewer macroprudential and capital flow management measures.

Keywords: Macroprudential policy, Capital controls, Foreign banks
JEL: E58, F33, F38, G28

Anni Norring, Bank of Finland; University of Helsinki, anni.norring@bof.fi. ORCID ID: 0000-0002-7403-388X
Disclaimer: The views expressed are those of the authors and do not necessarily reflect those of the Bank of Finland.

Mika Nieminen, School of Business and Economics, University of Jyväskylä, Finland, mika.p.nieminen@jyu.fi. ORCID ID: 0000-0002-9969-1803

The authors thank Sonja Jokinen for outstanding research assistance, as well as Bonnie Buchanan, Jan Fidrmuc, Zuzana Fungáčová, Laurent Weill and seminar participants at the Annual Meeting of the Finnish Economic Association, University of Vaasa Banking Research Workshop, and the Bank of Finland for their helpful comments.

Non-technical summary

FOCUS

The standard policy recipe for ensuring internal and external economic stability is often described as allowing external macroeconomic adjustment via flexible exchange rates and an open capital account, while reserving monetary policy for steering the domestic economic conditions. When this standard recipe is insufficient in shielding the economy from financial turmoil, policymakers resort to additional tools, such as macroprudential policy and capital flow management measures. Countries choose quite diverse policy mixes, yet the drivers of these choices remain largely unexplored. In this paper, we examine the motives and conditions facing policymakers in decisions on macroprudential policy and capital flow management measures.

CONTRIBUTION

To identify potential conditions for the adoption and determinants of the use of macroprudential and capital flow management measures, we first consider theoretical contributions on the optimal use of these policy tools. This discussion is followed by a systematic empirical evaluation of their relative importance in large sample of countries. We ask whether the determinants and their relative importance change depending on whether the country considered is an advanced economy, a major emerging economy or falls into the category of "other emerging and developing economies". The paper finishes with an assessment of whether macroprudential and capital flow management measures are complements, substitutes, both, or neither.

FINDINGS

We find that rich and high-growth economies tend to rely more heavily on macroprudential policy measures. Good institutions and robust regulatory regimes are associated with lower reliance on capital flow management and greater use of macroprudential policy. Countries with a large foreign bank presence are generally more reluctant to implement macroprudential and capital flow management measures. High economic growth and frequent currency crises cause major emerging economies to rely more heavily on macroprudential policy measures than advanced economies. Good institutional quality seems to be the reason major emerging economies rely on macroprudential policy more than other emerging and developing economies. The greater use of capital flow management measures by major emerging economies compared to advanced economies likely reflects lower institutional quality. Finally, there is no clear correlation between the use of these policy measures.

1 Introduction

It is long established that financial crises can be costly in terms of lost output (see e.g. Reinhardt and Rogoff, 2008; Claessens and Kose, 2013; Laeven and Valencia, 2013). Cerra and Saxena (2008) further show that the large output losses from financial crises are highly persistent. Post-crisis macroeconomic development can be sluggish or non-existing due to real wage stagnation, intractable economic slack and unsustainable fiscal outcomes. Sufi and Taylor (2022) note that financial crises are not costly in terms of only economic output, but they damage the social fabric of societies, public health, as well as trust in institutions and political sentiment. Thus, policymakers have an inherent interest in trying to prevent financial crises and containing their effects when they occur.

The standard policy recipe relied on for decades by international institutions and policymakers in advanced economies calls for measures that allow for external macroeconomic adjustment via flexible exchange rates and an open capital account, while limiting the use of monetary policy in steering domestic macroeconomic conditions (IMF, 2012). This recipe may not be optimal, however, for countries with weak economic fundamentals, shallow financial markets, strong pull factors, or other constraints such as constrained monetary policy or fixed exchange rates. Monetary policy in such cases may be inadequate in containing the domestic repercussions of external shocks (see Rey, 2016; Korinek and Sandri, 2016; Miranda-Agrippino and Rey, 2020; Basu et al., 2020; Adrian et al., 2022).

To secure financial stability in such circumstances, countries often turn to macroprudential policy measures (MPMs) or capital flow management measures (CFMs) in order to reduce their systemic vulnerability to crises and manage the effects of potential crises. The main objective with both MPMs and CFMs is to make the domestic financial system safer. For MPMs, this means boosting overall systemic resilience. For CFMs, it means directly containing capital flows and their effects.[1] Both theory (e.g. Farhi and Werning, 2014, 2016; Basu et al., 2020) and practical policy experience (IMF, 2011a, 2011b, 2020a; BIS, 2020) suggest that MPMs and CFMs can play an important role in securing macro-financial stability.

Countries tend to use MPMs and CFMs quite differently. Broadly speaking, advanced economies tend to avoid the use of CFMs and rely on MPMs, whereas emerging and developing economies rely more on controlling capital flows. This picture quickly becomes more nuanced,

[1] MPMs and CFMs can be substitutes (Korinek and Sandri, 2016; Rey, 2016) or complements. CFMs can be used to plug the holes for regulatory arbitrage in a country's macroprudential framework, and MPMs can be implemented to prepare the financial sector for the eventual lift-off of CFMs. Due to their close relationship, it makes sense here to consider these policy tools side by side.

however, once we distinguish among types of economies. The largest and most globally integrated emerging economies – *major emerging economies* – tend to rely more heavily on MPMs and CFMs than *advanced economies* or *other emerging and developing economies* (Norring 2022).[2] This stylized fact raises interesting questions about the drivers of the use of MPMs and CFMs. The relationship between economic development and characteristics of the macro-financial stability regulatory framework is clearly not linear. If it were linear, major emerging economies would not rely more heavily on MPMs and CFMs than advanced economies or other emerging and developing economies. There is also large variation among countries within the country groups. Overall, these broad country group differences, coupled with within-in group differences, point to underlying drivers that reflect more subtle differences in country characteristics. From an empirical standpoint, we know surprisingly little about what drives the application of specific policy tools.

Our paper provides empirical evidence to fill this gap in the literature. Most of existing research on MPMs and CFMs concentrate on theoretically optimal use of these policy tools (Farhi and Werning, 2014, 2016; Basu et al., 2020; Adrian et al., 2020, 2022) or provide empirical assessments of the effects and effectiveness of capital controls (Erten et al., 2021; Nispi and Schiavone, 2021) and macroprudential regulation measures (Galati and Moessner, 2018; Akinci and Olmstead-Rumsey, 2018; Ampudia et al., 2021). We focus here on possible motivations driving the adoption and use of policy measures. The contributions relevant for us are those that provide insight into the conditions and drivers for adopting MPMs and CFMs.

Theoretical models of the macro-financial stability framework suggest frictions and externalities for which MPMs and CFMs should account (Farhi and Werning, 2014, 2016; Basu et al., 2020). While CFMs and MPMs may not be the first-best option for stabilizing an economy, modeling suggests that their use can be optimal in the presence of frictions such as constrained monetary policy, a fixed exchange rate, or shallow FX markets. Of particular relevance to this discussion are the policy-oriented and descriptive contributions concerning on the practical policy landscape and experiences (IMF, 2011a, 2011b, 2020a; BIS, 2020). This strand of study highlights the importance policymakers attach to the use of MPMs and CFMs, as well as the benefits they provide in terms of internal and external economic stability.

[2] *Major emerging economies* comprises the to the 24 largest and most relevant emerging economies: Argentina, Bulgaria, Brazil, Chile, China, Colombia, Egypt, Hungary, India, Indonesia, Kuwait, Malaysia, Mexico, Pakistan, Peru, Philippines, Poland, Qatar, Russia, Saudi Arabia, South Africa, Thailand, Turkey, and the United Arab Emirates. All countries in this group are included in the MSCI Emerging Markets Index and not considered advanced economies by either the IMF or the OECD. Argentina and United Arab Emirates are excluded from the regression analysis due to lack of data.

Lying between theory and practice, we would expect numerous empirical studies on the drivers of MPM and CFM usage. Somewhat surprisingly, we can only identify a handful of papers that empirically consider the drivers of CFMs – most notably the general CFM studies of Johnston and Tamirisa (1998), Fratzscher (2012) and Das and Ordal (2022), as well as the country-specific study of Pandey et al. (2021) for India. These studies find the use of CFMs relates to a range of factors, including macroeconomic management, market and institutional development, FX policy objectives, and banking flows. We are not aware of any papers on the drivers of MPMs. Thus, our paper contributes to this gap in the literature by providing a comparative assessment on the use of CFMs and MPMs.

We pose three research questions. The first, "*What are the most important determinants of the use of MPMs and CFMs?"* calls for identifying potential determinants from previous research and testing them empirically. The second, "*Are the determinants same or different for different country groups?"* considers whether policymakers in different country groups have different motivations for their policy decisions, given the large disparities between major emerging economies, other emerging and developing economies and advanced economies. The final line of inquiry, "*Are MPMs and CFMs used as complements or substitutes?"* demands a two-pronged approach. While one might expect countries to retire their capital controls once they implement macroprudential regulations that safeguard financial stability and attract needed capital flows, it appears capital account openness has not really progressed even while countries' macroprudential frameworks have been bolstered with additional measures (Norring, 2022).

To identify potential determinants of the use of MPMs and CFMs, we review theoretical considerations of the macro-financial stability framework, as well as practical policy experiences. Based on our review, we consider determinants related to macroeconomic performance, institutional quality, previous economic crises, foreign banks, and the exchange rate regime. After identifying our determinant candidates, we empirically test them and assess their importance in explaining the observed differences in the use of MPMs and CFMs. We use Bayesian Model Averaging and Akaike information criteria (AIC) to evaluate which determinants are most relevant for explaining the cross-country variation in the number of MPMs and CFMs implemented. We then examine the sign of the association using OLS regressions.

The results support policy analyses and suggest paths for further theoretical and empirical work. On the first research question, we find first that *high institutional quality* is associated with lower reliance on CFMs and greater use of MPMs. Second, the *presence of foreign banks* is associ-

ated with lower use of MPMs and CFMs. Third, we find that *high economic growth* and the *continental average of MPMs* are associated with more MPMs. On the second research question, we find that there are *differences across country groups*. Higher economic growth and higher currency crisis frequency help explain why major emerging economies tend to rely more on MPMs than advanced economies. Lower institutional quality relates to the fact that major emerging economies use far more CFMs than advanced economies. Higher institutional quality helps explain why major emerging economy use far more MPMs than other emerging and developing economies. Regarding the third research question, we are unable to establish whether MPMs and CFMs are *substitutes or complements*, but we find that the degree of financial openness increases the sensitivity of MPMs to country characteristics.

The rest of the paper is organized as follows. Section 2 surveys the existing literature to identify categories of potential determinants of the use of MPMs and CFMs. Section 3 describes the data and methodology used. Empirical results are presented in section 4. Section 5 concludes with policy implications.

2 Literature review

To identify potential determinants of the use of macroprudential policy measures (MPMs) and capital flow management measures (CFMs), we review the existing literature on macro-financial stability frameworks.

Theoretical models of macro-financial stability frameworks often consider CFMs, MPMs, or both, as part of a holistic policy framework (e.g. the papers of Farhi and Werning, 2012, 2014, 2016). Basu et al. (2020) use MPMs and CFMs in presenting the conceptual model for the IMF's Integrated Policy Framework. Further, the role of MPMs and CFMs has been considered as a means of increasing the independence of monetary policy in the studies of Korinek and Sandri (2016) and Miranda-Agrippino and Rey (2020). In most of these models, the use of MPMs and CFMs is not seen as a first-best option, but nevertheless appropriate in the presence of frictions and externalities such as constrained monetary policy, a fixed exchange rate or shallow FX markets that prevent stabilizing the macroeconomy with the primary tools of monetary policy and flexible exchange rates.

Sometimes, however, the primary policy tools in the macro-financial stability toolbox are constrained. For example, a country may use a fixed or managed exchange rate or find itself at the zero lower bound of monetary policy. Farhi and Werning (2012, 2014) see the use of CFMs as

second-best instruments for reducing the effects of constrained monetary policy, non-flexible exchange rates, or both. In their 2016 paper, Farhi and Werning show the same for MPMs in a model of nominal rigidities in goods and labor markets that gives rise to an aggregate demand externality that can be corrected through macroprudential intervention in the financial markets.

Others have also considered environments of constrained space for other macroeconomic policies. Rey (2015, 2016) and Miranda-Agrippino and Rey (2020) argue that CFMs can be effective in returning monetary policy independence when a global financial cycle driven by US monetary policy works to reduce the Mundellian trilemma to a "Rey's dilemma," and that the effects of CFMs can be replicated using MPMs. Further, Benigno et al. (2016) show that capital controls are redundant when exchange rate policy is costless, while the use of CFMs can be optimal if there are efficiency costs.

Fratzscher (2012) finds that FX policy objectives, especially fixed exchange rate regimes and significantly undervalued exchange rates, are strongly associated with the use of CFMs. Pandey et al. (2021) similarly find that changes in the exchange rate are related to changes in capital controls in India. Thus, one candidate on our list of potential drivers of the use of CFMs and MPMs are variables related to the *exchange rate regime*.

Deficiencies in the macro-financial stability framework can mean fewer regulatory instruments or stability policy measures available to the authorities, making the economy more susceptible to economic crises arising from exuberance of the financial sector or large, volatile capital flows. Here, CFMs and MPMs can help countries shield themselves from such crises or contain their effects.

Schmitt-Grohé and Uribe (2016) and Korinek and Simsek (2016) show that countercyclical capital controls can help to counteract the tendency of cyclical capital flows to reduce the policy space of vulnerable countries. As a result, capital controls increase the policy space and allow for more flexible use of other countercyclical macroeconomic policy tools. Basu et al. (2020) consider optimal monetary policy, capital controls, foreign exchange interventions, and macroprudential policy. They find that shallow FX markets and vulnerability to sudden stops (i.e. financial crises triggered by a large and sudden reversal in capital flows preceded by expansion of external debt) calls for the use of CFMs. For MPMs, this model envisions a more ex-ante role. Drawing on their experiences from the Asian Financial Crisis (BIS, 2020), emerging economies in Asia were well ahead of other countries in implementing MPMs. In advanced economies, the use of MPMs only took off after the Global Financial Crisis in 2008. Thus, it is plausible to assume that countries that have

experienced *economic crises* may seek to strengthen their macro-financial stability framework by implementing CFMs, MPMs, or both.

Economic crises are complex and varied, but researchers generally accept that a key aspect of preventing crises or mitigating their effects are strong institutions and robust macroeconomic fundamentals. To implement any regulation, a country needs to have adequate institutions in place. Countries least likely to implement CFMs are advanced economies with strong policy frameworks, solid economic fundamentals, and good institutional quality. Such countries lack the need for shielding their economies from capital flows as they are robust enough to cope with the ebbs and flows of capital. In emerging and developing economies, on the other hand, large and volatile capital flows can wreak havoc. For emerging and developing economies using CFMs, Johnston and Tamirisa (1998) find that institutional and macroeconomic management is relevant in the sense that more complex CFMs are used more extensively in economies with higher capacity for institutional and macroeconomic management. Moreover, Beirne and Friedrich (2017) have shown that in order to be effective, macroprudential policy requires strong institutions. Implementing and enforcing macroprudential regulation also requires relatively strong institutions and efficient government, making *institutional quality* a good candidate for a potential driver of MPMs and CFMs.

Strong macroeconomic fundamentals and other characteristics of the macroeconomy have also been modeled as potential motivation for the use of these policy measures. Adrian et al. (2020) show that CFMs have their place in countries with de-anchored inflation expectations, substantial foreign currency mismatch, or vulnerabilities to shocks that cause capital outflows and exchange rate pressures. The model of Costinot et al. (2014) suggest the use of capital controls for a country experiencing higher growth than the rest of the world. Fratzscher (2012) finds that the use of CFMs be motivated by the need to contain economic overheating effects. On the other hand, Johnston and Tamirisa (1998) find a weak relationship between balance-of-payments developments and CFMs. Thus, we also consider *different measures of macroeconomy*, including in our empirical analysis size of the economy, income level, and inflation.

As MPMs and CFMs are policy interventions on the financial markets, potential drivers could be related to characteristics of the financial system. A high credit-to-GDP ratio, for example, could indicate vulnerabilities that policymakers might want to remedy with MPMs or CFMs. Basu et al. (2020) model MPMs as part of an optimal policy mix ex-ante crisis to decrease the credit-to-GDP ratio. Further, as proposed by Basu et al. (2020) and Adrian et al. (2020), the currency composition of domestic credit could also make the case for implementing more MPMs and CFMs (although data availability limits testing this empirically). However, as pointed out by Houston et al.

(2012) and Cerrutti and Zhou (2018) for MPMs and CFMs, as well as by Norring (2019) for MPMs, capital controls and macroprudential regulation are closely related to cross-border banking flows. Das and Ordal (2022) establish a strong association in emerging markets between capital controls and banking flows, but not aggregate capital flows. Further, Brana et al. (2023) find that, especially in the case of emerging economies, a higher the presence of foreign banks correlates with a higher amount of cross-border claims. As substantial cross-border claims can turn to large and volatile capital flows in a crisis, it is plausible that policymakers follow the presence of foreign banks closely. Hence, indicators of the financial system such as the *credit-to-GDP ratio* and variables on *foreign banking* are examined in our empirical analysis.

Norring (2022) notes that advanced economies, major emerging economies and other emerging and developing economies use MPMs and CFMs quite differently. Major emerging economies tend to be most active in implementing new and adjusting old MPMs, but at the same time, they still have most of their traditional capital management framework in place. For these reasons, if sample size permits, subsamples of the different country groups are also examined in our empirical analysis.

Researchers have proposed that CFMs and MPMs may be both substitutes and complements. Korinek and Sandri (2016) and Rey (2016), for example, argue that the effects of CFMs can be replicated using MPMs such as cyclical policies that limit credit growth and structural policies that limit leverage of financial intermediaries. Basu et al. (2020) show that MPMs can be substitutes for prudential capital controls when there is no regulatory arbitrage via foreign lending. Generally, however, the policy tools complement each other. Fabiani et al. (2022) argue that MPMs and CFMs work as complements in mitigating the effects of credit booms and excessive risk taking by banks. Adrian, Gaspar and Vitek (2022) show with a medium-scale DSGE model that it is optimal for a country to adjust both capital management and macroprudential policies in response to domestic and global financial cycles. Thus, considering MPMs and CFMs side by side and comparatively makes sense. As both the use of MPMs and CFMs are analyzed, we can also examine their potential interactions.

Based on our review, we consider five categories of potential determinants of the use of MPMs and CFMs: *1) macroeconomic performance; 2) institutional quality; 3) previous economic crises; 4) foreign bank presence; and 5) exchange rate regime.*

3 Data and methodology

3.1 Data

Our three dependent variables consist of use of macroprudential policy measures (MPMs) and alternative measures for the use of capital management measures (CFMs). All measures chosen are ultimately based on the number of regulatory measures implemented. These variables measure the completeness or complexity of a country's macroprudential or capital regulatory framework, not its stance or stringency. As there are many MPMs and CFMs, and even ostensibly identical tools can be quite different in terms of regulatory details across countries and times. Thus, constructing a measure for the aggregate stringency of the regulatory framework would be extremely difficult. Moreover, no reliable measures of stringency exist to our best knowledge. However, given that the different MPMs under the macroprudential policy framework and CFMs under the capital flow management framework all have the same goal of ensuring domestic financial stability, we argue that the completeness of the regulatory framework is a simple, sensible "measurement" approach.

Our dependent variable for macroprudential policy is from the updated version of the Macroprudential Index (MPI) dataset introduced by Cerutti et al. (2017). The Macroprudential Index (MPI) has been used extensively in research on the effects of macroprudential policy (Hu and Gong, 2019; Belkhir et al., 2022; Brana et al., 2024). The index measures the number of different macroprudential instruments implemented in a given year and thus gives an approximation of the completeness of a country's macroprudential framework. The data have excellent country coverage across advanced, emerging market and developing economies, making them suitable for a cross-country set-up such as here. For the most part, the data are drawn from the IMF's annual Macroprudential Survey conducted in conjunction to the Annual Report on Exchange Arrangements and Exchange Restrictions.[3] The macroprudential index of Cerutti et al. (2017) uniquely records the number of macroprudential policy measures implemented with a global coverage, precisely what we need for our set-up. Unfortunately, this Macroprudential Index has not been updated since 2017. As there are no alternative data sources suitable for our set-up available, we must take 2017 as the final year of our analysis.

Our first dependent variable for the use of capital flow management measures is the well-known Chinn-Ito Index, a measure of financial openness, which we refer to as Financial Openness

[3] The database is available here: https://www.elibrary-areaer.imf.org/Macroprudential/Pages/Home.aspx. The more recent and still updated iMaPP index is not suitable for our set-up as it documents macroprudential policy decisions, but not the implemented measures. For more information, see IMF (2018).

(FO).[4] The second dependent variable is the more detailed capital restrictions measure by Fernández et al. (2016), which we call Capital Restrictions (CR).[5] Both of the variables are based on the number of CFMs a country has implemented. This is done with the help of binary variables codifying the restrictions on cross-border financial transactions of different categories of financial flows that are reported in the IMF's Annual Report on Exchange Arrangements and Exchange Restrictions. The Chinn-Ito index measures financial openness, meaning that larger values of the index indicate *fewer* CFMs. The Fernández et al. (2016) dataset measures capital restrictions, whereby larger values indicate *more* CFMs, i.e. comparable to the macroprudential index. The Fernández et al. data are also more detailed for different types of CFMs, but country coverage is not as wide as that of the Chinn-Ito index. Thus, we include both in the analysis. The descriptive statistics of the dependent variables are given in Table 1.

Based on the review of the previous section, we consider the following five categories of potential determinants of the use of MPMs and CFMs: *1) macroeconomic performance; 2) institutional quality; 3) previous economic crises; 4) foreign bank presence; 5) exchange rate regime.* In choosing the specific explanatory variables inside the five categories identified based on past literature summarized in Section 2, our choices have been guided by robust statistical significance and country coverage. Robustness is maintained through systematic model selection, as detailed in Section 3.2, and by ensuring that no relationships are influenced by individual outliers. In addition, we avoid determinants which decrease the number of countries in our analysis to avoid the problems arising from a small sample size.

The chosen explanatory variables and their descriptive statistics are given in Table 1. The explanatory variables are calculated as multiyear averages from the preceding period to alleviate endogeneity concerns. We control *macroeconomic performance* with seven variables for 1990–2017 that are all statistically significant at some stage of the analysis.[6] To measure *institutional quality*, we use the World Governance Indicators of the World Bank, which includes six variables on institutional quality since 1996. Due to high pairwise correlations, all of them cannot be included. Two institutional variables with the highest posterior inclusion probabilities and reasonable pairwise

[4] The Chinn-Ito index is available here: web.pdx.edu/~ito/Chinn-Ito_website.htm. The most recent update covers the year 2021.
[5] The Fernandez et al. dataset is available here: columbia.edu/~mu2166/fkrsu/. The most recent update covers the year 2019.
[6] In addition, terms-of-trade volatility had a reasonable posterior inclusion probability. It was not included, because of data restrictions: full coverage of our sample of 142 countries in the World Development Indicators data of the World Bank is only available from 2000 onwards. Further, including it does not change our main results.

correlation are included for each dependent variable.[7] We measure *previous economic crises* by calculating the share of banking or currency crises years during the period 1970–2017.[8] The data for crises comes from Nguyen et al. (2022). We test several variables on *foreign bank presence* and competition in the banking sector from the Global Financial Development Database of the World Bank. The two variables ("proportion of foreign banks" and "asset share of foreign banks") with the highest explanatory power and the largest country coverage are included in the regressions. We tested various variables related to the *exchange rate regime.* These tend to reduce the sample size and are statistically insignificant for the Macroprudential Index and Financial Openness. However, for Capital Restrictions, "exchange rate stability" and a classification of the regimes are statistically significant and thus included in the set of explanatory variables for this dependent variable. Finally, Macroprudential Index is included in the set of explanatory variables for Financial Openness and Capital Restrictions, and vice versa.[9]

Our baseline sample consists of 142 countries, of which 34 are advanced economies (AEs) and 108 emerging market and developing economies (EMDEs). These groupings follow IMF's country classification. We mainly use these two country groups. We also divide the EMDE-group into the 22 major EMEs listed in Section 1, and the 86 other EMDEs, which are smaller and less integrated to the global economy. However, due to sample size restrictions, these groupings cannot be used in the baseline regressions, but the country group differences are explored in more detail in Section 4.4. Further, when certain explanatory variables are included to the regression model, the number of countries diminishes slightly. The sample sizes are clearly marked in the regression tables, but the listing of countries in different samples can also be found in Table A2 in the Appendix. The descriptive statistics of all included variables are provided in Table 1, while detailed description of all the variables and data sources can be found in Table A1 and the correlation matrix in Table

[7] The pairwise correlation between "Government effectiveness" and "Regulatory quality" is 0.96. Hence, only one of the two can be included in the set of explanatory variables. Based on posterior inclusion probabilities, we choose "Voice and accountability" as an explanatory variable for all three dependent variables, and "Government effectiveness" for Macroprudential Index, and "Regulatory quality" for Financial Openness and Capital Restrictions.
[8] We require that a country has data for both "Banking crises" and "Currency crises."
[9] In addition to the explanatory variables in Table 1, we tested several others, including the standard deviation of the "Net barter terms of trade index" (WDI); "Control of corruption," "Political stability," "Rule of law" (WGI); and various banking indicators from the GFDD such as "Bank regulatory capital to risk-weighted assets," "Bank z-score," and "nonresident bank loans to GDP." None of these explanatory variables alter the main results. The share of foreign-owned banks (FOR3) from Panizza (2023, 2024) strongly correlates with "Proportion of foreign banks" and "Asset share of foreign banks." Our main results are not sensitive to data source. "Risk-taking" from the Global Preferences Survey is significant in regressions with "Macroprudential Index" and "Financial Openness" as dependent variables, but not when "Capital Restrictions" is the dependent variable. As this variable reduces the sample size from 142 to 67 countries, these results are not reported.

A3 in the Appendix. Possible multicollinearity between explanatory variables is tested by the variance inflation factor and reported below each regression table.

Table 1. Descriptive statistics, 142 countries

Variable	Min	Max	Median	Mean	Std. dev.	#Countries	#Obs.[a]
Dependent variables in 2017:							
Macroprudential Index (MPI)	0.000	10.000	3.000	3.479	1.945	142	142
Financial Openness (FO)	-1.927	2.311	0.821	0.515	1.563	142	142
Capital Restrictions (CR)	0.000	0.975	0.300	0.394	0.329	92	92
Macroeconomy in 1990–2017:							
Ln GDP	19.308	30.300	24.272	24.442	2.174	142	3875
Ln GDP per capita	5.720	11.234	8.334	8.434	1.437	142	3868
Credit-to-GDP ratio	0.039	1.697	0.366	0.492	0.388	142	3720
Current account	-33.780	17.954	-3.333	-3.069	6.535	142	3602
GDP per capita growth	-1.475	10.255	1.938	2.312	1.748	142	3842
Inflation	0.456	408.332	6.541	24.056	58.416	142	3763
Fuel exports	0.000	97.190	4.633	14.383	23.734	142	3163
Institutions in 1996–2017:							
Voice and accountability	-1.804	1.608	-0.028	0.046	0.896	142	2698
Government effectiveness	-1.569	2.130	-0.165	0.078	0.918	142	2680
Regulatory quality	-1.841	1.950	-0.112	0.119	0.873	142	2683
Economic crises in 1970–2017:							
Banking crises	0.000	37.500	4.167	6.437	6.900	142	6264
Currency crises	0.000	33.333	4.167	7.183	8.212	142	6264
Foreign banking in 2005–2013:							
Proportion of foreign banks	0.000	1.000	0.416	0.416	0.272	119	1071
Asset share of foreign banks	0.000	1.000	0.248	0.378	0.328	119	989
Exchange rate regime in 2017:							
Exchange rate stability	0.130	1.000	0.589	0.631	0.284	139	139
Coarse classification	1.000	6.000	2.000	1.902	1.160	140	140

See Table A2 in the Appendix for a list of countries.
[a] The number of annual observations.

3.2 Methodology

The relationships between the dependent variables and the explanatory variables listed in Table 1 are tested by estimating the following linear cross-sectional regression model by the OLS estimator:

$$PolicyMeasure_{i,2017} = \alpha + \bar{\boldsymbol{x}}_i'\boldsymbol{\beta} + \varepsilon_i, \quad (1)$$

where $PolicyMeasure_{i,2017}$ is the Macroprudential Index (MPI), Financial Openness (FO) or Capital Restrictions (CR) of country i at the end of 2017, α is the intercept, $\boldsymbol{x}$ is the vector of selected explanatory variables, and ε is the residual.

We use policy measures from the end of 2017, the latest year for which MPI data are available. We assume that the decision to implement a macroprudential policy measure or a capital management measure is not based solely on contemporary values of potential determinants, but also the

long-term development of these determinants. Hence, explanatory variables are measured as multi-year averages. These multi-year averages are calculated from the preceding period, so the explanatory variables are predetermined. It should be noted, however, that this does not guarantee exogeneity.

When considering a linear regression model such as (1), uncertainty about which explanatory variables to include on the right-hand side of the equation cannot be avoided. In order to control for such model uncertainty, we use Bayesian Model Averaging with the uniform model prior and some other reasonable assumptions (see Fernández et al., 2001) as well as the Akaike information criterion (AIC). We calculate posterior inclusion probabilities for all explanatory variables using Bayesian Model Averaging and then estimate regression model (1) using the specification selected by the AIC. We assume the relationship to be linear for practicality because linearity assumption makes it easier to tackle model uncertainty. As there is no particular reason why the relationships should be linear, we test quadratic terms of all variables selected by the AIC and check whether relationships are driven by outliers as a robustness check. Our findings suggest that the linearity assumption is not unreasonable. None of our main findings are driven by outliers.

4 Results

In this section, we test the relationships between dependent variables and explanatory variables with the data and methodology described in section 3. The results are first presented for macroprudential policy measures (MPMs) in section 4.1 and then for capital flow management measures (CFMs) in Section 4.2. We start both sections by first going through the posterior inclusion probabilities and then the regression results. Section 4.3 considers further regressions. Section 4.4 takes a deeper look into the special case of major emerging economies as they stand out from other country groups as active users of both MPMs and CFMs.

4.1 Motives for using macroprudential policy measures

We use Bayesian Model Averaging to evaluate the determinants of the Macroprudential Index (MPI). The posterior inclusion probabilities of each explanatory variable are presented in Table 2. In this section, we measure the use of capital flow management measures by Financial Openness (FO), as it provides a larger sample of countries.

Table 2. Posterior inclusion probabilities for the determinants of the Macroprudential Index in 2017

Dependent variable:	Macroprudential Index (MPI) in 2017					
Country group:	All	AEs	EMDEs	EMDEs	All	All
Condition:				FO > Median[a]	Data on foreign banking	
# Countries:	142	34	108	58	119	119
Column:	1	2	3	4	5	6
Macroeconomy in 1990–2017:						
Ln GDP	0.94*	0.09	1.00*	0.54*	0.70*	0.30
Ln GDP per capita	0.67*	0.09	0.36	0.36	0.71*	0.82*
Credit-to-GDP ratio	0.46	0.09	0.14	0.12	0.29	0.36
Current account	0.32	0.14	0.10	0.19	0.48	0.28
GDP per capita growth	0.87*	0.14	0.24	0.09	0.98*	0.99*
Inflation	0.08	0.08	0.08	0.13	0.09	0.08
Fuel exports	0.15	0.41	0.10	0.55*	0.13	0.10
Institutions in 1996–2017:						
Voice and accountability	0.27	0.10	0.20	0.11	0.24	0.14
Government effectiveness	0.33	0.08	0.70*	0.51*	0.15	0.17
Economic crises in 1970–2017:						
Banking crises	0.11	0.08	0.08	0.50*	0.18	0.18
Currency crises	0.30	0.12	0.11	0.27	0.30	0.37
Regulation in 2017:						
Financial openness (FO)	0.11	0.10	0.15	0.08	0.13	0.11
Foreign banking in 2005–2013:						
Proportion of foreign banks	–	–	–	–	–	0.83*
Asset share of foreign banks	–	–	–	–	–	0.15

Posterior inclusion probabilities above 0.5 marked with *.
[a] Emerging and developing economies (EMDEs) for which Financial Openness (FO) is above its median value (−0.16).

Based on Bayesian Model Averaging, the size of the economy, measured by log of GDP, is the most important determinant of the MPI for the whole sample (column 1) and for emerging and developing economies (EMDEs, column 3). For advanced economies (AEs, column 2), the posterior inclusion probabilities are low. "Government effectiveness" is an important determinant of the MPI in EMDEs (column 3). For the financially open EMDEs, "Fuel exports" and "Banking crises" seem important (column 4). Despite the fact that the degree of financial openness seems to affect the posterior inclusion probabilities of the explanatory variables (columns 3 and 4), the variable "Financial Openness" does not have explanatory power on the cross-country variation of the MPI.

When variables on foreign banking are included to the set of explanatory variables the number of countries decreases from 142 to 119. In this sample GDP per capita growth is the most important determinant of the MPI (columns 5 and 6). Further, "Proportion of foreign banks" has

explanatory power on the MPI. When "Proportion of foreign banks" is included, "size of the economy" is no longer a strong determinant of the MPI, whereas the posterior inclusion probability of natural log GDP per capita ("Ln GDP per capita") is high. The posterior densities for "GDP per capita growth" and "Proportion of foreign banks" in the MPI regression model (column 6 in Table 2) are shown in Figures A19 and A20 in the Appendix.

Results of cross-sectional regressions for the MPI are presented in Table 3. The set of explanatory variables from which the AIC picks variables in is the same as in Table 2. For the most part, the AIC selects the variables that have the highest posterior inclusion probabilities in Table 2.

Our regression results in Table 3 reveal several interesting findings.

First, specifications (1) and (3) show that large economies with effective government tend to use a large number of macroprudential policy measures (MPMs) and this is not driven by outliers.[10] It is likely that macroprudential regulation requires good institutions such as government effectiveness (Beirne and Friedrich, 2017). However, it is unclear why large economies would need or want to implement a larger number of MPMs than small economies.

Second, the negative coefficient of "Voice and accountability" demonstrates that the relationship between macroprudential policy and institutional quality is complex. The countries that score low on "Voice and accountability" tend to be authoritarian regimes, and it seems that such states have more MPMs implemented than democratic states,[11] which raises further questions. For instance, are some MPMs so unpopular that authoritarian regimes are more capable of implementing them than democratic ones?

Third, according to specifications (5)–(8), economies with higher GDP growth implement a larger number of MPMs. This result is not driven by outliers.[12] Intuitively, we expect financial and business cycles to be interdependent, so high economic growth should increase the need for macroprudential regulation.

Finally, the negative coefficient of the "Credit-to-GDP ratio" is somewhat unexpected, as one might anticipate that a higher credit ratio (or greater financial development) would be associated with more MPMs. However, upon closer examination, this finding can be partly attributed to the high pairwise correlation between the "Credit-to-GDP ratio" and "Government effectiveness" (0.79

[10] See Figures A1 and A6 in the Appendix.
[11] The coefficient of "Voice and accountability" remains negative even if "Government effectiveness" is dropped from specification (1) of Table 3.
[12] The two fastest-growing economies in the sample are Bosnia and Herzegovina (BIH) and China (CHN). The former can be interpreted as an outlier (see Table A4). However, the positive relationship between the MPI and GDP per capita growth remains robust even when Bosnia and Herzegovina is excluded.

with 142 countries). The coefficient for the "Credit-to-GDP ratio" becomes -1.004 with a p-value of 0.062 when "Government effectiveness" is excluded from specification (1) of Table 3.[13]

Specification (2) shows that our explanatory variables fail to explain the cross-country variation of the MPI among advanced economies (AEs). The only statistically significant coefficient, the positive coefficient of "Fuel exports" is driven by Norway (see Figure A8 in the Appendix). "Fuel exports" are not completely meaningless, of course. Specification (4) shows that the coefficient is positive and statistically significant for the financially open emerging and developing economies (EMDEs), and in this case the result is not driven by an outlier. From past research we know that a high share of fuel exports increases macroeconomic volatility (van der Ploeg and Poelhekke, 2009). If, at the same time, the country maintains an open capital account, with the associated volatility in capital flows, this further heightens the need for macroprudential policy measures. Further in specification (4) of financially open EMDEs past banking crises as well as past currency crises are associated with more macroprudential measures implemented. As higher incidence of economic crises is related to vulnerability, this could suggest that capital flow management measures and macroprudential policy measures might be substitutes for vulnerable economies.

As noted above, the large positive relationship between the "Size of the economy" and the MPI seems puzzling. Indeed, with closer look the log of GDP seems to suffer from omitted variable bias as it loses statistical significance when the "Proportion of foreign banks" is included in the regression model (specifications (5) and (6) in Table 3 and columns 5 and 6 of Table 2). There is a highly significant negative association between the MPI and "Proportion of foreign banks" that is not driven by outliers.[14] In other words, it may not be the case that large economies seek to implement more macroprudential policy measures, but instead economies with predominantly domestic banks rely extensively on macroprudential policy measures. These countries tend to be large economies.

It is not immediately clear how the proportion of foreign banks influences the need for macroprudential regulation. However, the presence of foreign banks may limit the regulators' freedom of action. If domestic policymakers assume more extensive macroprudential regulation will

[13] Additionally, the pairwise correlation between the "Credit-to-GDP ratio" and the natural logarithm of GDP per capita is relatively high (0.73 with 142 countries). If both "Government effectiveness" and "Ln GDP per capita" are excluded from specification (1) in Table 3, the relationship between MPI and the credit-to-GDP ratio becomes non-linear and increasing for most countries, similar to Figure A3 in the Appendix. In other words, the negative relationship between the MPI and the credit-to-GDP ratio shown in Table 3 is not particularly robust, which also explains why the posterior inclusion probabilities for the credit-to-GDP ratio are relatively low in Table 2.

[14] See Figure A28 in the Appendix. The result is robust to using the share of foreign-owned banks (FOR3) from Panizza (2023, 2024) instead of "Proportion of foreign banks."

lead to increased cross-border borrowing facilitated by foreign banks, circumvention could partially explain the negative association between the MPI and the presence of foreign banks. Cerutti et al. (2017) find a positive association between the MPI and the relative reliance on cross-border credit in financially open economies. Aiyar et al. (2014) provide evidence that, in response to tighter capital requirements in the UK, circumvention occurs via foreign bank branches operating in the UK, with the leakage offsetting about one-third of the initial regulatory impulse.[15] Danisewicz et al. (2017) find that a similar result holds for the tightening of lending standards as foreign banks increase their lending to the UK's non-bank borrowers. Furthermore, they show that the response of lending to non-bank borrowers does not depend on the organizational form of foreign banks' UK affiliate (i.e. whether they operate as subsidiaries or branches). Consequently, the possibility of circumvention may discourage regulators from implementing macroprudential instruments if there is a significant presence of foreign banks.

If domestic policymakers view foreign banks as beneficial to the economy and anticipate that more extensive macroprudential regulation would reduce their presence, regulatory arbitrage could also explain the negative association between the MPI and the presence of foreign banks. Bruno and Hauswald (2014) provide evidence that domestic lending by foreign banks stimulates the growth of financially constrained industries when African countries are excluded. Panizza (2024) finds that the presence of foreign banks is positively associated with higher GDP growth in emerging and developing economies. According to Houston et al. (2012), bank capital inflows are negatively associated with bank regulation and supervision in the recipient country, while bank capital outflows are positively associated with regulation and supervision in the source country. Norring (2019) finds that the relationship between bilateral cross-border bank asset holdings and the number of financial institution-targeted instruments is positive when the analysis is limited to country pairs among EMDEs. Consequently, it is plausible that concerns about regulatory arbitrage make regulators hesitant to implement macroprudential instruments in economies with a significant presence of foreign banks.

Although Financial Openness is not an important determinant of the MPI, it does affect how well the model explains the variation in the index. In specification (7) and (8), the sample is

[15] According to Jeanne and Korinek (2014, p. 167), the internationally integrated banking system is a reason macroprudential regulation may leak.

split by the median value of Financial Openness.[16] The model fits financially open economies better than financially closed ones. In other words, the degree of financial openness increases the sensitivity of the MPI to the explanatory variables of specification (6). One possible interpretation is that financially open economies need to adjust macroprudential policy according to the economic environment, whereas the need is smaller for closed economies. Further, it holds that large economies implement more macroprudential policy measures in the case of financially closed countries.

[16] In specifications (7) and (8) in which the sample is split by the median value of Financial Openness (1.04), the models are not optimized separately by the AIC. When the models are separately optimized, it still holds that in financially open economies a larger proportion of the variation the MPI can be explained by a smaller number of variables than in financially closed economies.

Table 3. Determinants of the number of macroprudential instruments in 2017

Dependent variable:	Macroprudential Index (MPI) in 2017							
Country group:	All	AEs	EMDEs	EMDEs	All	All	All	All
Condition:				FO > Median	Data on foreign banking		FO > Median	FO ≤ Median
Specification:	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Macroeconomy in 1990–2017:								
Ln GDP	0.304***		0.438***		0.303**	0.194*	0.106	0.417*
	(0.086)		(0.085)		(0.116)	(0.115)	(0.116)	(0.216)
Ln GDP per capita	0.425*		0.328		0.511*	0.425*	0.955**	-0.076
	(0.230)		(0.238)		(0.259)	(0.246)	(0.388)	(0.352)
Credit-to-GDP ratio	-1.530***		-1.474**		-1.488***	-1.678***	-1.478*	-0.878
	(0.534)		(0.731)		(0.537)	(0.565)	(0.772)	(0.926)
GDP per capita growth	0.214**		0.147		0.308***	0.333***	0.488***	0.284**
	(0.090)		(0.092)		(0.100)	(0.101)	(0.157)	(0.114)
Fuel exports		0.038***		0.035***				
		(0.011)		(0.007)				
Institutions in 1996–2017:								
Voice and accountability	-0.603**		-0.488*		-0.658**	-0.512*	-0.744**	-0.237
	(0.243)		(0.257)		(0.284)	(0.275)	(0.295)	(0.562)
Government effectiveness	0.918**		1.209**	1.429***	0.773*	0.906**	0.446	0.770
	(0.391)		(0.483)	(0.429)	(0.463)	(0.441)	(0.578)	(0.900)
Economic crises in 1970–2017:								
Banking crises				0.092**				
				(0.035)				
Currency crises	0.029			0.059*	0.038	0.034*	0.054**	0.037
	(0.020)			(0.033)	(0.022)	(0.020)	(0.024)	(0.034)
Foreign banking in 2005–2013:								
Proportion of foreign banks	–	–	–	–	–	-1.837***	-1.970**	-1.228
						(0.547)	(0.762)	(1.089)
Constant	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.384	0.119	0.402	0.439	0.370	0.417	0.459	0.400
AIC rank	1	1	1	1		1		
# Countries	142	34	108	58	119	119	65	54

The dependent variable is the number of macroprudential instruments in 2017. Specifications (1)–(4) and (6) were selected by the AIC. In specification (4), EMDEs for which Financial Openness (FO) is above its median value (−0.16) are included. In specifications (7)–(8), the sample is divided by the median value of Financial Openness (1.04). Heteroscedasticity-robust standard errors are in parentheses. *, ** and *** denote statistical significance at the 10%, 5% and 1% levels, respectively. Multicollinearity was tested using the variance inflation factor (VIF). In specifications (1) and (5)–(7), the VIFs of Government effectiveness are between 8.4–9.5 and in specification (7) the VIF of Ln GDP per capita is 6.1. In all other cases, the VIFs are below 5. None of the quadratic terms is statistically significant at the 1% level.

4.2 Motives for using capital flow management measures

The posterior inclusion probabilities of explanatory variables based on the Bayesian Model Averaging method are presented in Table 4. For Financial Openness and Capital Restrictions in Table 4, the set of explanatory variables is the same as for the Macroprudential Index in Tables 2 and 3 except that institutional quality is measured by "Regulatory quality" and variables for the exchange rate regime are included.[17]

Table 4. Posterior inclusion probabilities for the determinants of capital controls in 2017

Dependent variables:	Financial openness (Chinn-Ito index) in 2017			Capital restrictions (KA) in 2017	
Country group:	All	AEs	EMDEs	All	Non-euro
Condition:				Coarse classification ≤ 4[a]	
# Countries:	142	34	108	89	75
Column:	1	2	3	4	5
Macroeconomy in 1990–2017:					
Ln GDP	0.08	0.53*	0.12	0.16	0.20
Ln GDP per capita	0.33	0.17	0.28	0.18	0.22
Credit-to-GDP ratio	0.64*	0.10	0.95*	0.48	0.46
Current account	0.08	0.10	0.08	0.08	0.08
GDP per capita growth	0.09	0.15	0.08	0.19	0.25
Inflation	0.13	0.41	0.15	0.10	0.10
Fuel exports	0.11	0.08	0.11	0.16	0.16
Institutions in 1996–2017:					
Voice and accountability	0.31	0.08	0.73*	0.17	0.22
Regulatory quality	1.00*	0.73*	1.00*	0.91*	0.84*
Economic crises in 1970–2017:					
Banking crises	0.09	0.10	0.08	0.09	0.11
Currency crises	0.11	0.19	0.11	0.09	0.09
Regulation in 2017:					
Macroprudential Index (MPI)	0.09	0.10	0.09	0.12	0.12
Exchange rate regime in 2017:					
Exchange rate stability	–	–	–	0.30	0.22
Coarse classification	–	–	–	0.18	0.17

Posterior inclusion probabilities above 0.5 marked with *.
[a] Countries for which Coarse classification equals 5 = "Freely falling" or 6 = "Dual market in which parallel market data is missing" in 2017 are excluded.

[17] "Regulatory quality" has higher posterior inclusion probabilities than "Government effectiveness" in the regression models of capital controls. Both of these institutional variables cannot be included due to a high pairwise correlation (0.96) (see Table A3 in the Appendix). Variables on foreign banking are added in section 4.3.

Based on Bayesian Model Averaging, "Regulatory quality" is clearly the most important determinant of capital flow management measures (CFMs). Unlike advanced economies, which are generally unlikely to have much more than marginal measures in place, "Credit-to-GDP ratio" is an important determinant of CFMs for emerging and developing economies. Surprisingly, the exchange rate regime is *less* important. The MPI does not have explanatory power on capital flow management measures. When comparing the posterior inclusion probabilities in columns 1–3 of Table 2 to the posterior inclusion probabilities in columns 1–3 of Table 4, it seems that the importance of determinants of the use of capital flow management measures vary much less across country groups than the importance of determinants of the use of macroprudential policy measures. Overall, the posterior inclusion probabilities in Table 4 are a bit smaller than in Table 2, but this does not hold for all individual variables.

Results of cross-sectional regressions for capital flow management measures (CFMs) are presented in Table 5. The set of explanatory variables from which the AIC picks variables is the same as in Table 4. The AIC seems to select the variables with the highest posterior inclusion probabilities in Table 5. Here too we can make interesting observations. Countries with a high "Credit-to-GDP ratio" value and a low value for "Regulatory quality" tend to have implemented CFMs extensively.[18] However, for advanced economies the connection between credit to GDP and CFMs does not hold. To understand these findings, consider that first, a high "Credit-to-GDP ratio" value implies a risk to financial stability, and second, that good institutional quality is a prerequisite for macroprudential policy. Emerging and developing economies with lower institutional quality may not have any other option than to use CFMs in order to implement policies to counteract the stability implications of indebtedness of the private sector.

The negative coefficient of "Voice and accountability" is somewhat puzzling. Upon closer inspection, we see this results largely from the high pairwise correlation with "Regulatory quality" (0.82 with 142 countries). The coefficient of "Voice and accountability" turns positive if "Regulatory quality" is dropped from specification (1) of Table 5. Thus, this finding is not robust. Variables other than "Credit-to-GDP ratio," "Regulatory quality," and "Voice and accountability" displayed in Table 5 have relatively low posterior inclusion probabilities (the the exception of log of GDP for

[18] This result is not driven by outliers (Figures A30, A33, A45, and A47 in the Appendix).

advanced economies). Exchange rate regime is not an important determinant of CFMs. From specification (5) we can see that countries with managed floating tend to have more CFMs than countries with de facto peg. This contradicts Fratzscher (2012), who finds that between 1984 and 2009, countries with a high level of capital controls tended to have fixed exchange rate regimes. However, our data on both capital restrictions and exchange rate regimes come from a different source and focus on 2017. Contrary to the regressions of the MPI in Table 3, our model explains the cross-country variation of Financial Openness among advanced economies better than among emerging and developing economies. This is clear from comparing specifications (2) and (3) in Table 5.

Table 5. Determinants of Financial Openness and Capital Restrictions in 2017

Dependent variables:	Financial Openness (FO) in 2017			Capital Restrictions (CR) in 2017	
Country group:	All	AEs	EMDEs	All	All
Condition:				Coarse classification ≤ 4[a]	
Specification:	(1)	(2)	(3)	(4)	(5)
Macroeconomy in 1990–2017:					
Ln GDP		0.107*	-0.101		
		(0.054)	(0.066)		
Ln GDP per capita	0.287**	-0.354	0.308**		
	(0.134)	(0.241)	(0.143)		
Credit-to-GDP ratio	-1.216***		-1.888***	0.224*	0.205*
	(0.340)		(0.387)	(0.113)	(0.112)
GDP per capita growth				0.025	0.024
				(0.016)	(0.016)
Inflation	-0.002	-0.006	-0.004**		
	(0.002)	(0.004)	(0.002)		
Institutions in 1996–2017:					
Voice and accountability	-0.354**		-0.687***		
	(0.172)		(0.203)		
Regulatory quality	1.493***	0.655***	1.745***	-0.274***	-0.284***
	(0.294)	(0.232)	(0.328)	(0.049)	(0.050)
Economic crises in 1970–2017:					
Currency crises			0.033*		
			(0.019)		
Exchange rate regime in 2017:					
Exchange rate stability	–	–	–	-0.190*	–
				(0.096)	
Coarse classification:					
2 = Crawling peg	–	–	–	–	-0.005
					(0.088)
3 = Managed floating	–	–	–	–	0.126*
					(0.065)
4 = Freely floating	–	–	–	–	0.065
					(0.115)
Constant	Yes	Yes	Yes	Yes	Yes
R^2	0.523	0.520	0.375	0.408	0.405
AIC rank	1	1	1	1	
# Countries	142	34	108	89	89

In specifications (1)–(3), the dependent variable is the Chinn-Ito index in 2017. In specifications (4)–(5), the dependent variable is the overall capital restrictions index (KA) by Fernandez et al. in 2017. Specifications (1)–(4) were selected by the Akaike information criterion (AIC). 1 = "De facto peg" is the reference category for the exchange rate regime in specification (5). The reference category includes 40 countries. Heteroscedasticity-robust standard errors are in parentheses. *, ** and *** denote statistical significance at the 10%, 5% and 1% levels, respectively. Multicollinearity was tested using the variance inflation factor (VIF). In specification (1), the VIF of "Regulatory quality" is 7.1. In all other cases, the VIFs are below 5. None of the quadratic terms is statistically significant at the 1% level.

[a] Countries for which the coarse classification equals 5 = "Freely falling" in 2017 are excluded (Angola). In addition, countries for which coarse classification have monthly values 6 = "Dual market in which parallel market data is missing" are excluded (Azerbaijan, Burundi, Malawi, and Mongolia).

4.3 Extended regression models

In this section, we include the regional averages of our dependent variables in the analysis to account for the possibility of policy diffusion. The regional average represents the mean value of a variable calculated across all countries within the same continent. When calculating the regional average for country *i*, the value of country *i* is omitted. We measure the number of capital flow management measures using the Capital Restrictions index proposed by Fernández et al. (2016), and include variables on foreign banking ("Proportion of foreign banks" and "Asset share of foreign banks") to the set of explanatory variables. The number of countries remains at 89, but the countries in the sample are slightly different than in the previous section. Due to the small sample size, countries are not divided into subsamples, except when we regress the MPI and split the sample based on the degree of Capital Restrictions (CR). We again use Bayesian Model Averaging and calculate the posterior inclusion probabilities of the explanatory variables, listed in Table 6.

"Growth of GDP per capita" and "log of GDP per capita" are the most important determinants of the MPI, while "Proportion of foreign banks," "log of GDP per capita," and "Regulatory quality" are the most important CR determinants. Notably, in this sample of 89 countries, the posterior inclusion probability of "Proportion of foreign banks" is smaller in the regressions of the MPI (0.38) than in the sample of 119 countries in Table 2 (0.83). When variables on foreign banking are included to the set of explanatory variables, the posterior inclusion probability of "Regulatory quality" becomes smaller in the CR regressions . This is due to the fact that if "Proportion of foreign banks," "log of GDP per capita," "Voice and accountability" and "Regulatory quality" are all included as explanatory variables, the variance inflation factor (VIF) of "Regulatory quality" rises and the regression model suffers from multicollinearity. Interestingly, regional average of the MPI is an important determinant of the MPI, whereas for the posterior inclusion probability of its regional average is low for CR.

Table 6. Posterior inclusion probabilities for determinants of MPI and Capital Restrictions in 2017

Dependent variable:	Macroprudential Index (MPI) in 2017			Capital Restrictions (CR) in 2017		
Country group:	All	All	All	All	All	All
Condition:	Data on foreign banking			Data on foreign banking		
# Countries:	89	89	89	89	89	89
Column:	1	2	3	4	5	6
Foreign banking in 2005–2013:						
Proportion of foreign banks	–	0.38	0.19	–	0.58*	0.56*
Asset share of foreign banks	–	0.13	0.10	–	0.20	0.20
Regional averages in 2017:						
Macroprudential Index (MPI)	–	–	0.95*	–	–	–
Capital Restrictions (CR)	–	–	–	–	–	0.07
Macroeconomy in 1990–2017:						
Ln GDP	0.45	0.32	0.32	0.20	0.11	0.11
Ln GDP per capita	0.71*	0.71*	0.21	0.18	0.56*	0.55*
Credit-to-GDP ratio	0.26	0.24	0.11	0.41	0.20	0.19
Current account	0.44	0.38	0.32	0.09	0.08	0.08
GDP per capita growth	0.93*	0.92*	0.61*	0.18	0.14	0.14
Inflation	0.08	0.08	0.07	0.08	0.09	0.09
Fuel exports	0.16	0.14	0.17	0.13	0.11	0.11
Institutions in 1996–2017:						
Voice and accountability	0.20	0.17	0.10	0.21	0.27	0.26
Government effectiveness	0.15	0.13	0.11	–	–	–
Regulatory quality	–	–	–	0.88*	0.51*	0.51*
Economic crises in 1970–2017:						
Banking crises	0.11	0.11	0.07	0.10	0.09	0.08
Currency crises	0.25	0.27	0.11	0.08	0.07	0.07
Regulation in 2017:						
Capital Restrictions (CR)	0.14	0.10	0.08	–	–	–
Macroprudential Index (MPI)	–	–	–	0.16	0.10	0.10

Posterior inclusion probabilities above 0.5 marked with *.

Results of cross-sectional regressions for the Macroprudential Index and Capital Restrictions are presented in Table 7. The sets of explanatory variables from which the AIC picks variables are the same as in Table 6. Again, for the most part, the AIC selects the variables that have the highest posterior inclusion probabilities in Table 6. An exception is "Regulatory quality," which is not selected for specification (6) in Table 7 despite of its high posterior inclusion probability. This is because "Proportion of foreign banks," "log of GDP per capita," "Voice and accountability," and "Regulatory quality" are multicollinear in this sample.

The following MPI results hold across the different samples in specification (1) in Table 7 and in specification (6) in Table 3. The coefficient of "Proportion of foreign banks" is negative and statistically significant. The coefficients of "log of GDP per capita," "GDP per capita growth," and

"Currency crises" are positive and statistically significant.[19] Potential mechanisms behind these empirical findings were discussed in Section 4.1. The AIC does not select variables measuring institutional quality to the explanatory variables in specification (1) to (4) in Table 7, in which MPI is the dependent variable.

The finding that the regression model of MPI fits financially open economies better than financially closed economies holds regardless of which variable on capital flow management measures is used to split the sample, i.e. Capital Restrictions in specifications (2) and (3) in Table 7, and Financial Openness in specifications (7) and (8) in Table 3. We can see in both sets of results that the negative association between the MPI and "Proportion of foreign banks" is conditional on the use of capital flow management measures.

Compared with Table 3, the results from specifications (1), (2), and (3) in Table 7 reveal a positive association between the MPI and the *current account balance*.[20] One potential explanation could be that large current account surpluses are related to fuel exports (with a pairwise correlation of 0.47, as shown in Table A3 in the Appendix), and fuel exports increase macroeconomic volatility (van der Ploeg and Poelhekke, 2009).

[19] The coefficient of GDP per capita growth remains positive and statistically significant at the 5% level when China, the fastest growing economy in our sample, is excluded.
[20] São Tomé and Príncipe (STP), whose current account is an outlier (see Table A4 in the Appendix), is not included in this sample (see Table A2 and Figure A53 in the Appendix).

Table 7. Determinants of Macroprudential Index (MPI) and Capital Restrictions (CR) in 2017

Dependent variables:	Macroprudential Index (MPI) in 2017				Capital Restrictions (CR) in 2017	
Country group:	All	All	All	All	All	All
Condition:		CR ≤ Median	CR > Median		Data on foreign banking	
Specification:	(1)	(2)	(3)	(4)	(5)	(6)
Foreign banking in 2005–2013:						
Proportion of foreign banks	-1.638**	-1.931**	-0.600	-1.302**	–	-0.367***
	(0.647)	(0.876)	(1.325)	(0.650)		(0.108)
Regional averages in 2017:						
Macroprudential Index (MPI)	–	–	–	0.513*	–	–
				(0.303)		
Macroeconomy in 1990–2017:						
Ln GDP per capita	0.627***	0.723**	0.662**	0.454*	-0.063	-0.095***
	(0.213)	(0.355)	(0.295)	(0.267)	(0.042)	(0.025)
Credit-to-GDP ratio	-0.957	-0.822	-1.229	-0.810	0.271**	
	(0.611)	(0.806)	(1.066)	(0.658)	(0.104)	
Current account	0.068**	0.073*	0.063	0.062*		
	(0.032)	(0.039)	(0.062)	(0.033)		
GDP per capita growth	0.501***	0.466**	0.568**	0.426**		
	(0.159)	(0.177)	(0.224)	(0.174)		
Institutions in 1996–2017:						
Voice and accountability						-0.084**
						(0.039)
Regulatory quality	–	–	–	–	-0.227***	
					(0.069)	
Economic crises in 1970–2017:						
Currency crises	0.044**	0.049	0.041	0.035		
	(0.022)	(0.034)	(0.031)	(0.022)		
Regulation in 2017:						
Macroprudential Index (MPI)	–	–	–	–	0.026*	
					(0.013)	
Constant	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.335	0.494	0.265	0.372	0.367	0.381
AIC rank	1				1	1
# Countries	89	45	44	89	89	89

In specifications (1)–(4), the dependent variable is the number of macroprudential instruments in 2017. In specifications (5)–(6), the dependent variable is the overall capital restrictions index (CR) by Fernandez et al. in 2017. Specifications (1) and (5)–(6) were selected by the Akaike information criterion (AIC). In specifications (2) and (3), the sample is divided by the median value of Capital Restrictions (CR) (0.3). Heteroscedasticity-robust standard errors are in parentheses. *, ** and *** denote statistical significance at the 10%, 5% and 1% levels, respectively. Multicollinearity was tested using the variance inflation factor (VIF), and in all regressions, VIFs are below 5. None of the quadratic terms is statistically significant at the 1% level.

Notably, we find a strong *policy diffusion effect* in the use of MPMs. Specification (4) in Table 7 reveals a strong positive association between the number of MPMs implemented by a country i and the average number of MPMs implemented by other countries within the same continent. Specifically, if other countries in the region implement one additional MPM, the number of MPMs

implemented by country *i* is expected to increase by 0.5. This result holds even after controlling for the most important country characteristics and it is not driven by outliers.[21] Thus, we find evidence of policy diffusion (i.e. that the use of MPMs spreads within the region). This regional pattern of policy diffusion has been highlighted, for instance, by Weyland (2005).

If foreign banking is not included in the regression, it seems that countries with a large number of MPMs tend to have more capital flow management measures (CFMs) as seen from specification (5) in Table 7. This is not a strong result, however. Overall, it seems that MPMs and CFMs are neither substitutes nor complements. The fact that regression model of the MPI fits financially open economies better than financially closed ones could mean that financially open economies need macroprudential policy as a stabilization tool to guard against volatility in the global economic environment. In closed economies, the need for such measures is smaller.

From specification (6) in Table 7, we also find that economies with predominantly foreign banks tend to have less capital flow management measures (CFMs), and the results are not driven by outliers.[22] Similar to how foreign banking limits the freedom of action of regulators regarding macroprudential policy measures, as discussed in section 4.1, regulatory arbitrage may make regulators hesitant to implement capital restrictions in economies with a significant presence of foreign banks. Alternatively, CFMs may act as an entry barrier to foreign banks.

Although the AIC picks "Voice and accountability" over "Regulatory quality" when "Proportion of foreign banks" is included to the regression model, it holds that countries with poor regulatory quality or a low level of GDP per capita tend to have extensive capital controls. This is a robust finding across different samples (specifications (5) and (6) in Table 7 and specifications (1), (3) to (5) in Table 5).

4.4 Explaining the heavy use of MPMs and CFMs in the major EMEs

In this section, we use the regression results from sections 4.1–4.3 to understand why the stylized fact identified in the introduction holds, i.e. that major emerging economies (EMEs) use both macroprudential policy measures and capital flow management measures more than advanced economies (AEs) and other emerging and developing economies (EMDEs). More specifically, we

[21] See Figure A56 in the Appendix.
[22] See Figure A61 in the Appendix.

calculate the contributions of explanatory variables to the differences in the dependent variables between the major EMEs and AEs as well as between the major EMEs and other EMDEs.

For macroprudential policy measures, our regression model from specification (1) in Table 7 successfully orders the country groups according to their MPI. As shown in Table 8, the major EMEs, AEs, and other EMDEs have estimated MPI values of 4.471, 4.433 and 3.425 respectively.

On the difference in the MPI between the major EMEs and AEs, the largest positive impacts come from "Credit-to-GDP ratio," "GDP per capita growth," and "Currency crises." However, "Credit-to-GDP ratio" is not statistically significant. According to specification (6) of Table 3, "Voice and accountability" is statistically significant with a negative coefficient, yet it has a substantial positive effect on the difference in the MPI between major EMEs and AEs. This is because the major EMEs have much lower "Voice and accountability" values than AEs.[23] We can thus conclude that *higher economic growth per capita and more frequent occurrence of currency crises* are the two main candidates for explaining why the major EMEs implement more macroprudential policy measures than AEs. In addition, it is possible that higher degree of authoritarianism in many of these countries has something to do with the extensive use of macroprudential policy measures in the major EMEs.

On the difference in the MPI between the major EMEs and other EMDEs, "log of GDP per capita" and "Current account" have the largest positive impact. However, according to specification (3) in Table 3, "Government effectiveness" is a more important determinant of the MPI for emerging economies than "log of GDP per capita."[24] Furthermore, the pairwise correlation between "Government effectiveness" and "log of GDP per capita" is as high as 0.87 (see Table A3 in the Appendix). As discussed in Section 4.3, it is possible that "Current account" suffers from omitted variable bias or endogeneity. Thus, we infer that *better institutional quality* measured by government effectiveness and possibly positive current account balances are central in explaining why the major EMEs have implemented far more macroprudential policy measures than other EMDEs.

[23] Mean of Voice and accountability is -0.160 for the major EMEs and 1.188 for AEs. According to specification (6) of Table 3, the impact of Voice and accountability is 0.690.
[24] Mean of Government effectiveness is 0.106 for the major EMEs and -0.395 for other EMDEs. According to specification (3) of Table 3, the impact of Government effectiveness is 0.606.

Table 8. Contribution of AIC-selected variables to the differences in the Macroprudential Index (MPI)

Dependent variable:		Macroprudential Index (MPI) in 2017				
Country group:		Major EMEs[a]	AEs	Diff. to Major EMEs	Other EMDEs	Diff. to Major EMEs
# Countries:		22	29		38	
Legend:	Coeff.[b]	Mean	Mean	Impact[c]	Mean	Impact[c]
Foreign banking in 2005–2013:						
Proportion of foreign banks	-1.638**	0.345	0.302	-0.070	0.450	0.172
Macroeconomy in 1990–2017:						
Ln GDP per capita	0.627***	8.686	10.407	-1.079	7.843	0.529
Credit-to-GDP ratio	-0.957	0.541	1.027	0.465	0.314	-0.217
Current account	0.068**	1.062	0.937	0.008	-3.784	0.330
GDP per capita growth	0.501***	2.553	1.910	0.322	2.210	0.172
Economic crises in 1970–2017:						
Currency crises	0.044**	11.053	2.155	0.392	9.651	0.062
Constant:	-1.730	1.000	1.000		1.000	
Estimated value:		4.471	4.433		3.425	
Actual value[d]:		5.273	4.276		3.079	

[a] Major emerging economies (EMEs) refer to the 22 countries that are included in the MSCI Emerging Markets Index, that are not defined as advanced economies by the IMF, and for which we have data on all explanatory variables. Argentina and the United Arab Emirates do not satisfy the last condition, so our number of major EMEs is 22, not 24.
[b] Coefficients from specification (1) of Table 7 which was selected by the Akaike information criterion (AIC). *, ** and *** denote statistical significance at the 10%, 5% and 1% levels, respectively.
[c] Impact refers to the contribution of a variable to the difference in the MPI between the major EMEs and the particular country group. For example, the impact of "Proportion of foreign banks" to the difference in the MPI between the major EMEs and AEs (-0.070) is calculated as follows: $-1.638 \times 0.345 - (-1.638) \times 0.302 = -0.070$.
[d] Only countries for which we have data on all variables are included (89 countries listed in Table A2 in the Appendix).

For capital flow management measures, our regression model of specification (6) in Table 7 performs well in estimating the levels of capital restrictions close to the actual values, as shown in Table 9. However, due to the small difference between the major EMEs and other EMDEs, it does not fully succeed in correctly ranking the country groups by capital restrictions: other EMDEs, the major EMEs, and AEs have estimated values of Capital Restrictions of 0.514, 0.456 and 0.195 respectively. In reality, the major EMEs had more capital restrictions in 2017 than other EMDEs, and the values of Capital Restrictions were 0.555 and 0.466 respectively. Log of GDP per capita and Voice and accountability have the largest positive impact on the difference in Capital restrictions between the major EMEs and AEs. However, according to specification (5) in Table 7,

Regulatory quality is the most important determinant of Capital Restrictions.[25] Furthermore, Regulatory quality is highly correlated with both log of GDP per capita (0.85) and Voice and accountability (0.83).[26] Thus, we can infer that *lower institutional quality* is the main candidate for explaining why the major EMEs have implemented much more capital restrictions than AEs.

Our regression models fail to predict that the major EMEs use CFMs slightly more than other EMDEs.[27] This is primarily because the three explanatory variables included in specification (6) of Table 7 are insufficient to fully account for the small difference between the two country groups. Nevertheless, it appears that the lower proportion of foreign banks in major EMEs is associated with their extensive use of CFMs.[28]

[25] Mean of Regulatory is 0.191 for the major EMEs and 1.389 for AEs. Based on specifications (3) in Table 3 the impact of Government effectiveness would be 0.606.
[26] See Table A3 in the Appendix.
[27] This failure holds for specifications (5) and (6) in Table 7 and specification (4) in Table 5. This difficulty is consistent with the observation made in Section 4.2 that regression models explains the cross-country variation of Financial Openness among AEs better than among EMDEs.
[28] When emerging and developing economies are divided into the BRICS-5 and other emerging economies (comprising 55 countries), the actual values of capital restrictions are 0.735 for the BRICS-5 and 0.477 for the other emerging economies. Using these groupings, the regression model from specification (6) in Table 7 effectively predicts that the BRICS-5 implement CFMs more extensively than other emerging economies.

Table 9. Contribution of AIC-selected variables to the differences in Capital Restrictions (CR)

Dependent variable:		Capital Restrictions (CR) in 2017				
Country group:		Major EMEs[a]	AEs	Diff. to Major EMEs	Other EMDEs	Diff. to Major EMEs
# Countries:		22	29		38	
Legend:	Coeff.[b]	Mean	Mean	Impact[c]	Mean	Impact[c]
Foreign banking in 2005–2013:						
Proportion of foreign banks	-0.367***	0.345	0.302	-0.016	0.450	0.039
Macroeconomy in 1990–2017:						
Ln GDP per capita	-0.095***	8.686	10.407	0.163	7.843	-0.080
Institutions in 1996–2017:						
Voice and accountability	-0.084**	-0.160	1.188	0.113	-0.364	-0.017
Constant:	1.394	1.000	1.000		1.000	
Estimated value:		0.456	0.195		0.514	
Actual value[d]:		0.555	0.182		0.466	

[a] Major emerging economies (EMEs) refer to the 22 countries that are included in the MSCI Emerging Markets Index, that are not defined as advanced economies by the IMF, and for which we have data on all explanatory variables. Argentina and the United Arab Emirates do not satisfy the last condition and therefore the number of major EMEs is 22 instead of 24.
[b] Coefficients from specification (6) of Table 7. *, ** and *** denote statistical significance at the 10%, 5% and 1% levels, respectively.
[c] Impact refers to the contribution of a variable to the difference in the MPI between the major EMEs and the particular country group. For example, the impact of "Proportion of foreign banks" to the difference in the MPI between the major EMEs and AEs (-0.016) is calculated as follows: $-0.367 \times 0.345 - (-0.367) \times 0.302 = -0.016$.
[d] Only countries for which we have data on all variables are included (89 countries listed in Table A2 in the Appendix).

5 Conclusions

The starting point of this paper was the observation that countries in our group of 24 *major emerging economies* tend to use more macroprudential policy measures (MPMs) and capital flow management measures (CFMs) than *advanced economies* and *other emerging and developing economies*. The determinants of these differences have been largely ignored by empirical literature. Research on macroprudential policy has concentrated on the effects of macroprudential regulation, and we are unaware of any study that has examined the determinants of the use of MPMs. The same largely holds true for CFMs, with only a couple attempts at assessing the determinants of the use of CFMs. Our paper fills this gap in the literature.

In this study, we systematically assessed the drivers of heavier MPM and CFM use in major emerging economies compared to advanced economies and other emerging and developing economies. Our side-by-side approach of looking at the determinants of both MPMs and CFMs allowed

for several insightful comparisons. We identified potential determinants from theoretical contributions on the optimal use of MPMs and CFMs and considered five categories: 1) macroeconomic performance; 2) institutional quality; 3) previous economic crises; 4) presence of foreign banks; and 5) exchange rate regime. We then used Bayesian Model Averaging and the Akaike information criterion (AIC) to evaluate which determinants are most relevant for explaining the cross-country variation in the number of MPMs and CFMs implemented. Finally, we examined the sign of the association using regression analysis.

The most significant country characteristics explaining cross country variation in the number of implemented MPMs are GDP per capita growth, GDP per capita level and proportion of foreign banks. For GDP per capita growth and level, the association is positive, whereas for proportion of foreign banks it is negative. In addition, continental average of the number of MPMs is a highly significant determinant of its value. Based on our results, major emerging economies use more MPMs than advanced economies, due in part to higher economic growth and more frequent occurrence of currency crises. Our empirical analysis did not detect motives behind decisions of regulatory authorities, but the results are intuitive. As economic crises indicate vulnerability and high growth implies a risk of overheating, these two circumstances increase the need for macroprudential regulation. The main explanation for the difference between major emerging economies and other emerging and developing economies in the use of MPMs is higher government effectiveness in major emerging economies. Good institutional quality is likely a prerequisite for implementing macroprudential regulation.

For the use of CFMs, we find that the most significant country characteristics explaining cross-country variation in the number of CFMs are regulatory quality and the proportion of foreign banks. These both have a negative association with CFMs. Based on our results, lower institutional quality is the main candidate for explaining why the major emerging economies have been far more active in implementing CFMs than advanced economies. However, we cannot establish a statistically significant explanation for why the major emerging economies use CFMs slightly more than other emerging market and developing economies.

The presence of foreign banks appears to be a determining factor for both the use of MPMs and CFMs, as the share of foreign banks has a negative association with both the use of MPMs and CFMs. Countries with a high proportion of foreign banks could be reluctant to use MPMs and CFMs due to fear of circumvention of regulation or reallocation of operations. On the relationship between

MPMs and CFMs, we are able to establish that the extent of CFMs decreases the sensitivity of the number of MPMs to the country characteristics. One possible interpretation is that financially open economies need to adjust macroprudential policy according to economic environment, whereas in closed economies the need for such is smaller.

These results not only shed light on the potential motivations and drivers of the different policy mixes chosen by the countries included in this study, they highlight the importance of considering the motivations of policymakers in implementing macroprudential and capital flow regulation. Their decisions, in turn, are driven by a need to safeguard their financial systems and economies from instability, as well as their capacity to implement policy measures. Policymakers must also account for potential and possibilities for regulatory arbitrage that might undermine the effectiveness of the implemented regulation or other lead to perverse outcomes. These findings inform policy analysis and suggest a need for further theoretical work on macro-financial stability frameworks.

References

Adrian, T., Erceg, C., Lindé, J., Zabczyk, P., & Zhou, J. (2020). A Quantitative Model for the Integrated Policy Framework. IMF Working Paper No. 22/15.

Adrian, M. T., Gaspar, V., & Vitek, M. F. (2022). A medium-scale DSGE model for the integrated policy framework. IMF Working Paper No. 20/122.

Aiyar, S., Calomiris, C. W., & Wieladek, T. (2014). Does macro-prudential regulation leak? Evidence from a UK policy experiment. *Journal of Money, Credit and Banking*, 46, S1, 181-214.

Akinci, O., & Olmstead-Rumsey, J. (2018). How effective are macroprudential policies? An empirical investigation. *Journal of Financial Intermediation*, *33*, 33-57.

Ampudia, M., Lo Duca, M., Farkas, M. G., Pérez-Quirós, G., Pirovano, M., Rünstler, G., & Tereanu, E. (2021). *On the effectiveness of macroprudential policy* (No. 2559). ECB Working Paper.

Bank for International Settlements, Asian Consultative Council (2020). Capital flows, exchange rates and policy frameworks in emerging Asia. Available at https://www.bis.org/publ/othp34.pdf.

Bank for International Settlements, Consultative Council for the Americas and the central banks of South Africa and Turkey (2021). Capital flows, exchange rates and monetary policy frameworks in Latin American and other economies. Available at https://www.bis.org/publ/othp37.pdf.

Basu, S., Boz, E., Gopinath, G., Roch, F., & Unsal, F. (2020). A Conceptual Model for the Integrated Policy Framework. IMF Working Paper, WP20/121.

Beirne, J., & Friedrich, C. (2017). Macroprudential policies, capital flows, and the structure of the banking sector. *Journal of International Money and Finance*, 75, 47-68

Belkhir, M., Naceur, S. B., Candelon, B., & Wijnandts, J-C. (2022). Macroprudential policies, economic growth and banking crises. *Emerging Markets Review*, 53, 100936.

Benigno, G., Chen, H., Otrok, C., Rebucci, A., & Young, E. R. (2016). Optimal capital controls and real exchange rate policies: A pecuniary externality perspective. *Journal of Monetary Economics*, 84, 147-165.

Brana, S., Chenaf-Nicet, D., & Lahet, D. (2024). Drivers of cross-border bank claims: The role of foreign-owned banks in emerging countries. *The World Economy*, 47(1), 96-121.

Bruno, V., & Hauswald, R. (2014). The real effect of foreign banks. *Review of Finance*, 18(5), 1683-1716.

Cerra, V., & Saxena, S. C. (2008). Growth dynamics: The myth of economic recovery. *American Economic Review*, *98*(1), 439-457.

Cerutti, E., Claessens, S., & Laeven, L. (2017a). The use and effectiveness of macroprudential policies: New evidence. *Journal of Financial Stability*, 28, 203-224.

Cerutti, M. E. M., & Zhou, H. (2018). Cross-border Banking and the Circumvention of Macroprudential and Capital Control Measures. IMF Working Paper, WP/18/217.

Chinn, M. D., & Ito, H. (2008). A New Measure of Financial Openness. *Journal of Comparative Policy Analysis*, 10(3), 309-322 (September).

Chinn, M. D., & Ito, H. (2006). What Matters for Financial Development? Capital Controls, Institutions, and Interactions. *Journal of Development Economics*, 81(1), 163-192 (October).

Claessens, M. S., & Kose, M. A. (2013). Financial crises explanations, types, and implications. IMF Working Paper.

Costinot, A., Lorenzoni, G., & Werning, I. (2014). A theory of capital controls as dynamic terms-of-trade manipulation. *Journal of Political Economy*, 122(1), 77-128.

Danisewicz, P, Reinhardt, D., & Sowerbutts, R. (2017). On a tight leash: Does bank organizational structure matter for macroprudential spillovers? *Journal of International Economics*, 109, 174-194.

Das, M., & Ordal, H. (2022). Macroeconomic stability or financial stability: How are capital controls used? Insights from a new database. *Journal of Financial Stability*, 63, 101067.

Erten, B., Korinek, A., & Ocampo, J. A. (2021). Capital controls: Theory and evidence. *Journal of Economic Literature*, 59(1), 45-89.

Fabiani, A., Piñeros, M. L., Peydró, J. L., & Soto, P. E. (2022). Capital controls, domestic macroprudential policy and the bank lending channel of monetary policy. *Journal of International Economics*, 139, 103677.

Farhi, E., & Werning, I. (2016). A theory of macroprudential policies in the presence of nominal rigidities. *Econometrica*, 84(5), 1645-1704.

Farhi, E., & Werning, I. (2014). Dilemma not trilemma? Capital controls and exchange rates with volatile capital flows. *IMF Economic Review*, 62(4), 569-605.

Farhi, E., & Werning, I. (2012). Dealing with the trilemma: Optimal capital controls with fixed exchange rates (No. w18199). National Bureau of Economic Research.

Fernández, A., Klein, M. W., Rebucci, A., Schindler, M., & Uribe, M. (2016). Capital control measures: A new dataset. *IMF Economic Review*, 64(3), 548-574.

Fernández, C., Ley, E., & Steel, M. F. J. (2001). Model uncertainty in cross-country growth regressions. *Journal of Applied Econometrics*, 16(5), 563-576.

Fratzscher, M. (2012). Capital controls and foreign exchange policy. ECB Working Paper Series no 1415/2012.

Galati, G., & Moessner, R. (2018). What do we know about the effects of macroprudential policy? *Economica*, 85(340), 735-770.

Houston, J. F., Lin, C., & Ma, Y. (2012). Regulatory arbitrage and international bank flows. *Journal of Finance*, 67(5), 1845-1895.

Hu, S., & Gong, D. (2019). Economic policy uncertainty, prudential regulation and bank lending. *Finance Research Letters*, 29, 373-378.

IMF (2011a). Recent experiences in managing capital inflows – Cross-cutting themes and possible policy framework. IMF Policy Paper. https://www.imf.org/external/np/pp/eng/2011/021411a.pdf

IMF (2011b). The multilateral aspects of policies affecting capital flows. IMF Policy Paper. https://www.imf.org/en/Publications/Policy-Papers/Issues/2016/12/31/The-Multilateral-Aspects-of-Policies-Affecting-Capital-Flows-PP4613.

IMF (2012). The Liberalization and management of capital Flows: An Institutional View. IMF Policy Paper. https://www.imf.org/external/np/pp/eng/2012/111412.pdf

IMF (2018). The IMF's Annual Macroprudential Policy Survey—Objectives, Design and Policy Responses. IMF Policy Paper and Note to G20. https://www.imf.org/en/Publications/Policy-Papers/Issues/2018/04/30/pp043018-imf-annual-macroprudential-policy-survey

IMF (2020a). Global Financial Stability Report, October 2020, Chapter 2: Emerging and Frontier Markets: A Greater Set of Policy Options to Restore Stability. Available at https://www.imf.org/en/Publications/GFSR/Issues/2020/10/13/global-financial-stability-report-october-2020#Chapter2

IMF (2020b). Toward an Integrated Policy Framework. IMF Policy Paper No. 2020/046.

Jeanne, O., & Korinek, A. (2014). Macroprudential policy beyond banking regulation, BanqueDe France Financial Stability Review, 18, 163-172.

Jeanne, O., & Korinek, A. (2019). Managing credit booms and busts: A Pigouvian taxation approach. *Journal of Monetary Economics*, 107, 2-17.

Johnston, R. B., & Tamirisa, N. T. (1998). Why Do Countries Use Capital Controls? IMF Working Paper.

Kaufmann D., & Kraay, A. (2023). World Governance Indicators, 2023 Update. https://www.worldbank.org/en/publication/worldwide-governance-indicators

Korinek, A. (2018). Regulating capital flows to emerging markets: An externality view. *Journal of International Economics*, 111, 61-80.

Korinek, A., & Sandri, D. (2016). Capital controls or macroprudential regulation? *Journal of International Economics*, 99, S27-S42.

Korinek, A., & Simsek, A. (2016). Liquidity trap and excessive leverage. *American Economic Review*, 106(3), 699-738.

Laeven, L., & Valencia, F. (2013). Systemic banking crises database. *IMF Economic Review*, 61(2), 225-270.

Miranda-Agrippino, S., & Rey, H. (2020). US monetary policy and the global financial cycle. *Review of Economic Studies*, 87(6), 2754-2776.

Nguyen, T. C., Castro, V., & Wood, J. (2022). A new comprehensive database of financial crises: Identification, frequency, and duration. *Economic Modelling*, 108, 105770.

Nispi Landi, V., & Schiavone, A. (2021). The effectiveness of capital controls. *Open Economies Review*, *32*(1), 183-211.

Norring, A. (2019). Macroprudential policy spillovers and international banking – Taking the gravity approach. ESRB Working Paper No. 101. Available at https://www.esrb.europa.eu/pub/pdf/wp/esrb.wp101~97411ff552.en.pdf.

Norring, A. (2022). Taming the tides of capital – Review of capital controls and macroprudential policy in emerging economies. *Bank of Finland Economics Review*, 1/2022.

Ostry, J. D., Ghosh, A. R., Chamon, M., & Qureshi, M. S. (2011b). Capital controls: When and why? *IMF Economic Review*, 59(3), 562-580.

Pandey, R., Pasricha, G. K., Patnaik, I., & Shah, A. (2021). Motivations for capital controls and their effectiveness. *International Journal of Finance & Economics*, 26(1), 391-415.

Panizza, U. (2023). Bank ownership around the world. The Graduate Institute of International Studies Working Paper Series, Working Paper No. HEIDWP07-2023. Available at https://repec.graduateinstitute.ch/pdfs/Working_papers/HEIDWP07-2023.pdf

Panizza, U. (2024). Bank ownership around the world. *Journal of Banking and Finance*, 166, 107255.

Reinhardt, C. M., & Rogoff, K. S. (2009). *This Time Is Different: Eight Centuries of Financial Folly*. Princeton University Press. https://doi.org/10.2307/j.ctvcm4gqx

Rey, H. (2016). International channels of transmission of monetary policy and the Mundellian trilemma. *IMF Economic Review*, 64(1), 6-35.

Rey, H. (2015). Dilemma not trilemma: the global financial cycle and monetary policy independence (No. w21162). National Bureau of Economic Research.

Schmitt-Grohé, S., & Uribe, M. (2016). Downward nominal wage rigidity, currency pegs, and involuntary unemployment. *Journal of Political Economy*, 124(5), 1466-1514.

Sufi, A., & Taylor, A. M. (2022). Financial crises: A survey. *Handbook of International Economics*, 6, 291-340.

Van der Ploeg, F., & Poelhekke, S. (2009). Volatility and the natural resource curse. *Oxford Economic Papers*, 61, 727-760.

Weyland, K. G. (2005). Theories of policy diffusion: Lessons from Latin American pension reform. *World Politics*, 57(2), 262-295.

Appendix A

Table A1. Data sources and variable descriptions

Variable	Description	Source[a]
Macroprudential Index	"Macroprudential Index (0-12)". Macroprudential Index (MPI) = Borrower-Targeted Instruments (Borrower) + Financial Institution-Targeted Instruments (Financial). Borrower = Loan-to-Value Ratio Caps + Debt-to-Income Ratio. Financial = Time-Varying/Dynamic Loan-Loss Provisioning + General Countercyclical Capital Buffer/Requirement + Leverage Ratio + Capital Surcharges on SIFIs + Limits on Interbank Exposures + Concentration Limits + Limits on Foreign Currency Loans + FX and/or Countercyclical Reserve Requirements + Limits on Domestic Currency Loans + Levy/Tax on Financial Institutions.	CCL
Financial openness	"kaopen", The Chinn-Ito index is an index measuring a country's degree of capital account openness. It is scaled from -1.927 to 2.311.	CI
Capital restrictions	"ka", overall restrictions index. ka = average of kai (overall inflow restrictions index) and kao (overall outflow restrictions index). kai = average of equity inflow restrictions; bond inflow restrictions; money market inflow restrictions; collective investments inflow restrictions; derivatives inflow restrictions; commercial credits inflow restrictions; financial credits inflow restrictions; guarantees, sureties and financial backup facilities inflow restrictions; direct investment inflow restrictions; real estate inflow restrictions. kao is defined similarly on outflow restrictions.	FKRSU
Ln GDP	Natural logarithm of "GDP (constant 2015 US$)"	WDI
Ln GDP per capita	Natural logarithm of "GDP per capita (constant 2015 US$)"	WDI
Credit-to-GDP ratio	"Private credit by deposit money banks and other financial institutions to GDP (%)" multiplied by 0.01	GFDD
Current account	"Current account balance (% of GDP)"	WDI
GDP per capita growth	"GDP per capita growth (annual %)"	WDI

[a] CCL: Cerutti, Claessens and Laeven, August 18, 2018. (https://www.google.com/url?q=https%3A%2F%2Fwww.imf.org%2F~%2Fmedia%2FWebsites%2FIMF%2Fimported-datasets%2Fexternal%2Fpubs%2Fft%2Fwp%2F2015%2FData%2F_wp1561.ashx&sa=D&sntz=1&usg=AOvVaw2MlrhBb7xjNsCwfD98ukLt);
CI: Chinn and Ito, October, 2022 (http://web.pdx.edu/~ito/Chinn-Ito_website.htm; https://web.pdx.edu/~ito/Readme_kaopen2020.pdf);
FKRSU: Fernández, Klein, Rebucci, Schindler and Uribe, Jul 30, 2021 (https://www.columbia.edu/~mu2166/fkrsu/2021-FKRSU-Update-12-08-2021.xlsx);
WDI: World Development Indicators (Last updated 03/30/2023) (https://databank.worldbank.org/source/world-development-indicators);
GFDD: Global Financial Development Database (September 2022 Version) (https://thedocs.worldbank.org/en/doc/5882f2b2117b882d58a78f9c64ea3613-0050062022/original/20220909-global-financial-development-database.xlsx)

Table A1. Data sources and variable descriptions (continued)

Variable	Description	Source[a]
Inflation	"Inflation, consumer prices (annual %)"	WDI
Fuel exports	"Fuel exports (% of merchandise exports)"	WDI
Voice and accountability	"Voice and Accountability, Estimate"	WGI
Government effectiveness	"Government Effectiveness, Estimate"	WGI
Regulatory quality	"Regulatory Quality, Estimate"	WGI
Banking crises	Share of "Banking Crises" years if data on "Currency Crises" exists	Nguyen et al. (2022)
Currency crises	Share of "Currency Crises" years	Nguyen et al. (2022)
Proportion of foreign banks	"Foreign banks among total banks (%)" multiplied by 0.01. "Percentage of the number of foreign owned banks to the number of the total banks in an economy. A foreign bank is a bank where 50 percent or more of its shares are owned by foreigners." Data originally from Claessens and Van Horen (2014, 2015).[b]	GFDD
Asset share of foreign banks	"Foreign bank assets among total banks assets (%)" multiplied by 0.01. "Percentage of the total banking assets that are held by foreign banks. A foreign bank is a bank where 50 percent or more of its shares are owned by foreigners." Data originally from Claessens and Van Horen (2014, 2015).[b]	GFDD
Exchange rate stability	"Exchange Rate Stability Index"	ACI
Coarse classification	Annual averages of monthly data on "Exchange Rate Arrangement, Coarse classification" 1 = De facto peg 2 = De facto crawling peg 3 = Managed floating 4 = Freely floating 5 = Freely falling 6 = Dual market in which parallel market data is missing	IRR

[a] WDI: World Development Indicators (last updated March 30, 2023). (https://databank.worldbank.org/source/world-development-indicators);
WGI: World Governance Indicators (last updated September 23, 2022). (https://databank.worldbank.org/source/worldwide-governance-indicators).
Nguyen et al. (2022): Updated version of the Systematic Banking Crises Database by Laeven and Valencia (https://ars.els-cdn.com/content/image/1-s2.0-S0264999322000165-mmc1.xlsx);
GFDD: Global Financial Development Database (September 2022 Version) (https://the-docs.worldbank.org/en/doc/5882f2b2117b882d58a78f9c64ea3613-0050062022/original/20220909-global-financial-development-database.xlsx);
ACI: Trilemma Indexes by Aizenmann, Chinn and Ito (updated on 8/31/2021) https://web.pdx.edu/~ito/trilemma_indexes.htm
IRR: Exchange rate regime classification by Ilzetzki, Reinhart and Rogoff (last updated August 27, 2021) (https://www.ilzetzki.com/_files/ugd/b3763a_242513d0fba24aa1a64be41c8f73d887.xlsx?dn=ERA_Classification_Monthly_1940-2019.xlsx)

[b] Claessens, S., Van Horen, N. 2014. Foreign banks: Trends and impact. *Journal of Money, Credit and Banking* 46 (1): 295–326. https://doi.org/10.1111/jmcb.12092; Claessens, S., Van Horen, N. 2015. The impact of the global financial crisis on banking globalization. *IMF Economic Review* 63 (4): 868–918. https://doi.org/10.1057/imfer.2015.38

Table A2. Listing of countries in different samples

Country	Abbr.	142 countries in Tables 2–5	119 countries in Tables 2–3	89 countries in Tables 4–5	89 countries in Tables 6–7
Albania	ALB	X	X		
Algeria	DZA	X	X	X	X
Angola	AGO	X	X		X
Armenia	ARM	X	X		
Australia	AUS	X	X	X	X
Austria	AUT	X	X	X	X
Azerbaijan	AZE	X	X		
Bahamas	BHS	X			
Bahrain	BHR	X	X	X	X
Bangladesh	BGD	X	X	X	X
Belarus	BLR	X	X		
Belgium	BEL	X	X	X	X
Belize	BLZ	X			
Benin	BEN	X	X		
Bhutan	BTN	X			
Bolivia	BOL	X	X	X	X
Bosnia and H.	BIH	X	X		
Botswana	BWA	X	X		
Brazil	BRA	X	X	X	X
Brunei D.	BRN			X	
Bulgaria	BGR	X	X	X	X
Burkina Faso	BFA	X	X	X	X
Burundi	BDI	X	X		
Cambodia	KHM	X	X		
Canada	CAN	X	X	X	X
Cape Verde	CPV	X			
Chile	CHL	X	X	X	X
China	CHN	X	X	X	X
Colombia	COL	X	X	X	X
Costa Rica	CRI	X	X	X	X
Cote d'Ivoire	CIV	X	X	X	X
Croatia	HRV	X	X		
Czech Rep.	CZE	X	X	X	X
Denmark	DNK	X	X	X	X
Djibouti	DJI	X			
Dominican Rep.	DOM	X	X	X	X
Ecuador	ECU	X	X	X	X
Egypt	EGY	X	X	X	X
El Salvador	SLV	X	X	X	X
Estonia	EST	X	X		
Ethiopia	ETH	X	X	X	X
Fiji	FJI	X			
Finland	FIN	X	X	X	X
France	FRA	X	X	X	X
Gambia	GMB	X			
Georgia	GEO	X	X	X	X
Germany	DEU	X	X	X	X
Ghana	GHA	X	X	X	X

Table A2. Listing of countries in different samples (continued)

Country	Abbr.	142 countries in Tables 2–5	119 countries in Tables 2–3	89 countries in Tables 4–5	89 countries in Tables 6–7
Greece	GRC	X	X	X	X
Guatemala	GTM	X	X	X	X
Guinea-Bissau	GNB	X			
Guyana	GUY	X			
Haiti	HTI	X	X		
Honduras	HND	X	X		
Hong Kong	HKG	X	X	X	X
Hungary	HUN	X	X	X	X
Iceland	ISL	X	X	X	X
India	IND	X	X	X	X
Indonesia	IDN	X	X	X	X
Iran	IRN	X	X	X	X
Ireland	IRL	X	X	X	X
Israel	ISR	X	X	X	X
Italy	ITA	X	X	X	X
Jamaica	JAM	X	X	X	X
Japan	JPN	X	X	X	X
Jordan	JOR	X	X		
Kazakhstan	KAZ	X	X	X	X
Kenya	KEN	X	X	X	X
Korea Rep.	KOR	X	X	X	X
Kuwait	KWT	X	X	X	X
Kyrgyz Rep.	KGZ	X	X	X	X
Lao PDR	LAO	X			
Latvia	LVA	X	X	X	X
Lebanon	LBN	X	X	X	X
Lesotho	LSO	X			
Lithuania	LTU	X	X		
Macedonia	MKG	X	X		
Madagascar	MDG	X	X		
Malawi	MWI	X	X		
Malaysia	MYS	X	X	X	X
Maldives	MDV	X			
Mali	MLI	X	X		
Malta	MLT	X		X	
Mauritania	MRT	X	X		
Mauritius	MUS	X	X	X	X
Mexico	MEX	X	X	X	X
Moldova	MDA	X	X	X	X
Mongolia	MNG	X	X		
Morocco	MAR	X	X	X	X
Mozambique	MOZ	X	X		
Myanmar	MMR	X		X	
Namibia	NAM	X	X		
Nepal	NPL	X	X		
Netherlands	NLD	X	X	X	X
New Zealand	NZL	X	X	X	X
Nicaragua	NIC	X	X	X	X

Table A2. Listing of countries in different samples (continued)

Country	Abbr.	142 countries in Tables 2–5	119 countries in Tables 2–3	89 countries in Tables 4–5	89 countries in Tables 6–7
Niger	NER	X	X		
Nigeria	NGA	X	X	X	X
Norway	NOR	X	X	X	X
Oman	OMN	X	X	X	X
Pakistan	PAK	X	X	X	X
Panama	PAN	X	X	X	X
Papua New G.	PNG	X			
Paraguay	PRY	X	X	X	X
Peru	PER	X	X	X	X
Philippines	PHL	X	X	X	X
Poland	POL	X	X	X	X
Portugal	PRT	X	X	X	X
Qatar	QAT	X	X	X	X
Romania	ROU	X		X	
Russia	RUS	X	X	X	X
Rwanda	RWA	X	X		
Samoa	WSM	X			
Sao Tome and P.	STP	X			
Saudi Arabia	SAU	X	X	X	X
Senegal	SEN	X	X		
Sierra Leone	SLE	X			
Singapore	SGP	X	X	X	X
Slovak Rep.	SVK	X	X		
Slovenia	SVN	X	X	X	X
Solomon Islands	SLB	X			
South Africa	ZAF	X	X	X	X
Spain	ESP	X	X	X	X
Sri Lanka	LKA	X	X	X	X
St. Kitts and N.	KNA	X			
Sudan	SDN	X	X		
Sweden	SWE	X	X	X	X
Switzerland	CHE	X	X	X	X
Tajikistan	TJK	X			
Tanzania	TZA	X	X	X	X
Thailand	THA	X	X	X	X
Togo	TGO	X	X	X	X
Tonga	TON	X			
Trinidad and T.	TTO	X	X		
Tunisia	TUN	X	X	X	X
Turkey	TUR	X	X	X	X
Uganda	UGA	X	X	X	X
Ukraine	UKR	X	X		X
UK	GBR	X	X	X	X
US	USA	X	X		X
Uruguay	URY	X	X	X	X
Vietnam	VNM	X	X	X	X
Zambia	ZMB	X	X		X

Table A3. Correlation matrix, 89 countries

		Y_1	Y_2	Y_3	X_1	X_2	X_3	X_4	X_5	X_6	X_7	X_8	X_9	X_{10}	X_{11}	X_{12}	X_{13}	X_{14}
Macroprudential index	Y_1	1.00																
Financial openness	Y_2	0.13	1.00															
Capital restrictions	Y_3	0.01	-0.80	1.00														
Ln GDP	X_1	0.35	0.20	-0.10	1.00													
Ln GDP per capita	X_2	0.31	0.69	-0.49	0.53	1.00												
Credit-to-GDP ratio	X_3	0.16	0.43	-0.28	0.59	0.73	1.00											
Current account	X_4	0.33	0.15	-0.10	0.44	0.49	0.33	1.00										
GDP per capita growth	X_5	0.25	-0.17	0.18	0.00	-0.19	0.03	-0.12	1.00									
Inflation	X_6	-0.04	-0.28	0.14	-0.04	-0.17	-0.25	-0.07	-0.14	1.00								
Fuel exports	X_7	0.11	-0.17	0.10	0.03	0.07	-0.22	0.47	-0.29	0.16	1.00							
Voice and accountability	X_8	0.06	0.61	-0.51	0.33	0.66	0.56	0.01	-0.13	-0.17	-0.47	1.00						
Government effectiveness	X_9	0.24	0.65	-0.44	0.50	0.87	0.81	0.37	-0.04	-0.29	-0.25	0.80	1.00					
Regulatory quality	X_{10}	0.20	0.74	-0.55	0.42	0.85	0.76	0.27	-0.07	-0.24	-0.32	0.83	0.96	1.00				
Banking crises	X_{11}	0.03	0.00	0.01	-0.02	0.00	-0.12	-0.15	-0.13	0.19	-0.16	0.21	-0.03	0.02	1.00			
Currency crises	X_{12}	0.02	-0.30	0.16	-0.19	-0.36	-0.44	-0.29	0.00	0.55	0.00	-0.20	-0.43	-0.38	0.23	1.00		
Proportion of foreign banks	X_{13}	-0.30	0.07	-0.20	-0.42	-0.25	-0.24	-0.36	0.04	0.12	-0.21	0.02	-0.15	0.00	0.08	0.22	1.00	
Asset share of foreign banks	X_{14}	-0.27	0.09	-0.17	-0.47	-0.25	-0.30	-0.36	-0.08	0.10	-0.24	0.05	-0.15	-0.01	0.11	0.21	0.82	1.00

Pairwise correlations above 0.8 or below -0.8 bolded.

Table A4. Tukey's fences for the variables listed in Table 1 (typically 142 countries)

Variable	Q1	Q3	IQ[a]	Upper[b]	Lower[c]	#Outliers	Outliers
Macroprudential index$_{2017}$	2.000	5.000	3.000	14.000	-7.000	0	
Financial openness$_{2017}$	-1.234	2.311	3.545	12.946	-11.869	0	
Capital restrictions$_{2017}$	0.088	0.700	0.612	2.536	-1.748	0	
Ln GDP$_{1990–2017}$	22.826	26.003	3.177	35.534	13.295	0	
Ln GDP per capita$_{1990–2017}$	7.371	9.557	2.186	16.115	0.813	0	
Credit-to-GDP ratio$_{1990–2017}$	0.215	0.691	0.476	2.119	-1.213	0	
Current account$_{1990–2017}$	-6.188	0.247	6.435	19.552	-25.493	1	STP (-33.780)
GDP per capita growth$_{1990–2017}$	1.111	3.334	2.223	10.003	-5.558	1	BIH (10.255)
Inflation$_{1990–2017}$	3.012	13.002	9.990	42.972	-26.958	15[d]	
Fuel exports$_{1990–2017}$	1.003	13.077	12.074	49.299	-35.219	15[e]	
Voice and accountability$_{1996–2017}$	-0.629	0.863	1.492	5.339	-5.105	0	
Government effectiveness$_{1996–2017}$	-0.645	0.711	1.356	4.779	-4.713	0	
Regulatory quality$_{1996–2017}$	-0.514	0.780	1.294	4.258	-4.396	0	
Banking crises$_{1970–2017}$	0.000	10.417	10.417	41.668	-10.417	0	
Currency crises$_{1970–2017}$	0.000	12.500	12.500	50.000	-12.500	0	
Proportion of f banks$_{2005–2013}$	0.179	0.641	0.462	2.027	-1.207	0	
Asset share of f banks$_{2005–2013}$	0.077	0.633	0.556	2.301	-1.591	0	
Exchange rate stability$_{2017}$	0.393	1.000	0.607	2.821	-1.428	0	
Coarse classification$_{2017}$	1.000	2.000	1.000	5.000	-2.000	0	

See Table A2 in the Appendix for a list of countries.
[a] IQ=Q3−Q1, where Q3 is the upper quartile and Q1 the lower quartile.
[b] Upper limit is Q3+3*IQ
[c] Lower limit is Q1−3*IQ
[d] AGO (408.332), BRA (305.437), PER (290.343), UKR (254.835), BLR (206.566), ARM (152.397), MDA (131.209), AZE (127.902), HRV (104.192), KAZ (94.999), RUS (70.251), BGR (70.136), LTU (62.534), ROU (49.913), LVA (47.022)
[e] DZA (97.190), AGO (96.268), NGA (93.603), KWT (93.355), SAU (88.174), QAT (87.135), AZE (85.492), OMN (80.979), IRN (76.447), SDN (62.687), BHR (59.622), KAZ (59.284), TTO (59.199), NOR (58.613), RUS (56.940)

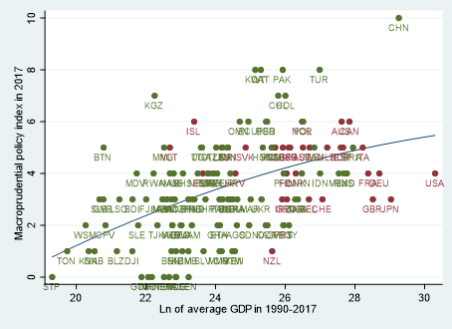

Figure A1. MPI and Ln GDP, All countries (142)

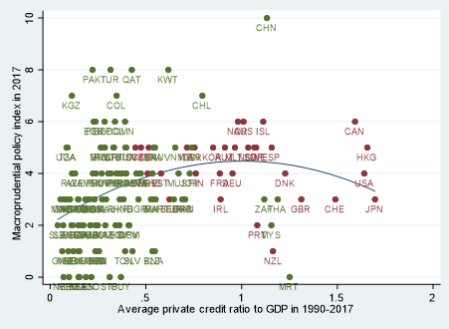

Figure A3. MPI and private credit ratio, All countries (142)

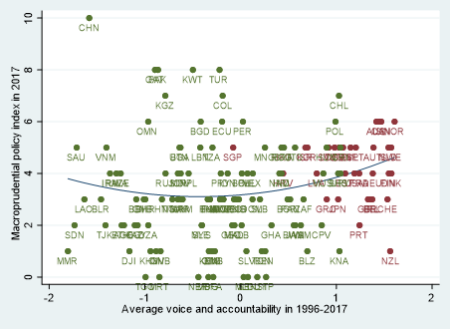

Figure A5. MPI and voice and accountability, All countries (142)

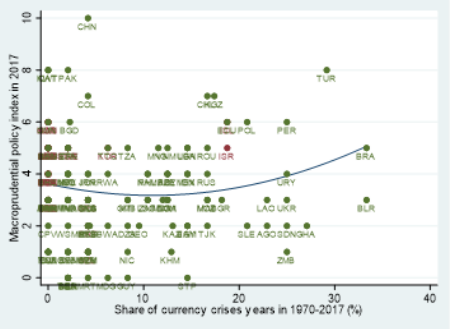

Figure A7. MPI and currency crises, All countries (142)

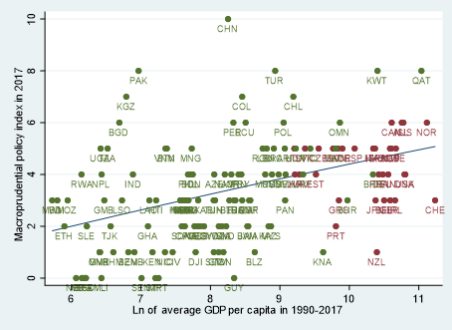

Figure A2. MPI and Ln GDP per capita, All countries (142)

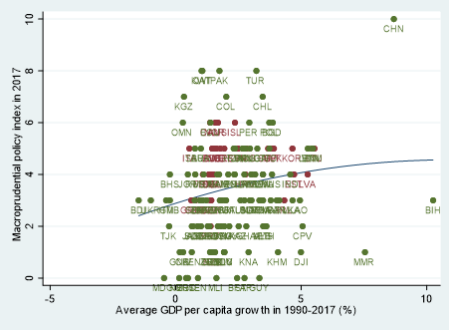

Figure A4. MPI and GDP per capita growth, All countries (142)

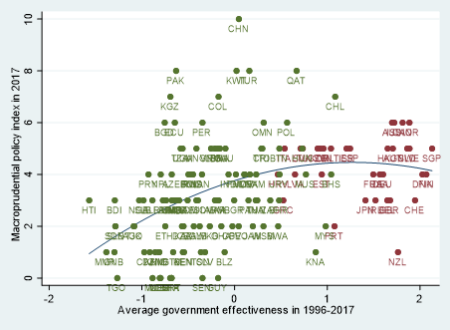

Figure A6. MPI and government effectiveness, All countries (142)

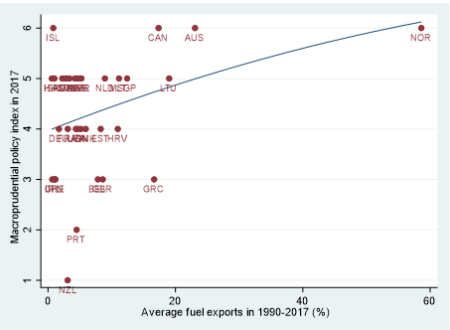

Figure A8. MPI and fuel exports, Advanced economies (34)

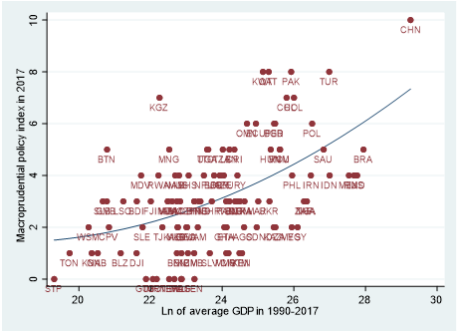

Figure A9. MPI and Ln GDP,
Emerging and developing economies
(108)

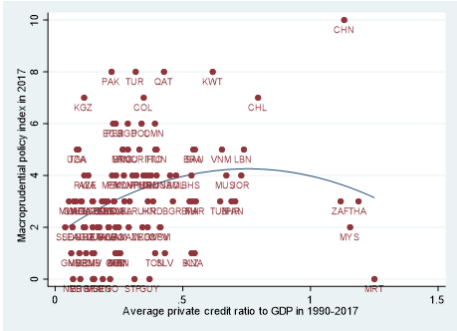

Figure A11. MPI and private credit ratio,
Emerging and developing economies
(108)

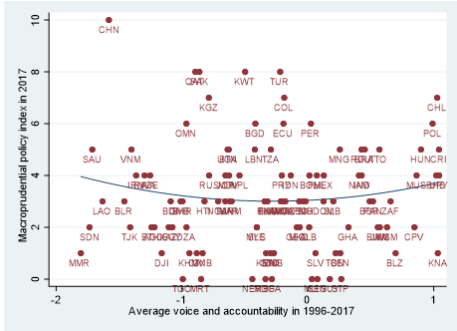

Figure A13. MPI and voice and accountability,
Emerging and developing economies
(108)

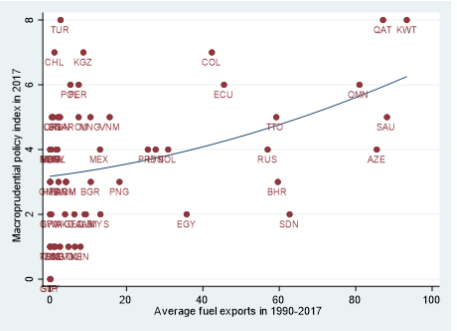

Figure A15. MPI and fuel exports,
Emerging and developing economies
above median financial openness (58)

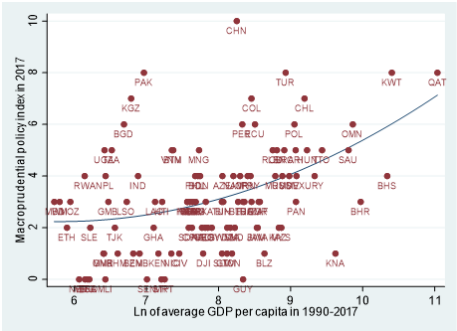

Figure A10. MPI and Ln GDP per capita,
Emerging and developing economies
(108)

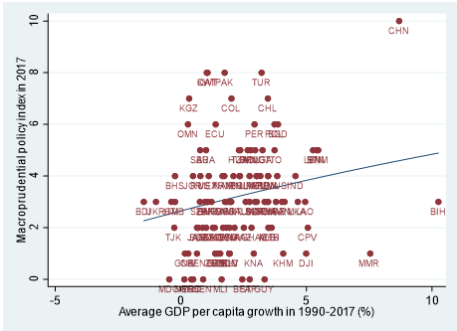

Figure A12. MPI and GDP per capita growth,
Emerging and developing economies
(108)

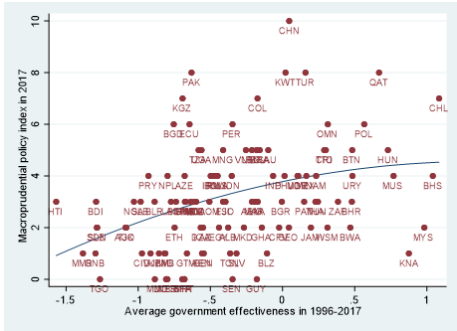

Figure A14. MPI and government effectiveness,
Emerging and developing economies
(108)

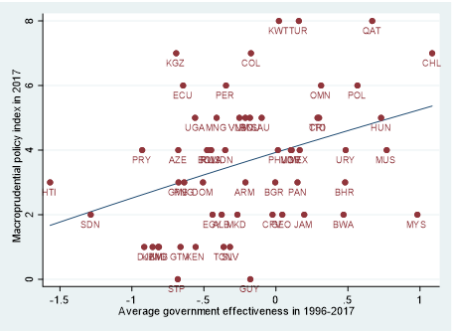

Figure A16. MPI and government effectiveness,
Emerging and developing economies
above median financial openness (58)

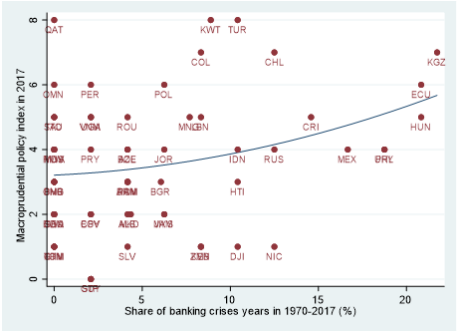

Figure A17. MPI and banking crises, Emerging and developing economies above median financial openness (58)

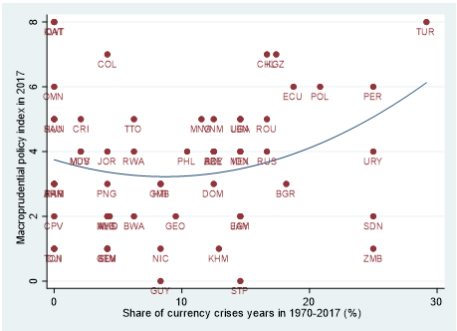

Figure A18. MPI and currency crises, Emerging and developing economies above median financial openness (58)

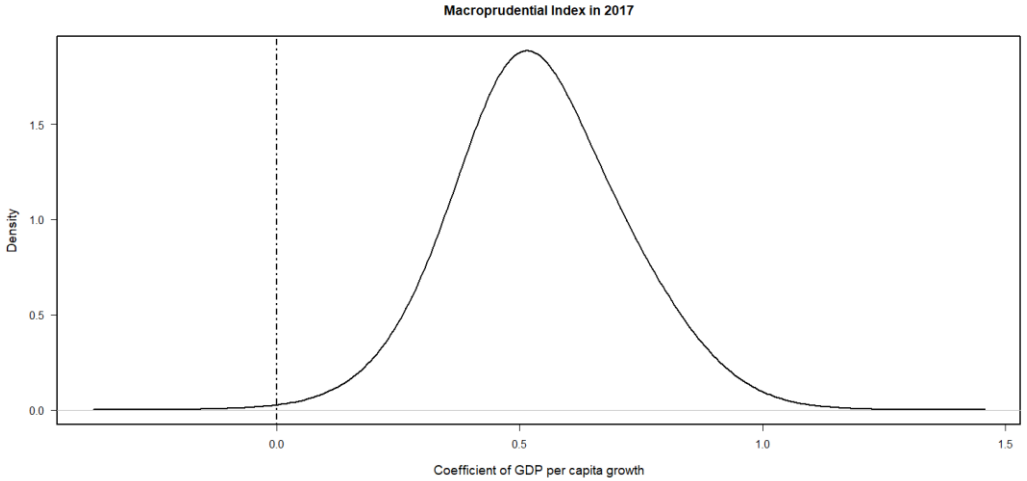

Figure A19. Posterior density for GDP per capita growth in the Macroprudential Index regression models (column 6 of Table 2). The coefficient average of GDP per capita growth over all models is 0.351.

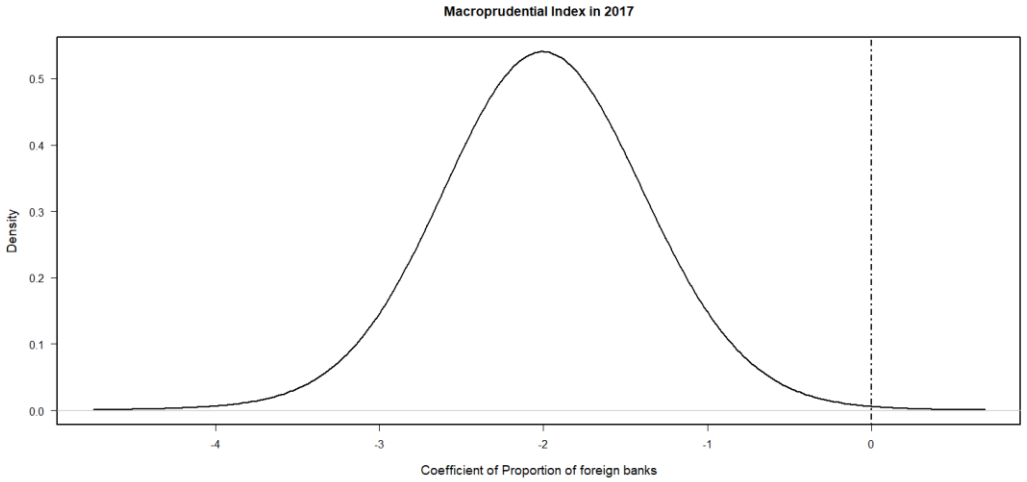

Figure A20. Posterior density for proportion of foreign banks in the Macroprudential Index regression models (column 6 of Table 2). The coefficient average of the proportion of foreign banks over all models is -1.699.

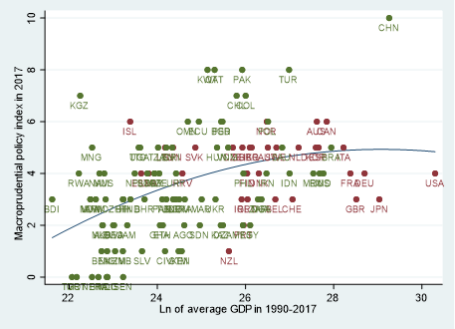

Figure A21. MPI and Ln GDP,
All countries (119)

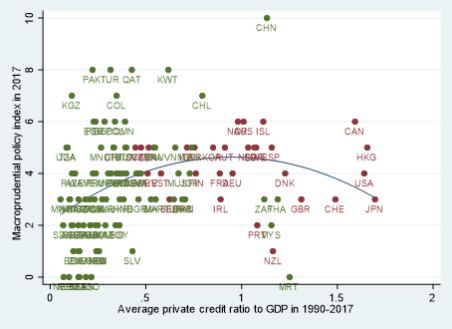

Figure A23. MPI and private credit ratio,
All countries (119)

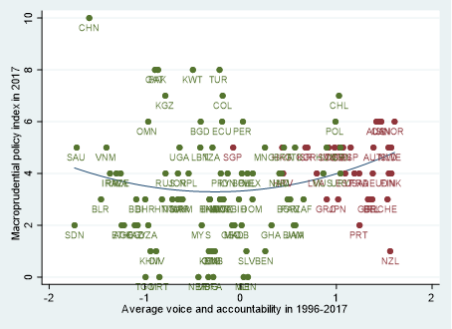

Figure A25. MPI and voice and accountability,
All countries (119)

Figure A27. MPI and currency crises,
All countries (119)

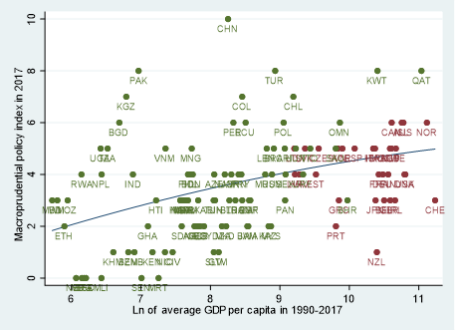

Figure A22. MPI and Ln GDP per capita,
All countries (119)

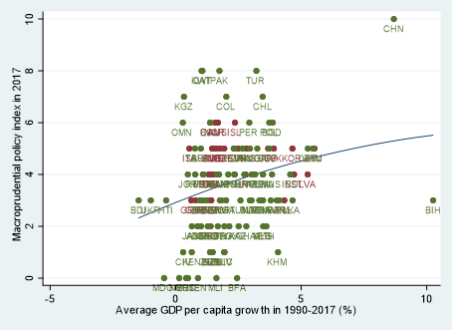

Figure A24. MPI and GDP per capita growth,
All countries (119)

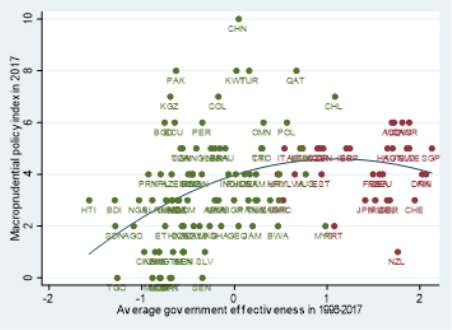

Figure A26. MPI and government effectiveness,
All countries (119)

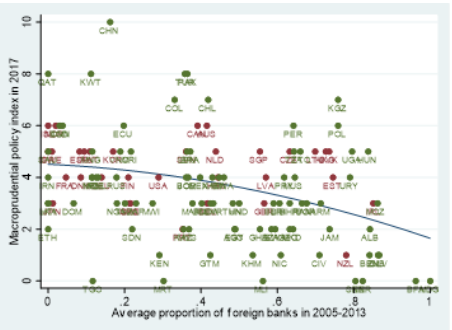

Figure A28. MPI and proportion of foreign banks,
All countries (119)

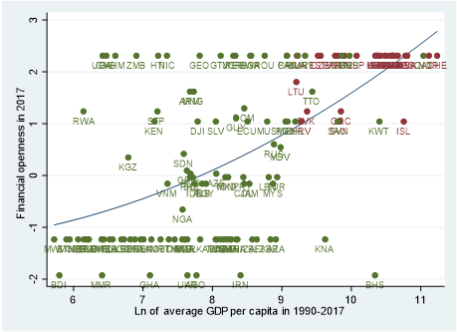

Figure A29. Financial openness and Ln GDP per capita,
All countries (142)

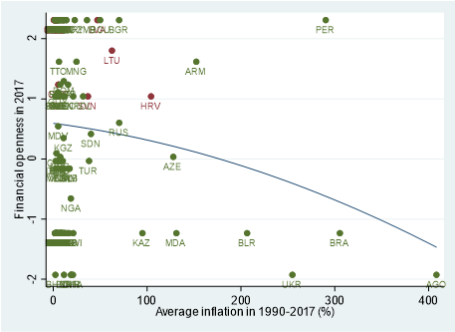

Figure A31. Financial openness and inflation,
All countries (142)

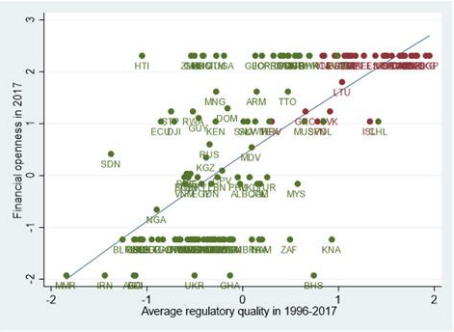

Figure A33. Financial openness and regulatory quality,
All countries (142)

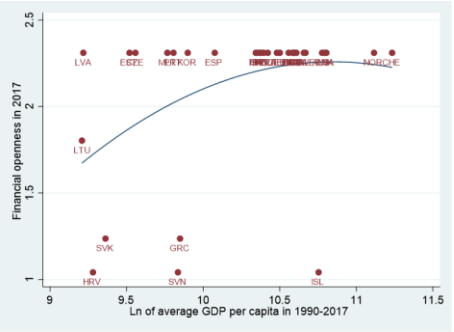

Figure A35. Financial openness and Ln GDP per capita,
Advanced economies (34)

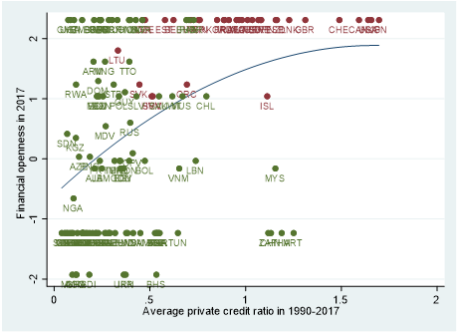

Figure A30. Financial openness and private credit ratio,
All countries (142)

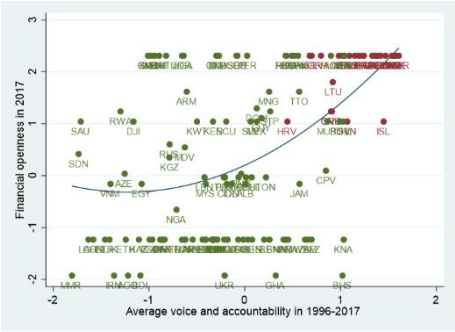

Figure A32. Financial openness and voice and accountability,
All countries (142)

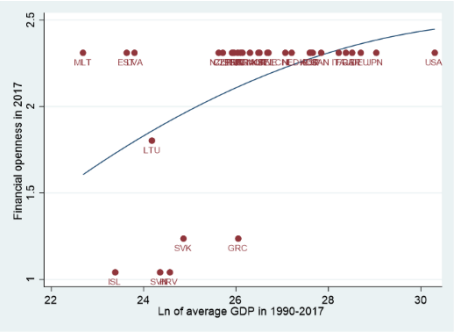

Figure A34. Financial openness and Ln GDP,
Advanced economies (34)

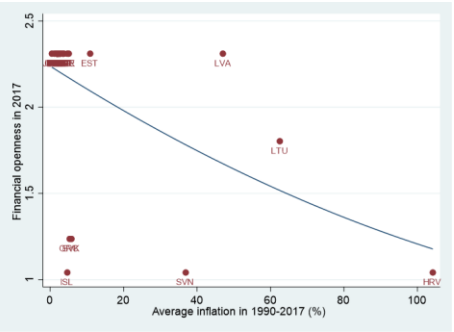

Figure A36. Financial openness and inflation,
Advanced economies (34)

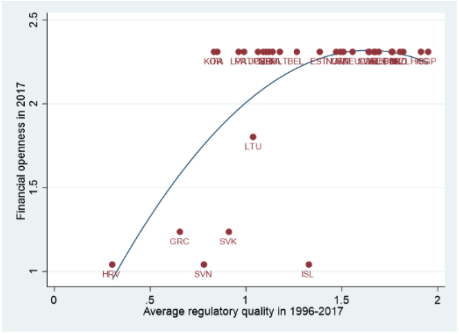

Figure A37. Financial openness and regulatory quality,
Advanced economies (34)

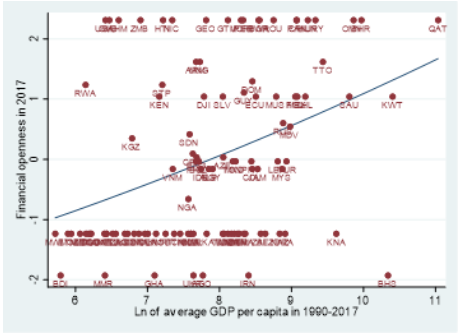

Figure A39. Financial openness and Ln GDP per capita,
Emerging and developing economies (108)

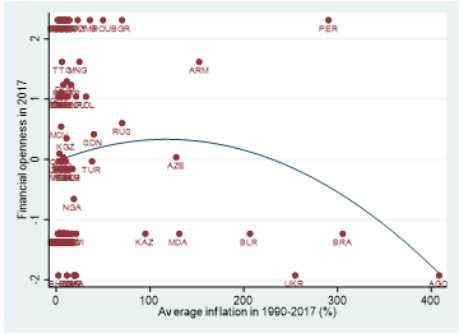

Figure A41. Financial openness and inflation,
Emerging and developing economies (108)

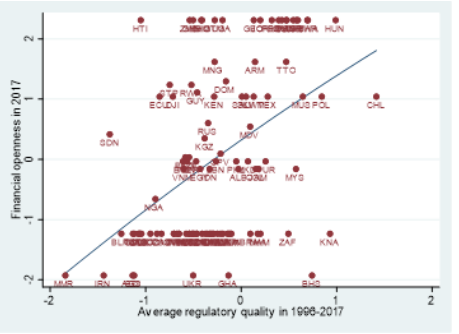

Figure A43. Financial openness and regulatory quality,
Emerging and developing economies (108)

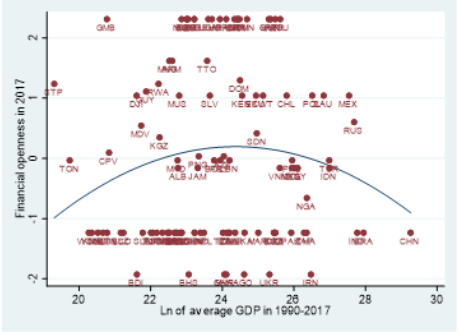

Figure A38. Financial openness and Ln GDP,
Emerging and developing economies (108)

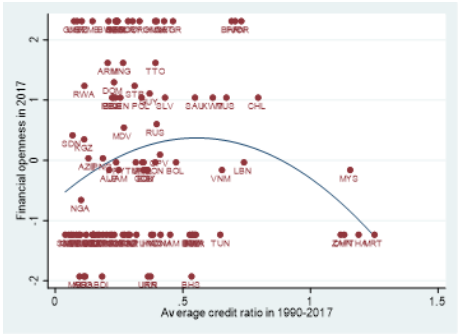

Figure A40. Financial openness and private credit ratio,
Emerging and developing economies (108)

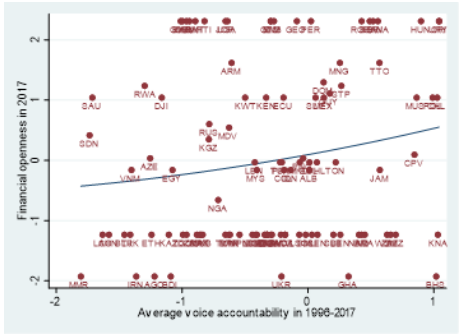

Figure A42. Financial openness and voice and accountability,
Emerging and developing economies (108)

Figure A44. Financial openness and currency crises,
Emerging and developing economies (108)

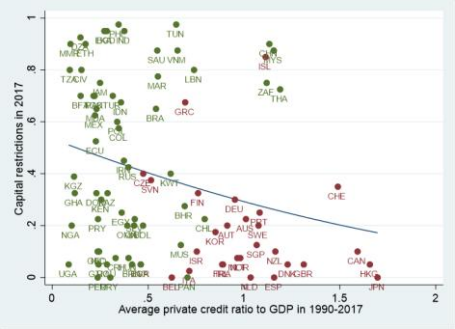

Figure A45. Capital restrictions and private credit ratio,
All countries (89)

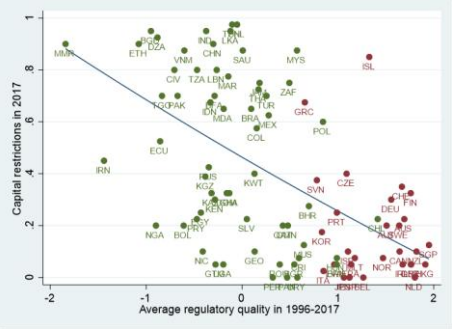

Figure A47. Capital restrictions and regulatory quality,
All countries (89)

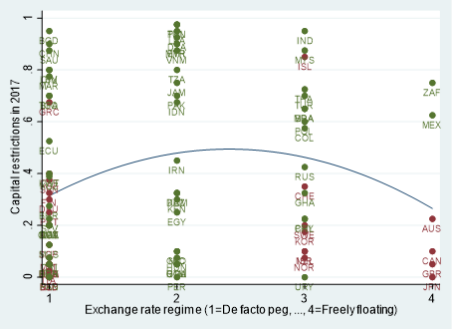

Figure A49. Capital restrictions and exchange rate regime,
All countries (89)

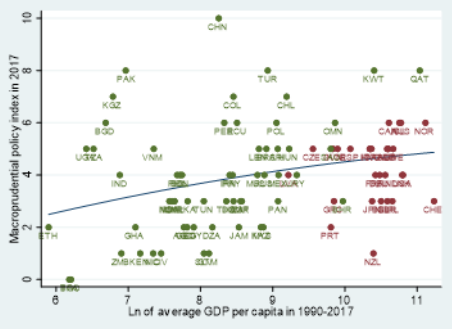

Figure A51. MPI and Ln GDP per capita,
All countries (89)

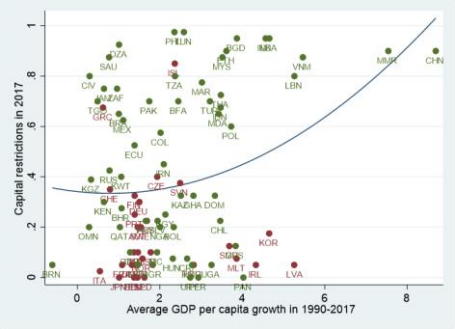

Figure A46. Capital restrictions and GDP per capita growth,
All countries (89)

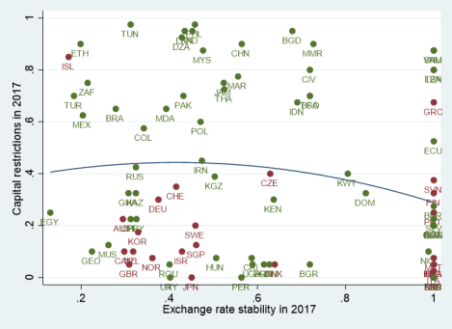

Figure A48. Capital restrictions and exchange rate stability,
All countries (89)

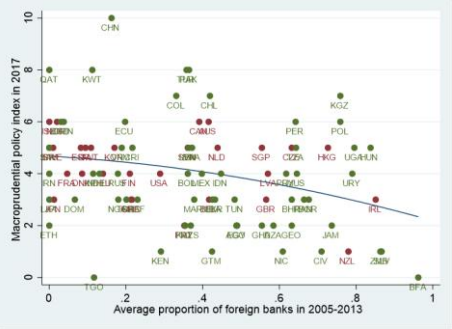

Figure A50. MPI and proportion of foreign banks,
All countries (89)

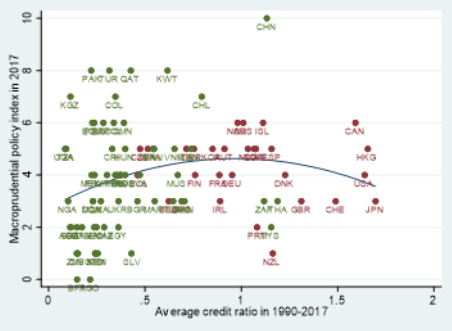

Figure A52. MPI and private credit ratio,
All countries (89)

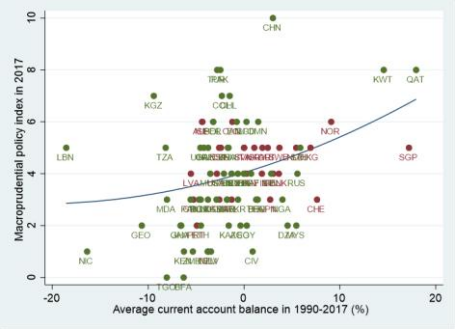

Figure A53. MPI and current accounts,
All countries (89)

Figure A55. MPI and currency crises,
All countries (89)

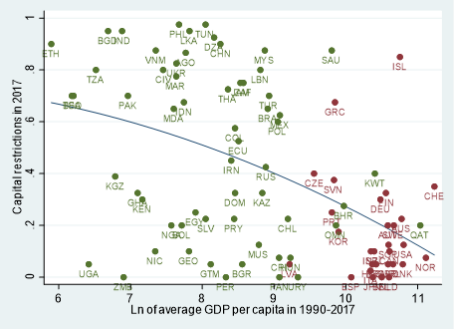

Figure A57. Capital restrictions and Ln GDP per capita,
All countries (89)

Figure A59. Capital restrictions and regulatory quality,
All countries (89)

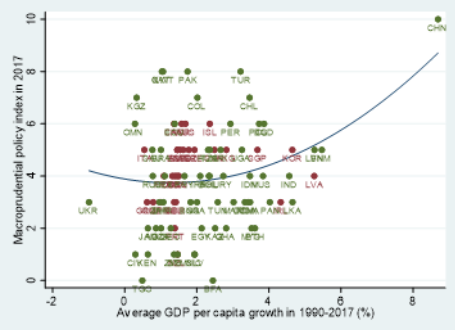

Figure A54. MPI and GDP per capita growth,
All countries (89)

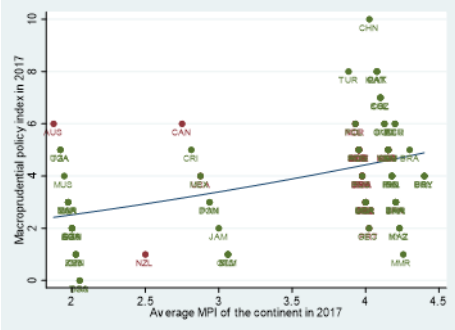

Figure A56. MPI and average MPI of the region,
All countries (89)

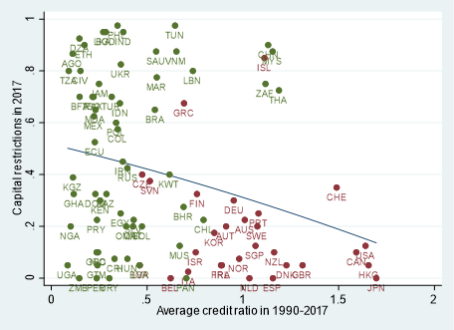

Figure A58. Capital restrictions and private credit ratio,
All countries (89)

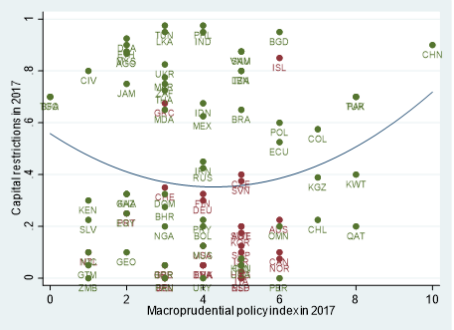

Figure A60. Capital restrictions and MPI,
All countries (89)

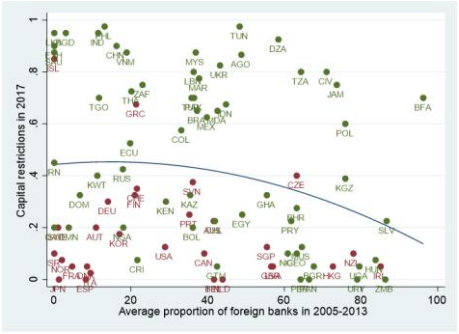

Figure A61. Capital restrictions and proportion of foreign banks,
All countries (89)

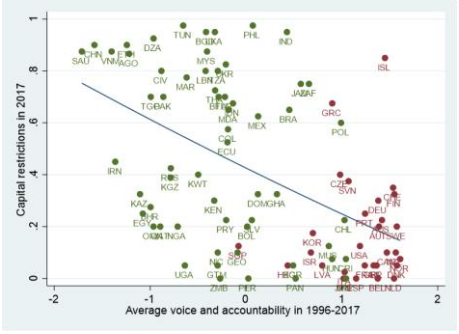

Figure A62. Capital restrictions and voice and accountability,
All countries (89)

BOFIT Discussion Papers

A series devoted to academic studies by BOFIT economists and guest researchers. The focus is on works relevant for economic policy and economic developments in transition / emerging economies.

2022	No 1	Michael Funke and Adrian Wende: The US–China phase one trade deal: An economic analysis of the managed trade agreement
	No 2	Michael Alexeev and Nikita Zakharov: Who profits from windfalls in oil tax revenue? Inequality, protests, and the role of corruption
	No 3	Florian Léon and Laurent Weill: Elections hinder firms' access to credit
	No 4	Alistair Dieppe and Hideaki Matsuoka: Sectoral decomposition of convergence in labor productivity: A re-examination from a new dataset
	No 5	David P. Newton, Steven Ongena, Ru Xie and Binru Zhao: Banks vs. markets: Are banks more effective in facilitating sustainability?
	No 6	Tat-kei Lai and Luhang Wang: Spatial disparity of skill premium in China: The role of financial intermediation development
	No 7	Zuzana Fungáčová, Alexei Karas, Laura Solanko and Laurent Weill: The politics of bank failures in Russia
	No 8	Jin Cao, Valeriya Dinger, Ragnar E. Juelsrud and Karolis Liaudinskas: Trade conflicts and credit supply spillovers: Evidence from the Nobel Peace Prize trade shock
	No 9	Nils Steiner, Ruxanda Berlinschi, Etienne Farvaque, Jan Fidrmuc, Philipp Harms, Alexander Mihailov, Michael Neugart and Piotr Stanek: Rallying around the EU flag: Russia's invasion of Ukraine and attitudes toward European integration
	No 10	Andrey Tkachenko: State-business relations and access to external financing
	No 11	Denis Davydov, Tatiana Garanina and Laurent Weill: Managing bank liquidity hoarding during uncertain times: The role of board gender diversity
	No 12	Timur Natkhov and William Pyle: Revealed in transition: The political effect of planning's legacy
	No 13	Michael Funke and Adrian Wende: Modeling semiconductor export restrictions and the US-China trade conflict
	No 14	David Finck and Peter Tillmann: The macroeconomic effects of global supply chain disruptions
2023	No 1	Francis Osei and Laurent Weill: Regional favoritism in access to credit: just believe it
	No 2	Yiping Huang, Xiang Li, Han Qiu and Changhua Yu: BigTech Credit and Monetary Policy Transmission: Micro-Level Evidence from China
	No 3	Günther G. Schulze and Nikita Zakharov: Political cycles of media repression
	No 4	Anna Di Gong, Jin Wu and Jigao Zhu: When banks' shadow fades and shadow banking rises: Securitization and loan performance in China
	No 5	Julia Niemeläinen: China's macroeconomic policies and spillover effects
	No 6	Loren Brandt, Johannes Van Biesebroeck, Luhang Wang and Yifan Zhang: Where has all the dynamism gone? Productivity growth in China's manufacturing sector, 1998-2013
	No 7	Xiaoshan Hu, Guanghua Wan and Congmin Zuo: Education expansion and income inequality: Empirical evidence from China
	No 8	Tuuli McCully: Drivers of portfolio flows into Chinese debt securities amidst China's bond market development
	No 9	Iftekhar Hasan, Xiang Li and Tuomas Takalo: Technological innovation and the bank lending channel of monetary policy transmission
2024	No 1	David Lodge, Ana-Simona Manu and Ine Van Robays: China's footprint in global financial markets
	No 2	Mustafa Özer, Jan Fidrmuc, Emmanouil Mentzakis and Özcan Özkan: Does education affect religiosity? Causal evidence from a conservative emerging economy
	No 3	Iikka Korhonen and Heli Simola: High-priority battlefield items and television sets – How sanctions reduced Russians' access to goods
	No 4	Zuzana Fungáčová, Eeva Kerola and Laurent Weill: European banks are not immune to national elections
	No 5	Kari Heimonen and Risto Rönkkö: The RMB's global role as an anchor currency: no evidence
	No 6	Biswajit Banerjee and Risto Herrala: Testing the impact of liquidation speed on leverage using Indian data
	No 7	Madhav S. Aney and Sanjay Banerji: Forgery, market liquidity, and demat trading: Evidence from the national stock exchange in India
	No 8	Eeva Kerola, Tuuli McCully and Riikka Nuutilainen: Trade with Chinese characteristics – economics versus politics
	No 9	Martin Hodula, Jan Janků, Simona Malovaná and Ngoc Anh Ngo: Geopolitical risks and their impact on global macro-financial stability: Literature and measurements
	No 10	Lea Borchert, Ralph De Haas, Karolin Kirschenmann and Alison Schultz: Broken relationships: De-risking by correspondent banks and international trade
	No 11	Liyuan Liu, Xianshuang Wang and Zhen Zhou: Let a small bank fail: Implicit non-guarantee and financial contagion
2025	No 1	Hans Degryse, Cédric Huylebroek and Bernardus Van Doornik: The disciplining effect of bank supervision: Evidence from SupTech
	No 2	Richard C. K. Burdekin and Pierre L. Siklos: Combating crises and deflation in China's central bank: Modeling post-pandemic monetary policymaking
	No 3	Mika Nieminen and Anni Norring: What motives and conditions drive countries to adopt macroprudential and capital management measures?

BOFIT Discussion Papers
http://www.bofit.fi/en • email: bofit@bof.fi
ISSN 1456-5889 (online)