Capital Flows and Macroprudential Policies – A Multilateral Assessment of Effectiveness and Risks

John Beirne[1] and Christian Friedrich[2]

Abstract

This paper examines the effectiveness and risks of macroprudential policies (MPPs) in managing international capital flows. Our empirical analysis is underpinned by a multilateral framework for assessing the impact of MPPs based on the party that bears the cost of the policies. We examine empirically the impact of various MPPs on foreign capital inflows for up to 39 emerging markets and middle income countries over the period from 1999 to 2009. Our results based only on domestic macroeconomic fundamentals indicate that MPPs were not very effective in reducing capital inflows. However, this is no longer the case when the structure of the domestic financial system is also taken into account. In particular, we find that the effectiveness of MPPs is inversely related to cost measures in the domestic banking system. Finally, our analysis highlights the presence of negative spillover risks associated with MPPs. The introduction of an MPP in one country, while controlling domestic capital inflows, poses a negative externality risk to neighbouring countries via increased capital flows. The analysis contributes to the policy debate on the importance of devising a macroprudential framework at the multilateral level.

JEL Classification: F3, F5, G01, G11

Keywords: macroprudential policies, international capital flows, banking system, emerging markets

[1] European Central Bank, International Policy Analysis Division, Kaiserstraße 29, Frankfurt am Main, 60311, Germany; e-mail: John.Beirne@ecb.int. Also affiliated to the Centre for Empirical Finance, Brunel University, London, UB8 3PH, United Kingdom.

[2] Graduate Institute for International and Development Studies, Avenue de la Paix 11A, 1202 Geneva, Switzerland. e-mail: christian.friedrich@graduateinstitute.ch. And, June–Sept. 2012: European Central Bank, International Policy Analysis Division, Kaiserstraße 29, Frankfurt am Main, 60311, Germany.

We are grateful for comments received at presentations of the paper in September 2012 at both the European Central Bank, Germany, and the University of London, UK. The views expressed in this Working Paper are those of the authors and do not necessarily represent those of the ECB.

1. Introduction

The recent global financial crisis has demonstrated the role played by systemic risk in raising global financial stability concerns. Since then, macroprudential policies (MPPs) have been placed prominently on the research agendas of central banks and international policy institutions. Lately, the policy discussion has extended to also assessing the use of MPPs in managing large capital inflows to emerging market economies (e.g. IMF, 2011c). It is worth noting that while capital flows can have substantial positive effects on economies in relation to the promotion of growth and employment, there is also ample evidence to suggest that foreign capital inflows can contribute to the creation of credit booms, lead to over-indebtedness, and facilitate maturity and currency mismatches. In order to mitigate against the negative effects associated with capital inflows, MPPs can be used. These measures (unlike capital controls, which differentiate between residents and non-residents of a country) apply to all participants of the financial system.

In the growing literature on the effectiveness of MPPs in emerging markets, mostly the "direct" effect of MPPs has been examined. This literature finds increasing evidence that MPPs have been effective in reducing systemic risk (e.g. Lim et al., 2011, Habermeier et al., 2011, Qureshi et al. 2011). However, in all of these papers, no broad and significant "indirect" effect is found, i.e. the effect that MPPs have on foreign capital inflows. A second gap in the literature relates to the dearth of analysis carried out on costs associated with MPPs (the majority of the literature focuses very strongly on benefits associated with these measures). We address this gap by adopting a multilateral perspective and contributing to the literature by providing a rich organising framework that incorporates the channels through which MPPs can be beneficial on the one hand, but potentially costly on the other. Based on this framework, the paper focuses on both, an extensive assessment of the effectiveness of MPPs in reducing foreign capital inflows on the one hand and an examination of related spillover risks and thus potential costs on the other hand.

The organising framework is structured in terms of the party (i.e. the investor, the capital receiver or the intermediary) that will eventually bear the costs of the policy, which in turn is linked to the reaction of capital inflows. This framework subsequently motivates the three sets of empirical analyses pursued: (i) a baseline specification based purely on the impact of MPPs controlling for domestic macroeconomic fundamentals; (ii) a financial threshold analysis which augments the baseline with measures of the domestic financial sector; and (iii) a spillover analysis which is based on an assessment of possible negative externalities to immediate neighbour countries as well as a country's region as a whole following the introduction of an MPP. The latter two specifications are set up in a flexible way, allowing for a large number of sub-channels to be tested.

First, the baseline specification is estimated to show the effectiveness of MPPs on capital inflows to the average country in the sample. It turns out that, on average MPPs, are not very effective in reducing the inflow of foreign capital. The second specification mainly deals with the role of the financial system and especially the financial intermediary in mitigating or strengthening the effect of MPPs. Empirical tests are carried out using a set of financial variables as threshold conditions. The results show that the structure of the domestic financial system is a key factor determining the effectiveness of MPPs. In particular, we find that MPPs are inversely related to several measures of costs in the domestic banking system. Finally, the third specification focuses on the investor side and deals with the occurrence of spillover effects. In recent times, policy discussions have prominently centred on the multilateral effects of MPPs (IMF, 2011d), such as evasion effects, spillovers to other asset classes and other countries, and on the implementation of coordinated international regulatory and supervisory reforms. We examine spillover effects across asset classes and across countries. We find that the introduction of an MPP in one country, while controlling domestic capital inflows, poses a negative externality risk to immediate neighbouring countries via increased capital flows. This is particularly notable in the cases of both bank flows and portfolio debt flows.

The remainder of the paper is organised as follows. Section two provides a summary of the literature. Section three presents the organising framework for our empirical analysis, the construction of the MPP measures used in the paper, and also presents some stylised facts on the impact of MPPs on foreign capital flows. Section four describes the methodology and the data to be used in the empirical analysis. Section five presents the empirical results, and section 6 finally concludes.

2. Literature

2.1. Theoretical Literature

Before discussing the most recent findings of the empirical literature on the use and the effectiveness of MPPs and capital controls to manage large capital inflows, the key theoretical arguments why actively managing capital flows or their negative consequences may be desirable from an efficiency point of view are presented.

Most of the theoretical literature assumes the existence of a state-dependent, aggregate, external financing shock. A financial friction is often also introduced that induces agents, such as banks, firms, or even households to take on too much systemic risk. Hence, agents become underinsured against the external financing shock. Financial frictions can for example take the form of limited commitment in financial contracts (Lorenzoni, 2008), limited access of banks to productive capital in times of crisis (Federico, 2011), or collateral constraints (Korinek, 2010). Usually, financial

frictions materialise though a downward pressure on asset prices when the economy is hit by a negative financing shock. The reason for this inefficiency is related to an externality arising from the fact that agents consider themselves as atomistic and thus, do not incorporate the impact of their actions on the economy as a whole. Hence, there is room for policymakers to improve welfare by introducing measures that may lead to a better internalisation of the externality.

Lorenzoni (2008) sets up the model and applies it to credit booms and over-borrowing. His analysis suggests that reserve requirements may limit the need to sell assets in times of crisis and thus might be welfare improving. Federico (2011) builds upon the same framework and introduces banks that finance long- and short-term investments by borrowing locally and externally. To overcome inefficiencies resulting from the above mentioned externality, he suggests using liability-side instruments, such as unremunerated reserve requirements and asset-side instruments, such as taxes on short-term at the same time. Korinek (2010) focuses on high capital flow volatility and argues that taxing risky inflows, such as foreign currency debt with unremunerated reserve requirements can be welfare improving. In the same vein, Jeanne and Korinek (2010) show in a calibrated model that a Pigouvian tax on borrowing may induce borrowers to internalise externalities and increase welfare.

Using a calibrated Dynamic Stochastic General Equilibrium (DSGE) model, where financial constraints give rise to amplification effects, Bianchi (2011) evaluates the macroeconomic and welfare effects of over-borrowing. He examines several MPP measures, such as taxes on debt, tightening of margins, as well as capital and liquidity requirements that are designed to increase the effective costs of borrowing and thus can increase welfare. He finds that implementing a constrained-efficient allocation requires an increase in effective costs of borrowing by about five per cent on average. This number turns out to be even for greater levels of debt and an increasing probability of a future financial crisis.[3]

2.2. Policy Literature

Although the theoretical literature suggests using measures to manage large capital inflows can be welfare improving, their implementation is complex and difficult. For this reason, the International Monetary Fund (IMF) has started a large policy-oriented research program[4] on the use and the implementation of capital controls and MPPs in recent years.[5]

[3] Also Unsal (2011) confirms the theoretical conclusions that MPPs may be welfare-improving by introducing latter ones in an Open Economy DSGE model. Beningno et al. (2010a, 2010b) arrive at different conclusions.

[4] This program has evolved alongside the question on how to manage large-scale capital inflows in emerging markets after the crisis and the problem of a missing international framework on how to deal with capital account restrictions (e.g. see IMF, 2010 and IMF, 2011c).

[5] A similar intention is observed by other policy institutions as well: see for example BIS (2010).

With regard to capital controls, in a staff position note, the IMF has identified an overvalued exchange rate, sufficiently high reserve holdings, overheating concerns that preclude a more expansive monetary policy and no room for fiscal policy as macroeconomic conditions under which countries may apply capital controls successfully (Ostry et al. 2010). In a subsequent staff discussion note, the IMF then examines the use of capital controls in conjunction with MPPs. This note stresses the distortions and costs that both types of measures create, highlights the preferred policy response depending on the way foreign capital is intermediated in the financial system - e.g. via banks (MPPs) or via markets (capital controls) - and eventually suggests to fit a response to the country-specific circumstances: to tackle macro concerns, broad, price-based, and temporary controls are recommended, to tackle financial stability concerns, risky flows and persistent flows should be targeted, even under the use of administrative measures.

With regard to MPPs (and a focus going substantially beyond managing capital inflows), the IMF has implemented the following agenda: Defining and categorising MPPs (IMF, 2011a), identifying indicators to measure systemic risk (IMF, 2011b), examining the institutional frameworks for MPPs (Nier et al., 2011), and also assessing their effectiveness (Lim et al., 2011). The results of the latter one are highly relevant for this paper and are therefore summarized in the next subsection.

Lately, the IMF has also placed multilateral aspects of capital flow measures on the agenda (IMF, 2011d) and urges national policy makers to pay more attention to multilateral effects of MPPs, such as evasion effects and spillovers to other countries, and to implement coordinated international regulatory and supervisory reforms.

2.3. Empirical Literature

Based on the policy literature, a number of more research-oriented empirical papers have emerged. Magud et al. (2011) provide an extensive meta-study on the empirical literature of capital controls. The authors identify four key problems in the literature: (i) no unified theoretical framework to analyse macroeconomic consequences of capital controls; (ii) a substantial heterogeneity across countries and types of controls implemented; (iii) no clear definition of when capital controls are successful; and, (iv) a strong reliance on a few country cases. To solve these issues, the authors try to standardise the results of 30 empirical studies by constructing two indices that assign weights to the results of various papers. The authors conclude that capital controls can make monetary policy more independent, influence the composition of flows and, to a lesser extent, can reduce exchange rate pressures. However, no significant impact is found on the level of net capital flows.

A study that goes beyond assessing the effectiveness of capital controls only on the introducing country is Forbes et al. (2011).[6] The authors examine the introduction of a tax on foreign debt investments in Brazil from 2006 to 2011. Using bond and equity fund data, the approach differentiates between effects on the funds' portfolio allocation to Brazil and spillover effects on the portfolio allocation to other countries. It is found that spillover effects are heterogeneous across countries: countries that are perceived as likely to implement capital controls in the near future receive lower portfolio weights, while countries that are located in the same region, that are of similar weight in the benchmark index, and that benefit from growth in China are likely to receive higher portfolio weights.

More recently, a number of studies has emerged that focus jointly on the effectiveness of capital controls and on MPPs. A first set of papers is Habermeier et al. (2011) and Baba and Kokenyne (2011). Both papers are targeted to find empirical evidence on the effectiveness of capital controls and MPPs during the past decade. The authors refer to both policies jointly as "capital flows measures". Habermeier et al. (2011) summarise the empirical literature by stating that capital controls had only a small effect on the volume of flows and the resulting currency appreciation but can change the composition of flows. The authors also note that there has not been much in-depth study of the effectiveness of MPPs to date. They supplement their literature survey by a four-country (Brazil, Columbia, Korea and Thailand) GMM analysis that shows a very limited success of capital controls in reducing capital inflows. Baba and Kokenyne (2011) examine the same set of countries in a VAR framework. The authors find a positive impact of capital controls in maintaining an interest differential to conduct independent monetary policy. However, also here, it is found that capital controls have nearly no effect on the level of capital flows and the currency appreciation.

Lim et al. (2011) examine the effectiveness of 10 different MPPs using three different methodological approaches: a case study, a before-after-analysis, and a panel-regression. The panel approach, where MPPs are represented by dummy variables taking on the value of 1 when they are present, is split up in cyclical and cross-sectional risks. Starting with the direct effect of MPPs on systemic risk indicators, for credit booms, a number of MPP instruments that significantly reduce the pro-cyclicality of credit – and thus the cyclical risk component – can be identified. Successful instruments include caps on the loan-to-value ratio and the debt-to-income ratio, limits on credit growth, reserve requirements, and dynamic provisioning. Focusing on the indirect effect, the only outcome variable in the analysis that is related to capital flows and currency mismatches is associated with cross-sectional risks and comprises the ratio of foreign liabilities to foreign assets. It

[6] Lambert et al. (2011) examine the same event and also find spillovers to other countries in the region, especially to Mexico.

is found that only MPPs that limit net open positions in foreign currency have a mitigating effect on the ratio mentioned above. All other MPPs turn out to be ineffective in this setup.

The most closely related study to this paper is Qureshi et al. (2011). The authors construct three indices for capital controls, "foreign exchange related MPPs", and "other MPPs". These indices are used in a panel regression with 51 emerging market countries over the period 1995-2008. The findings indicate that capital controls and foreign exchange related MPPs are associated with a lower ratio of lending in foreign currency to total domestic bank credit and a lower proportion of portfolio debt in total external liabilities. In addition, measures of the category "other MPPs" seem to reduce the intensity of aggregate credit booms. However, the effect of MPPs on capital flows, measured as debt flows in % of total flows is mostly insignificant.

Another strand of literature deals more explicitly with policy responses to lending in foreign currencies. Zettelmeyer et al. (2010) focus on currency mismatches in Eastern Europe. The authors deliver a survey of the empirical literature on the dollarisation of corporate and household liabilities, and provide evidence themselves on the causes of foreign currency lending in Eastern Europe. Finally, it is concluded that using (macroprudential) regulation to reduce foreign currency mismatches is useful in relatively advanced countries where a small market size or the proximity to the euro area make it difficult to develop local currency bond markets.

Concluding the literature review, it turns out that the effect of capital controls on the level of capital flows, their composition as well as their effect on exchange rate pressure/the interest rate differential have been extensively researched. Most prominently, no effect of capital controls on the volume of capital flows has been found. Regarding MPPs, first assessments of the effectiveness of different macroprudential measures in reducing systemic risk indicators, such as credit growth or currency and maturity mismatches, have been carried out and a positive impact was identified. The literature has also examined the effect of MPPs on capital flows. However, in nearly all studies, this effect turns out to be insignificant and no compelling explanation for this finding is offered. In addition, the literature has also neglected the examination of related costs and risks following the introduction of MPPs. In a unified framework, this paper focuses on both issues in order to close the present gap in the literature.

3. Macroprudential Policies and Capital Flows

3.1. A Multilateral Framework for the Empirical Analysis

Following the introduction of an MPP, capital flows to the implementing country may most likely either decrease or remain constant and hence, the policy may eventually be effective or not. Based on the observed outcome, there will be a number of channels through which the policy may or may not work. This paper aims to examine these channels and their associated risks. The analysis is carried out through a series of empirical specifications that test the effectiveness of MPPs based on observable implications depending on the structure of the financial system and based on international spillover effects.

Figure 1 explains potential channels in greater detail. Following the introduction of an MPP, there are three potential parties that can bear the resulting costs: the investors (creditors), the receivers of capital (debtors) or a third party. While costs to the investors come primarily in form of a lower return to the investment, costs to the capital receiver materialise through higher costs of capital. Also the third party may be affected by a reduction in corresponding payoffs.

If a third party bears the costs, there are two likely alternatives: either the intermediary – usually the bank – bears the costs or the intermediary helps to avoid the occurrence of costs in the first place. Whenever a third party bears the costs, the amount of capital inflows in the asset class to which the MPP is targeted should not change. In an empirical analysis, this would imply that in a regression of capital flows on MPPs, coefficient values for the effect of MPPs would be insignificant. However, to identify the reason for this insignificance and to clearly localise the channel through which it occurs, the presence of threshold conditions in the structure and the state of the financial system has to be tested. The following paragraph describes in greater detail which channels require which threshold conditions to be fulfilled.

When the costs of the MPP are avoided, this can happen either legally or illegally. A legal circumvention of an MPP would channel foreign capital flows to the country in question around the official financial system, meaning capital inflows may potentially not be affected by the MPP. A testable implication for this channel would be the presence of foreign banks or a large share of offshore deposits relative to domestic deposits in the financial system. In case the intermediary tries to illegally circumvent the policies, the testable implication would show up in terms of poor profit conditions, such as those arising from strong competition in the banking system, high banking costs, or low profit margins (which could force banks to circumvent rules in favour of their customers).

When the intermediary bears the costs, one has to differentiate according to the size of the costs. When the costs to comply with the MPP are relatively small, the constraint for the intermediary may hardly be binding. A potential situation in which this may be the case is when

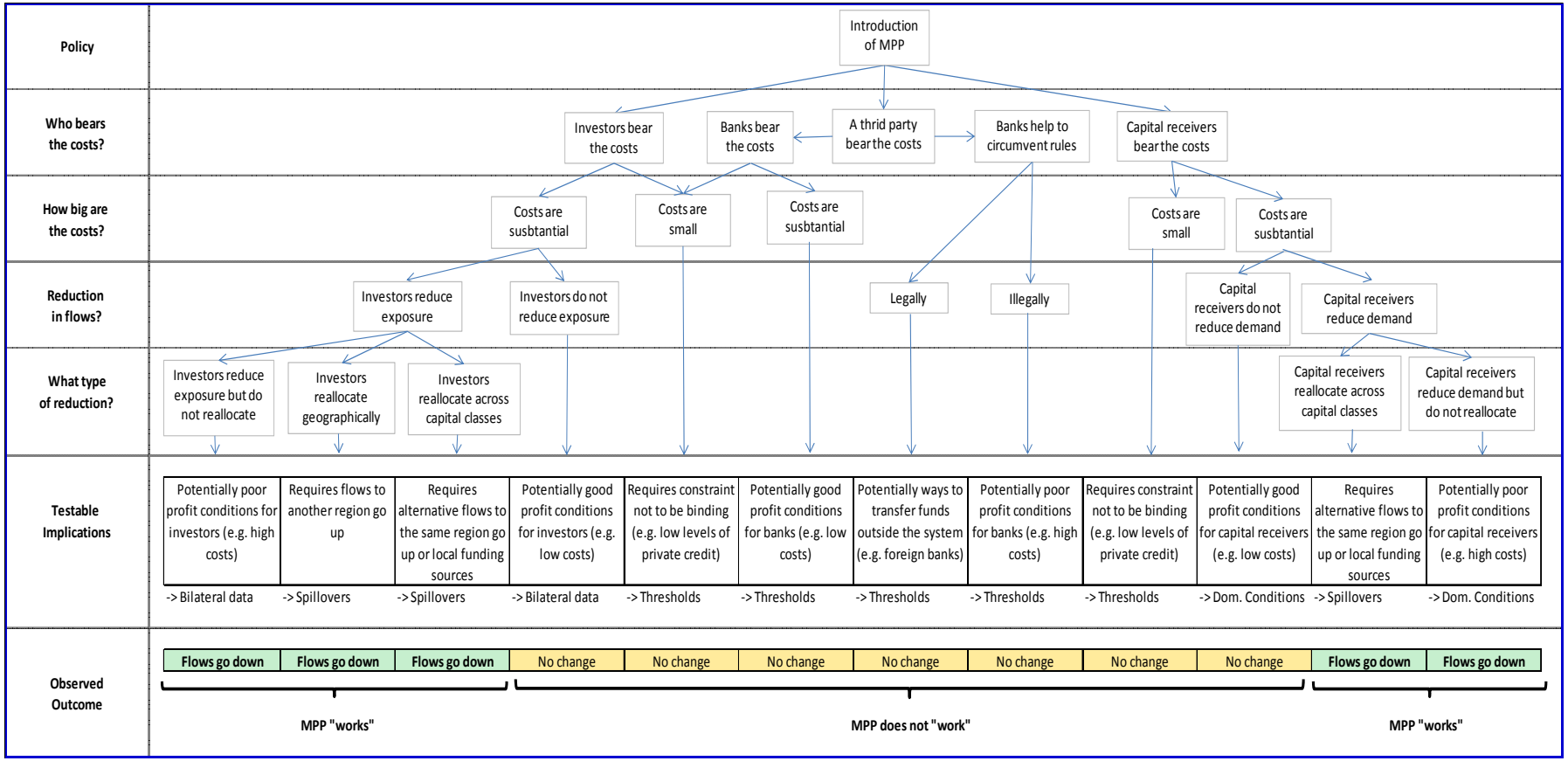
there is already a high level of, for example, private credit to GDP in the system and the introduction of a corresponding MPP will apply to the entire stock and thus strongly reduce the inflow of foreign capital. When on the other hand, the costs are substantial and we are in a world where banks bear these costs, we should be able to observe a lower effectiveness of MPPs, thus smaller and less significant coefficients, when profit conditions for banks improve.

We turn now to the second case, where investors bear the costs. If instead of the intermediary, the investor bears the costs, an alternative set of channels and thus also an alternative set of testable implications exists. Again, the behaviour strongly depends on the size of the costs. When costs are small, for the same reasons as in the intermediary case, the required adjustment is rather small and the regression coefficient for MPPs may become insignificant. When the adjustment costs are higher however, a set of alternative channels emerges again.

The next question that has to be answered is whether investors change their exposure or continue to invest equal amounts of capital in the same asset class and the country that has implemented the MPPs. The latter case occurs when investors have relatively good profit conditions and therefore can bear additional costs. To test this implication, bilateral data containing information on the source country of the investor is required. The occurrence of the former case requires a finer differentiation. Following the implementation of the MPP, investors can reduce capital flows in at least three different ways.

First, investors may simply reduce their exposure and restrain from any reallocation of their capital. This case may occur when investors have relatively poor profit conditions and cannot bear additional costs. To test this implication, again bilateral data containing information on the source country of the investor is required. A second possibility is that investors continue to invest in the policy-implementing country but switch to a different asset class in order to avoid costs arising from the MPP. In terms of testable implications, one would expect the occurrence of spillover effects, such as an increase in other types of capital flows to the same country. Finally, a third channel may exist through which investors may remain within their asset class but change their geographical exposure to the policy-implementing country. A testable implication in this case would be that spillovers should occur across countries, either in the same or, less likely but still possible, even in a different asset class. Alternatively, one would expect the emergence of local funding sources, which in turn could also be tested using a corresponding measure of local currency funding as a financial threshold variable.

Figure 1: Implications of MPPs



Eventually, the third option is that costs of the policy are borne by the capital receiver. This case largely parallels with the one in which investors have to bear the costs. When the costs of compliance are small, one would expect the constraint to not be binding and hence, low corresponding threshold conditions should support this argument. When the costs of compliance are substantial, capital receivers may either reduce their demand for capital, which would be reflected in good profit conditions for capital receivers or a reduction in capital demand. If the latter one is the case, capital receivers may simply reduce their capital demand which this time would be indicated by poor profit conditions. Eventually, if capital from one asset class becomes too expensive, capital receivers may shift to another asset class in order to avoid high costs of capital (e.g. by replacing debt with equity financing). Also this can be tested empirically. The only difference to the investor side, however, is that capital receivers cannot relocate their investment geographically, since MPPs apply independently to all potential sources of capital flows.

3.2. Construction of Macroprudential Policy Measures

To examine the impact of MPPs on capital flows and test the previously derived testable implications empirically, the abstract notion of an MPP has to be made measurable. This paper uses two different sources to identify MPPs. Both are based on other papers in the literature.

The first source of MPPs is Qureshi et al. (2011) who use measures that are mainly based on the AREAER database. We replicate four of their measures exactly: *fincont1* and *fincont2* that measure capital controls specifically directed to the financial sector (a form of hybrid measures of capital controls and MPPs) and *fxreg1* and *fxreg2* that are related to the use of foreign currency. In the remainder of the paper we will refer to the financial system measures as “Financial System 1 and 2” and to the foreign exchange measures as “Foreign Exchange 1 and 2”. All measures are averages of dummy variables from the AREAER database. A more detailed description of the content of these measures can be found in the Appendix in Table A.1 – Panel a).

The second source is Lim et al. (2011) who describe a large set of MPP incidents in their appendix. Based on this data, we compute dummy variables that take on the value of 1 when a policy is implemented for the following categories: 1) Restrictions on the use of foreign currency, comprising Caps on Foreign Currency Lending and Limits on Net Open Currency Positions/Currency Mismatches. 2) Lending related policies that are targeted to reduce the individual credit risk, such as Ceilings on Credit or Credit Growth, caps to the Loan to Value Ratio (LTV), and caps on the Debt to Income Ratio (DTI); however excluding all foreign exchange restrictions. 3) Capital buffer related policies that are targeted at banks and comprise all policies in the form of Countercyclical Capital Requirements, Time-varying/Dynamic Provisioning, and Restrictions on Profit Distribution. 4) Finally,

liquidity-related policies combine Limits on Maturity Mismatches and all Reserve Requirements that are not part of one of the previous groupings. Again, a detailed description of the construction can be found in Appendix Table A.1. – Panel b). For both types of MPP measures, Table 1 reports all possible values and their frequencies. It turns out that the measures based on Lim et al. (2011), as opposed to those of Qureshi et al. (2011), only show the introduction date of an MPP and hence exhibit a much lower number of policy incidents. Finally, we present the development of our MPP measures over time. Figure 2 and Figure 3 show the development of the MPP measures, here depicted as cross-country averages over time. Figure 2 presents the four measures taken from Qureshi et al. (2011). As described above, the two groups of measures Financial System 1 and 2 and Foreign Exchange 1 and 2 show very similar patterns and dynamics. Nearly all four measures peak in late 90s and have their lowest levels in the mid-2000s. Lately, all measures seem to have picked up again indicating an increased use of MPPs.

Table 1: Macroprudential Policy Incidents

Measure	Total	Low			Middle			High
Value >>		*0*	*0.25*	*0.3*	*0.5*	*0.7*	*0.75*	*1*
Qureshi et al. (2011), Financial System 1	395	173			173			49
Qureshi et al. (2011), Financial System 2	395	159		127			83	26
Qureshi et al. (2011), Foreign Exchange 2	418	123			163			132
Qureshi et al. (2011), Foreign Exchange 2	282	52	58		84		56	32
Lim et al. (2011), Foreign Exchange	429	411						18
Lim et al. (2011), Credit Ceilings	429	416						13
Lim et al. (2011), Maturity Mismatches	429	421						8
Lim et al. (2011), Capital Requirements	429	410						19

Note: Low, Middle, and High indicate all possibe value of the Macroprudential Policy Index.
Numbers below indicate the number of incidents.

3.3. The Stylized Fact

Given the development of MPPs over time, our focus shifts now to the impact of MPPs on capital inflows. Figure 4 presents simple correlations between the Foreign Exchange 1 measure taken from Qureshi et al. (2011) and various types of capital flow measures, namely Banking Flows in % of GDP, Portfolio Debt flows in % of GDP and both types of flows as portfolio share measures. At a first glance there does not seem to be a strong impact of MPP measures on capital flows - the. Nearly all four regression lines are flat or only minimally downward sloping. If MPPs would be effective, however, we would recognise a significantly negative relationship between the two variables.

Figure 2: Macroprudential Policy Indices from Qureshi et al. (2011), Cross-Country Mean

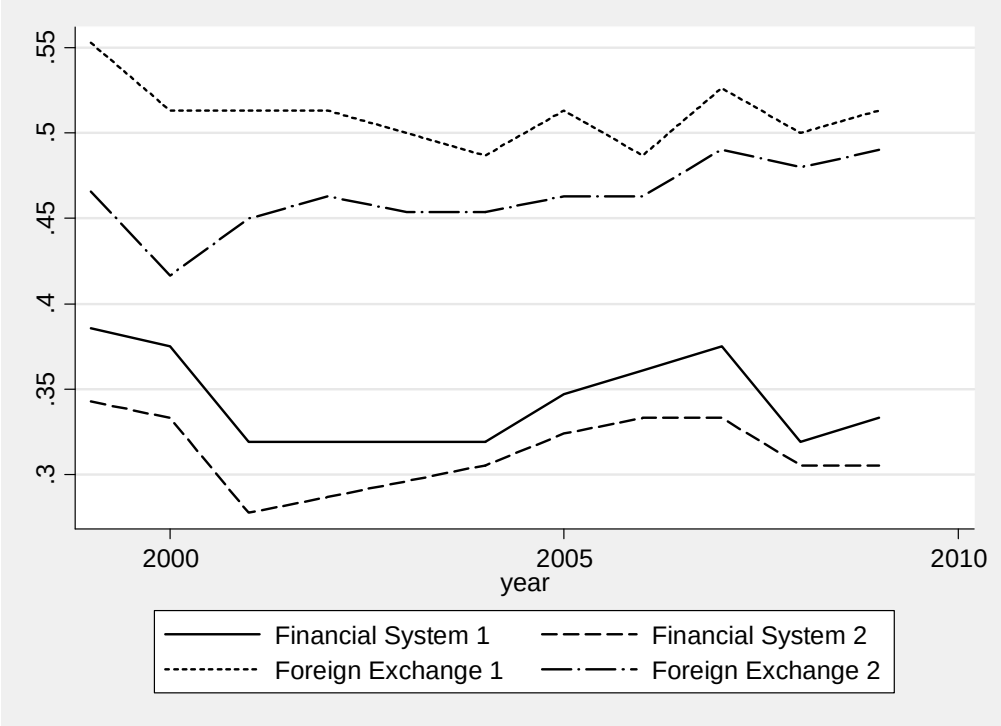


Figure 3: Macroprudential Policy Indices from Lim et al. (2011), Cross-Country Mean

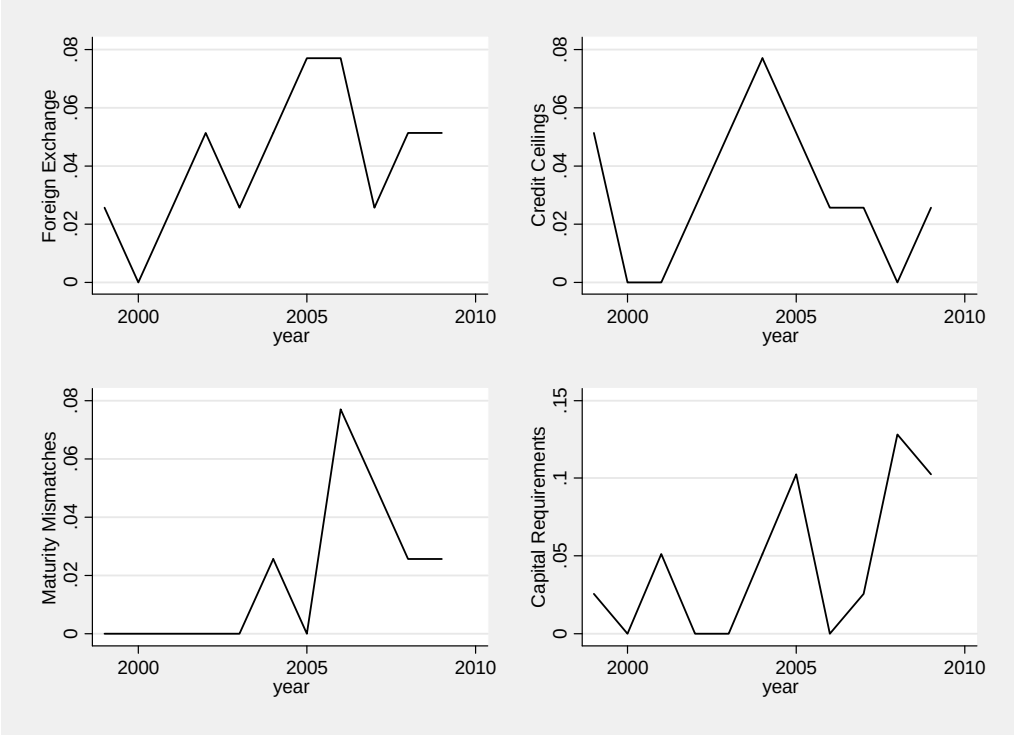


Figure 4: Correlation of MPPs and different Types of Capital Flows

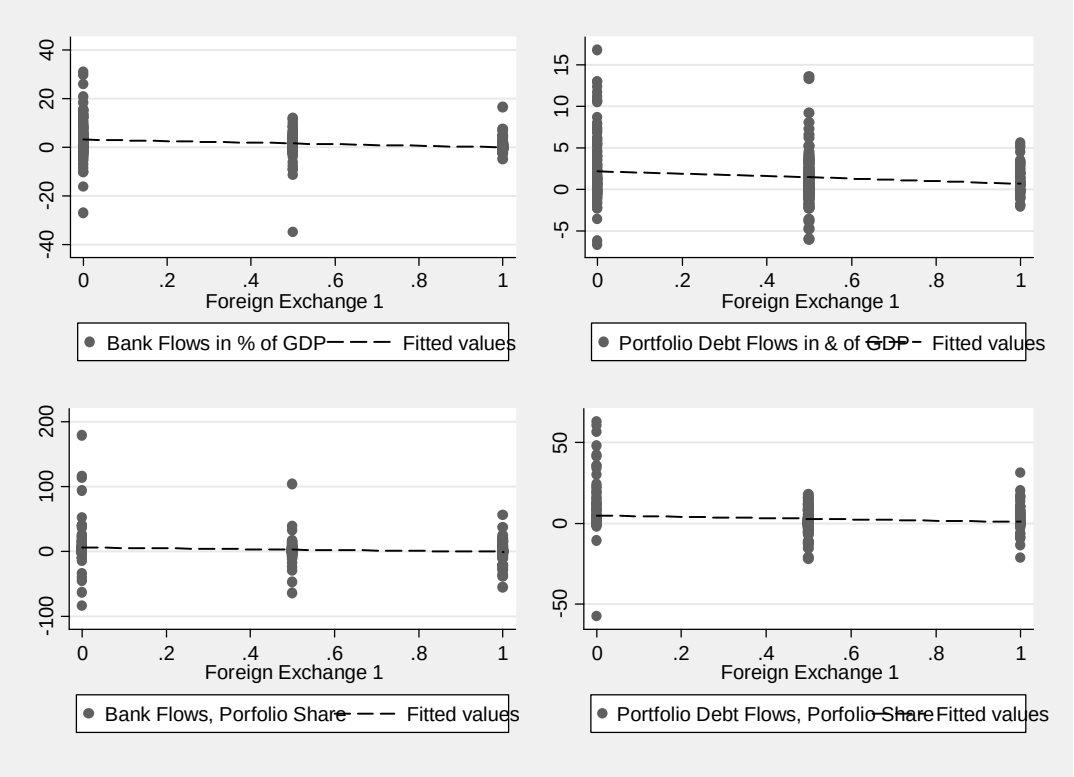
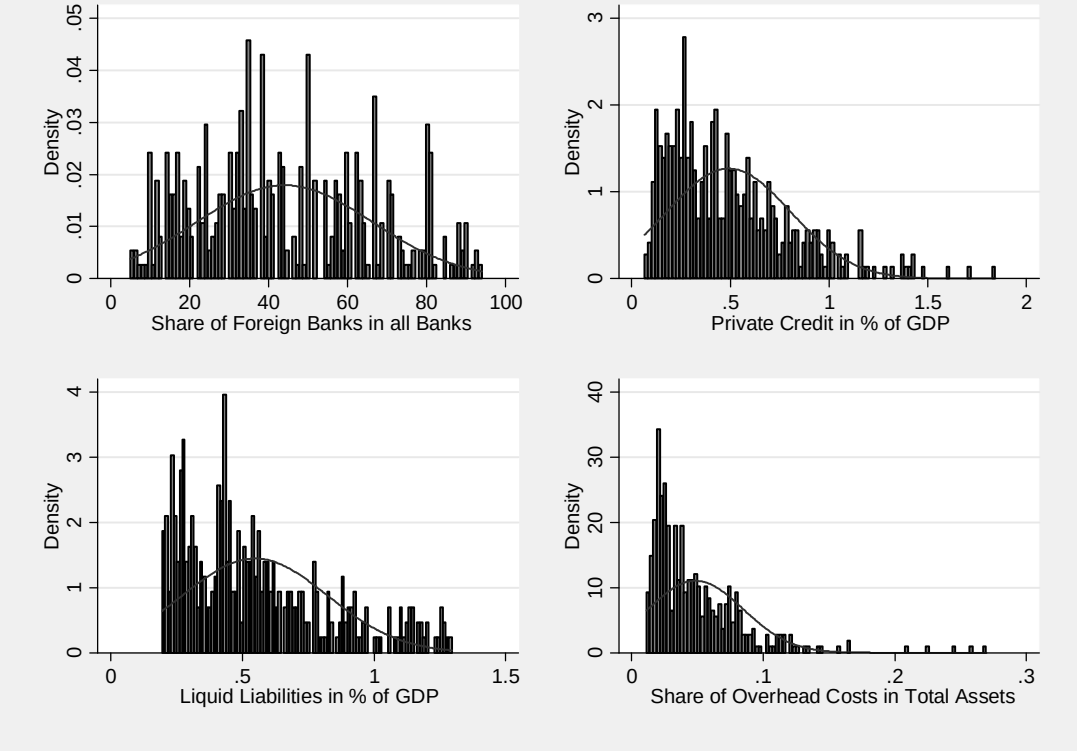


Figure 5: Heterogeneity in Financial Development across Sample Countries



Thinking about potential reasons why there could be a lack of impact from MPPs on capital inflows, a subject that comes into one's mind is the structure of the domestic financial system, the environment to which MPPs apply to in the first place. Figure 5 presents four different variables related to the domestic financial system, each represented by a sub-plot for all country/year observations of the corresponding variable in the sample. The four variables comprise the Share of Foreign Banks in all Banks, Private Credit in % of GDP, Liquid Liabilities in % of GDP, and the Share of Overhead Costs in Total Assets. It turns out that all of these variables exhibit a substantial degree of heterogeneity across countries and time.

Given this first observation, in the next step, the correlation exercise in Figure 4 is repeated for different levels of financial threshold variables. We consider the financial threshold variables Private Credit in % of GDP and the ratio of Overhead Costs and Total Assets and split the sample at the median of both variables. Figure 6 and Figure 7 present the results for the same MPP as above using portfolio shares of portfolio debt flows as a measure of capital flows. Figure 6 presents a sample split by private credit in % of GDP. The left panel in the figure shows that for the highest 50 % of country-year observations in private credit, we observe a negative relationship between MPPs and capital flows, hence latter ones are indeed affect for this subset of the sample. The right panel, containing the lowest 50% of country-year observations in private credit on the other hand indicates that there is no or even a slightly positive relationship between MPPs and capital inflows. This in turn would imply that MPPs are at best ineffective.

Evidence comes also from Figure 7 where the financial threshold variable is given by the ratio of Overhead costs to Total Assets. In the left panel, we see a slightly positive relationship for the high cost sample, indicating that MPPs are ineffective in this environment. In the right panel, we see again the negative relationship from above suggesting MPPs are effective in financial systems with low overhead costs. Concluding this section, we could identify indeed a higher effectiveness of MPPs in reducing capital inflows when certain financial threshold conditions are met. This *prima facie* evidence is now being examined in greater detail using a larger number of financial threshold variables and a more robust econometric approach.

Figure 6: Correlation of MPPs (Foreign Exchange 1) and Portfolio Debt Flows (Portfolio Shares) for High (left) and Low (right) Levels of Private Credit

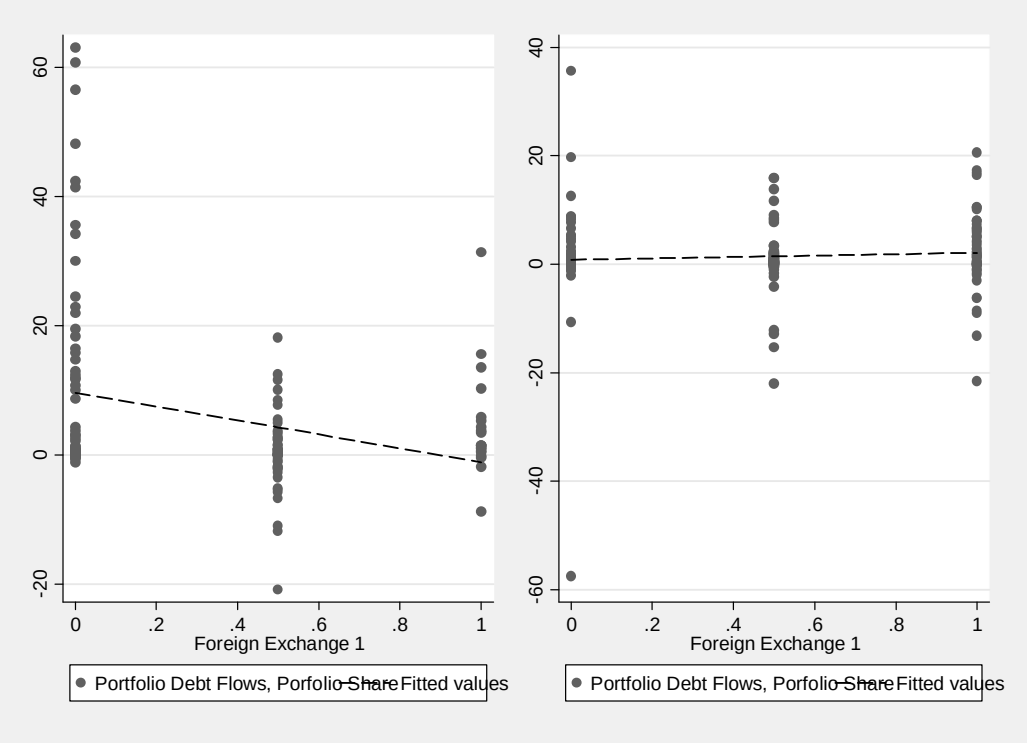
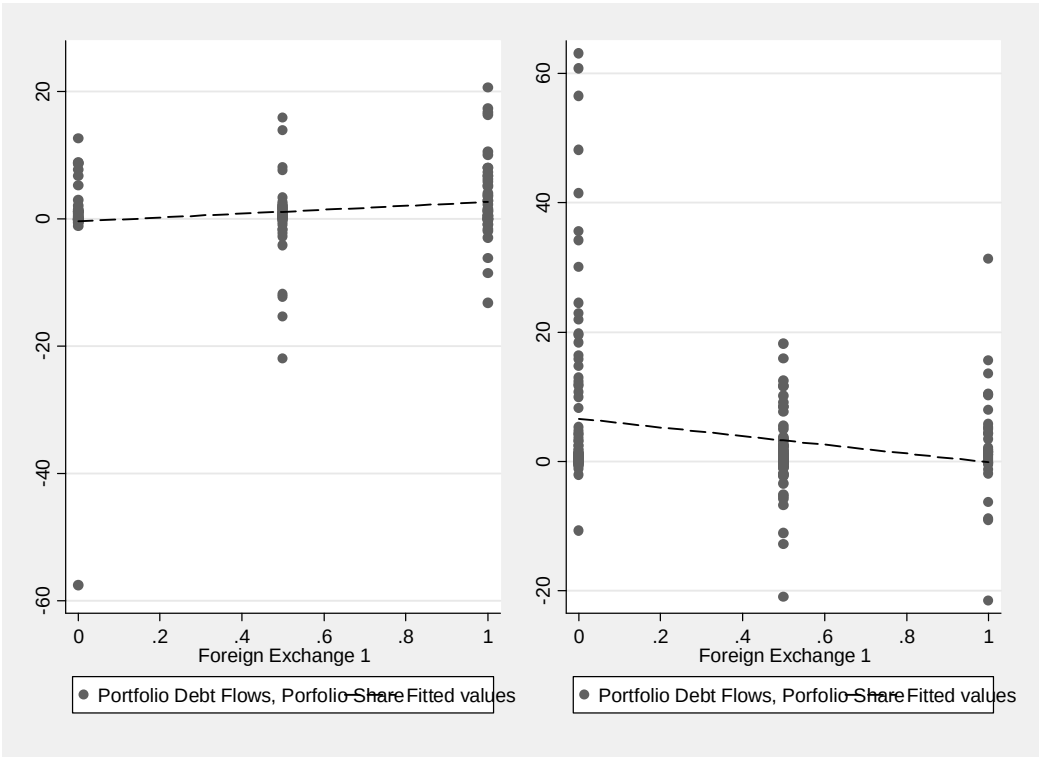


Figure 7: Correlation of MPPs (Foreign Exchange 1) and Portfolio Debt Flows (Portfolio Shares) for High (left) and Low (right) Levels of Overhead Costs



5. Empirical Analysis

5.1. Empirical Specifications

In order to examine the effectiveness of MPPs, we use a panel model with country and time fixed effects. First, a baseline specification is estimated that provides an estimate of the effectiveness of all types of MPPs for the average country in the sample.[7] The baseline specification is shown in equation (1) below:

$$k_{i,t} = \alpha_i + \alpha_t + \lambda\ MP_{i,t-1} + \beta\ X_{i,t-1} + \varepsilon_{i,t} \qquad (1)$$

where $k_{i,t}$ represents the proportion of capital flows to country *i* in all capital flows to developing countries at time *t* or capital flows to country *i* in percent of its GDP. Depending on the MPP measure, $MP_{i,t}$ represents a discrete or a dummy variable reflecting the use of an MPP in country *i* at time *t.* λ is the corresponding coefficient of interest and determines the effect of the MPP on capital flows to the average country in the sample. Provided that an MPP is effective, our prior here is for a negative coefficient, i.e. the MPP reduces the proportion of capital flows to country *i* and reduces capital flows to country *i* in percent of its GDP. Finally, $X_{i,t}$ represents a set of macroeconomic control variables (such as real GDP growth rate, nominal interest rates, trade integration, and the bilateral exchange rate with the US). α_i and α_t are country- and time-fixed effects and $\varepsilon_{i,t}$ is the error term. Control and MPP variables enter the specification with a one-year lag to minimize endogeneity concerns.[8] Standard errors in all specifications are clustered by country.

The baseline specification is followed by two additional specifications. A first specification is targeted at examining the role of threshold variables from the financial system in determining the effectiveness of MPPs and the second one on assessing spillover effects to other geographical aggregates and asset classes.

We start with the financial threshold specification, depicted in equation (2), which is targeted at detecting the role of financial sector thresholds on the effectiveness of MPPs:

[7] Please note that we also conduct a regional analysis based on three regional groupings: Latin America, Eastern Europe, and the Rest of the World. The results of this analysis indicate that some of the MPPs have worked slightly better in Eastern Europe and Latin America than in the Rest of the World but altogether, no strong regional differences have been found. Results are not displayed as in any case the next step would require explaining away regional differences with corresponding fundamentals, which is the task of specification (2).

[8] The results are largely similar when the MPP variable enters contemporaneously.

$$k_{i,t} = \alpha_i + \alpha_t + \lambda\ MP_{i,t-1} + \mu\ MP_{i,t-1} * F_{i,t-1} + \delta\ F_{i,t-1} + \beta\ X_{i,t-1} + \varepsilon_{i,t} \qquad (2)$$

The basic labeling of variables and coefficients in equation (2) corresponds to the one presented in the baseline specification. To examine the role of the intermediary in addition and here, especially the role of the banking system in modifying the effectiveness of MPPs, a set of financial threshold variables is interacted with the MPP variable. Financial threshold variables enter the specification one at a time through variable $F_{i,t}$ and MPPs enter through variable $MP_{i,t}$ again. Their corresponding interaction term is defined by $MP_{i,t} * F_{i,t}$. Coefficients λ and μ will now characterise this interaction and determine the effect of the MPPs on capital flows jointly. As due to the large number of financial threshold variables, an anticipated sign for these coefficients cannot be determined *a priori*, although their general interpretation is as follows. λ captures now the effect of an MPP on capital flows when the modifying financial threshold variable is equal to zero. Whether this is a likely or unlikely case has to be determined on a case-by-case basis. Coefficient μ on the other hand is associated with the interaction term and indicates how the impact of an MPP on capital flows will change for a variation in the financial variables. MPPs and threshold variables enter with a one period lag again.[9]

Finally, for the assessment of spillover effects of MPPs to other countries, a specification along the lines of Forbes et al. (2012) is adopted:

$$k_{i,t} = \alpha_i + \alpha_t + \lambda\ MP_{i,t-1} + \gamma MPN_{i,t-1} + \beta\ X_{i,t-1} + \varepsilon_{i,t} \qquad (3)$$

λ is also here the coefficient of interest indicating the change of capital flows to country *i* in response to the implementation of an MPP. As before, $MP_{i,t}$ represents again a discrete or dummy variable reflecting the use of an MPP in country *i* at time *t.* Provided that the MPP is effective in country *i*, our prior here is that for a negative coefficient as well. In addition, equation (3) contains a spillover term. $MPN_{i,t}$ is a corresponding discrete or dummy variable for the use of MPPs in the "neighbourhood" of country *i* at time *t*. For an MPP that is targeted at a specific country, we would expect an insignificant coefficient γ here, i.e. MPP measures in the neighbourhood of country *i* do not affect the share of capital inflows to country *i*. When coefficient γ is positive however, we

[9] As there may be a concern that MPPs could influence financial threshold variables contemporaneously, for robustness, latter ones also entered the specification with two lags. This however did not change the pattern of results substantially.

would observe negative spillover effects from domestic MPPs to neighbor countries. To measure $MPN_{i,t}$, we compute two different versions measures that are both GDP weighted: a first measures representing the GDP weighted average value of the MPP across all direct neighbour countries and a second measure taking on the corresponding GDP weighted average value of MPPs across all countries in the region in which the country is located.

5.2. Data

This subsection outlines the list of countries in the panel (see Table A.2. in Appendix), and briefly describes the variables used in the empirical analysis in addition to the MPPs measures. Appendix Tables A.3. to A.5. contain a detailed description of the data sources and summary statistics for all variables. Towards the end of this subsection, in addition, the process of the sample selection is explained. In all specifications, the data frequency is annual.

5.2.1. Capital flows

Capital flows represent the left-hand side variable in our analysis. Data on capital flows is taken from the IMF's International Financial Statistics (IFS) database. We use the liability side of the financial account for five classes of capital flows: Foreign Direct Investment (FDI), Portfolio Equity, Portfolio Debt, Bank Flows, and Other Flows. For most of the analysis, we use the share of capital flows to country *i* in total capital flows of the sample by year and asset class. Henceforth, we refer to this measure as "portfolio share". Portfolio shares are computed in two different versions, in a "standard" version and in a "strict" version. A more detailed description on how these shares are computed can be found in section 5.2.3. In most of the specifications, we additionally use capital flows in per cent of GDP as well. Although both variables should behave in a largely similar way following the introduction of an MPP, differences between the two measures can occur when the GDP of the policy-introducing country is affected as well or the general pattern of capital flows to developing countries changes.

5.2.2. Control Variables

Data on control variables is taken from the World Economic Outlook (WEO) and the International Financial Statistics (IFS) database. We compute the real growth rate based on the series "Gross domestic product, constant prices" from the WEO database. The interest rate is composed of two interest rate series from the IFS database: whenever available, the short-term Treasury Rate is used. If this series is not available, the national Central Bank Policy Rate is used. Finally, trade integration is

calculated as the sum of exports and imports divided by GDP, and the bilateral exchange rate with the US dollar is included in its original form. Both variables are taken again from the WEO database.

5.2.3. Financial Threshold Variables

Data for threshold variables in the financial and especially the banking system is taken from Beck et al. (2000). The database contains measures of bank profitability, credit availability, financing structure of banks, concentration, as well stock- and bond market capitalisation among others. All measures relate to the country level and vary over countries and time.

5.2.4. Sample Selection

To obtain a sample of middle income countries and avoid biasing our results due to the inclusion of publicly administered capital flows, small island economics with very high and volatile financial account figures or windfall profits from oil exporters, we implement the following selection procedure: Starting with all countries in the world for which IFS data is available, we drop all countries from the sample that:

- Receive Official Development Assistance of more than 10 per cent of Gross National Income
- Export oil with a value of more than 10 per cent of GDP
- Are island economies with a size of less than 20,000 square kilometres

The remaining countries are then included when their nominal GDP per capital falls in the range of 1000 and 15000 US dollar.Using all countries that fulfil the basic conditions above, we define a set of additional conditions that have to be met in a certain number of periods for a country to be included in the analysis. These additional conditions comprise the presence of all four macroeconomic control variables, i.e. real growth rate, interest rate, trade integration, and the bilateral exchange rate with the US dollar, the presence of at least one capital flow type as well as the presence of at least one MPP measure for each country-year observation. The number of periods in which the above mentioned additional conditions have to be met, differs according to the "strictness" of the portfolio share measure. For the general analysis and thus also for the "standard" measure of portfolio shares, the number of periods in which the conditions have to be met for a country amounts to 6. The number of 6 periods is the solution to the trade-off of a reasonably large sample and avoiding too large differences in the number of countries included in the calculation across periods to avoid a bias in the results. For the "strict" portfolio share measure, the number of periods comprises the full sample and therefore amounts to 11**.**

6. Results

6.1. The Baseline Specification

First, the baseline specification, equation (1) is estimated for all combinations of capital flow types, and MPP measures. As there are 5 different types of capital flows – namely FDI, Portfolio Equity, Portfolio Debt, Bank Flows and Other Flows – and 8 different MPPs, the resulting number of specifications in this exercise for each version of the left-hand side variable amounts to 40 specifications. For illustrative purposes, the results of the first five specifications, using capital flows in per cent of GDP as the left-hand side measure are depicted in Table 2. All specifications are based on the first version of the MPP measure for *restrictions in the financial system* ("Financial System 1") taken from Qureshi et al. (2011). This measure is based on entries in the AREAER database in the categories "Borrowing abroad" and "Differential treatment of deposit accounts held by non-residents".

Table 2: Baseline Regression, example

Dependent Variable: Percent of GDP	**Bank**	**PF Debt**	**FDI**	**PF Equity**	**Other**
GDP Growth in t-1	0.421**	0.095	-0.171	0.045	0.093**
	(0.03)	(0.19)	(0.32)	(0.13)	(0.02)
Interest Rate in t-1	0.096*	-0.008	-0.033	0.006	0.009
	(0.10)	(0.63)	(0.29)	(0.38)	(0.43)
Exchange Rate to USD in t-1	-0.002***	-0.003*	-0.001	0.001	-0.001***
	(0.00)	(0.06)	(0.13)	(0.53)	(0.00)
Trade Integration in t-1	0.055	0.010	0.089*	0.008	0.012
	(0.13)	(0.67)	(0.06)	(0.28)	(0.43)
MPP ^{x} in t-1	-1.310	-1.312	-1.724	-0.055	1.082
	(0.39)	(0.12)	(0.28)	(0.84)	(0.19)
Constant	-8.262**	1.949	-1.349	-0.850	-0.682
	(0.05)	(0.40)	(0.64)	(0.35)	(0.63)
Observations	327	287	348	294	348
R-squared	0.196	0.078	0.168	0.068	0.206
Number of ifs	34	30	36	30	36

Notes:
P-Values in parentheses. *** p<0.01, ** p<0.05, * p<0.1
MPP ^{x}: Macroprudential policy; here: Financial System 1, Qureshi et al. (2011)

Turning to the specifications, each one listed in Table 2 has between 294 and 348 observations and is based on 30-36 countries. The corresponding R-squared measures range between 7 and 21 per cent. We first examine sign and significance levels of the coefficients associated with the vector of

control variables that was depicted as $X_{i,t}$ in equation (1). As expected, whenever the real growth rate is significant, it carries a positive sign. This implies that capital flows react positively to good macroeconomic conditions in the target country and is in line with economic theory. The short-term interest rate has two possible interpretations. First, it serves as a measure of returns from capital and thus one would expect a positive sign here. Second, it could also measure risk and therefore carry a negative sign. The fact that most of the coefficients for the short-term interest rate in Table 2Table 2 are insignificant strengthens the presumption that two opposing effects are being observed. Only bank flows react positively to an increase in interest rates. The bilateral exchange rate with the US dollar has a negative sign and is significant in three out of five cases. This implies that an increase in the exchange rate, and hence, an increase in the local currency price of one dollar or a depreciation, leads to a reduction in capital inflows. This implies that investors evaluate also the exchange rate as a measure of risk rather than return. Finally, trade integration in per cent of GDP is especially relevant for FDI flows – a result that is backed-up well by a large literature on FDI and international trade. It should be noted that the variables so far comprise "pull" factors that determine capital inflows through the demand side. "Push" factors and hence supply side variables cannot be identified separately, as their impact is taken up by the time fixed effects – this, however, is a more rigorous approach then adding such variables individually to the specification. The same holds for time-invariant variables and country fixed effects. Finally, λ, the coefficient of interest in equation (1) that measures the impact of the MPP measure on the left-hand side variable, is evaluated across the different specifications. It turns out that MPP measures have, with the exception of the category "other flows", negative signs and are insignificant in all cases.

Since Table 2 only shows the impact of one MPP on five different asset classes, Table 3 completes the picture by showing all possible combinations of left-hand side asset class measures and MPPs. It turns out that only very few MPPs have a significant impact on capital flows. In relation to banking flows, the introduction of credit ceilings for example reduces banking flows in per cent of GDP by 1.5 percentage points. Regarding portfolio debt flows in per cent of GDP, the introduction of capital requirements reduces latter ones by 1.6 percentage points. Evidence from the last two columns shows that equity-based and other flows sometimes even increase and thus spillovers across asset classes may potentially occur.

Nevertheless, in most of the cases, MPPs seem to be ineffective for the average country in the sample. This mirrors to some extent the picture that emerged in the stylised facts section, where in the first figure no clear relationship between MPP measures and capital flows could be established.

Table 3: The Effectiveness of MPPs using per cent of GDP

Dependent Variable: Percent of GDP	Bank	PF Debt	FDI	PF Equity	Other
Qureshi et al. (2011)					
Financial System 1	-1.310	-1.312	-1.724	-0.055	1.082
Financial System 2	-0.702	-0.867	-1.641	0.025	0.613
Foreign Exchange 1	0.856	-0.317	-0.867	-0.269	0.550
Foreign Exchange 2	-1.183	-0.642	-0.342	0.825	0.227
Lim et al. (2011)					
Foreign Exchange	0.050	0.512	-0.558	-0.170	-0.444
Credit Ceilings	-1.506*	-1.270	0.513	0.616**	1.010**
Maturity Mismatches	-0.203	-0.665	3.104	-0.019	1.880**
Capital Requirements	-0.975	-1.583**	1.125	0.292	0.126

Table 4: The Effectiveness of MPPs using Portfolio Shares (standard)

Dependent Variable: Portfolio Share	Bank	PF Debt	FDI	PF Equity	Other
Qureshi et al. (2011)					
Financial System 1	2.365	-0.035	-0.967	-0.803	-14.032
Financial System 2	2.242	0.752	-1.252	-1.219	-14.021
Foreign Exchange 1	-14.549**	3.690	-1.168***	8.802	20.198
Foreign Exchange 2	-13.225**	5.206	-0.771	8.059	-26.782
Lim et al. (2011)					
Foreign Exchange	-0.901	2.525	-0.000	-9.720	40.182
Credit Ceilings	-7.891	-1.997	0.457	3.258	-37.959*
Maturity Mismatches	4.957	0.252	0.422	-23.035	-7.587
Capital Requirements	3.725	-4.318**	1.220	-1.063	-4.516

As throughout the paper portfolio shares are used as additional capital inflow measure, Table 4 and Table 5 provide evidence on latter one. The measure is an approximation of the portfolio share of a country in all flows of this asset class. As described above, the portfolio share measure exists in two versions: a standard version that is presented in Table 4 and a strictly computed version that is presented in Table 5. As can be seen, the results from both portfolio share measures are very similar suggesting that the standard version is only moderately affected by changes in the sample composition over time. However, there seems to be some evidence that the portfolio share results differ from the per cent of GDP measures. Still, the majority of the coefficients is insignificant

suggesting that MPPs are mostly ineffective for the average country. The number of significantly negative coefficients and thus effective MPPs is indeed slightly higher than in the per cent of GDP case, this is especially often the case for foreign exchange restrictions.

Taking all of the evidence together, the goal of the next subsections is to uncover the reasons why most of the MPPs are ineffective, identify the conditions under which they may become effective, and finally assess potential side effects and international distortions in the latter case.

Table 5: The Effectiveness of MPPs using Portfolio Shares (strict)

Dependent Variable: Portfolio Share (strict)	Bank	PF Debt	FDI	PF Equity	Other
Qureshi et al. (2011)					
Financial System 1	4.134	1.067	-1.153	-1.527	-11.969
Financial System 2	6.262	2.300	-1.765	-2.562	-13.308
Foreign Exchange 1	-15.160**	6.650	-1.379***	8.453	14.901
Foreign Exchange 2	-15.056*	11.240*	-1.044	11.858	-40.098*
Lim et al. (2011)					
Foreign Exchange	-1.155	2.268	0.051	-10.699	33.574*
Credit Ceilings	-7.956	-2.011	0.485	3.466	-26.541*
Maturity Mismatches	5.649	-0.405	0.435	-24.385	-6.651
Capital Requirements	4.375	-5.290**	1.399	-1.740	-9.945

6.2. Financial Thresholds

6.2.1. Legal Circumvention Through Foreign Exposure

The first hypothesis about the effectiveness of MPPs that can be tested is related to legal circumvention of the policy rules. The empirical specification for this exercise is based on equation (3) and the corresponding box describing the economic intuition and the related empirically testable implication is located in the right centre box of Figure 1. Possible incidents may occur when households take out credit from non-resident banks directly and thus avoid an intermediation by the domestic banking system. As the latter one is usually targeted by MPPs, this practice may reduce the effectiveness of MPPs and thus prevent the reduction of foreign capital inflows. A similar outcome may occur when the share of foreign banks in a country is large and capital can move within rather than between banks across countries. In the next step, we examine a potential role of both channels empirically. We therefore test whether the impact of MPPs is specifically low when the corresponding financial threshold variables, loans from non-resident banks and the share of foreign

banks in the banking system, take on high values. The results for these exercises, in each case carried out for the two left-hand side variables, standard portfolio share measure and the capital flows in per cent of GDP measure, are depicted in Table 6 and Table 7. In each table, the impact of all MPPs on the left-hand side variables bank flows and portfolio debt flows is presented. The impact is characterised through the presentation of two coefficients that where both estimated from equation (2): coefficient λ, the level term of the MPP effect, and coefficient μ, the corresponding interaction term.

Table 6: Testing for Legal Circumvention of MPP using Portfolio Shares

Interaction Variable	**Loans from Non-resident Banks**		**Share of Foreign Banks**	
Dep. Variable: Portfolio Share	**Bank**	**PF Debt**	**Bank**	**PF Debt**
	Qureshi et al. (2011)			
Financial	-2.863	0.115	12.770	5.468
System 1	100.922	-4.304	-12.650	-7.384
Financial	-1.167	-1.236	1.312	2.160
System 2	58.289	40.132	2.081	-2.137
Foreign	-21.807**	-3.572	-16.822*	-2.605
Exchange 1	139.357	141.239***	4.739	8.334
Foreign	-15.267	-1.504	-10.846	-0.448
Exchange 2	0.913	147.217***	-2.409	7.366
	Lim et al. (2011)			
Foreign	5.612	0.764	16.974	3.159
Exchange	-122.038**	31.490	-25.017	-0.863
Credit	-6.087	-3.265	-28.186	-0.325
Ceilings	14.064	45.628	30.598	-1.647
Maturity	14.505	19.886**	37.687*	13.442
Mismatches	-259.673	-527.523***	-52.036**	-20.202
Capital	46.954	-6.716	30.189	3.853
Requirements	-934.228	62.932	-37.210	-11.459

Notes:
First row - Level effect of the macroprudential policy
Second row - Interaction effect of the macroprudential policy

Starting with columns 3 and 4 in each of the tables, it turns out that the presence of foreign banks does not seem to be an important explanation. Out of four significant coefficient pairs, only two are in line with the story, indicating a greater ineffectiveness of MPPs for higher shares of foreign banks in the domestic banking system. A similar conclusion can be drawn for the Loans from Non-resident Banks measure in case portfolio shares are used as left-hand side variable. Although the foreign exchange exposure policies have a negative level and a positive interaction effect on the two left-hand side variables, there are also cases, where the story is not supported. A remarkable difference

occurs, however, when the corresponding financial threshold is examined for the capital flows in per cent of GDP measure. Here, for the banking flow measure, a large number of interaction terms is positively significant suggesting that an increase in loans from non-resident banks may indeed lead to less effective MPPs. Interestingly, the reverse is true for portfolio debt flows as here, the interaction term is also significant and carries a negative sign in the majority of cases.

Table 7: Testing for Legal Circumvention of MPP using Capital Flows in per cent of GDP

Interaction Variable	**Loans from Non-resident Banks**		**Share of Foreign Banks**	
Dep. Variable: Percent of GDP	**Bank**	**PF Debt**	**Bank**	**PF Debt**
	Qureshi et al. (2011)			
Financial	-3.202*	1.232*	-2.727	0.697
System 1	9.257*	-9.419***	0.033	-0.044
Financial	-2.901	1.387*	-3.865	1.159
System 2	11.230**	-9.827***	0.071	-0.042
Foreign	-4.318**	1.827	-2.053	-0.399
Exchange 1	32.935***	-14.857*	0.076	0.015
Foreign	-10.435**	2.393	-2.246	-2.836
Exchange 2	37.620**	-19.483	0.031	0.051
	Lim et al. (2011)			
Foreign	-0.431	2.087*	1.149	-0.733
Exchange	3.022	-11.273**	-0.023	0.024
Credit	0.802	-1.304	-3.417***	-1.103
Ceilings	-11.237***	0.534	0.056**	-0.003
Maturity	2.278*	-1.186	-4.262	0.885
Mismatches	-15.299	2.877	0.097	-0.039
Capital	-2.912	-1.178	13.557*	-3.533**
Requirements	9.276	-2.801	-0.363*	0.045

Notes:
First row - Level effect of the macroprudential policy
Second row - Interaction effect of the macroprudential policy

Figure 8 and Figure 9 visualise the interaction terms for two capital flow-macroprudential policy combinations. In both of them, the marginal effect of a macroprudential foreign exchange measures (measured by the "Foreign Exchange 1" measure from Qureshi et al., 2011) on capital flows in per cent of GDP depending on the level of loans from non-resident banks in per cent of GDP is shown.

Figure 8 presents bank flows as the left-hand side variable and Figure 9 shows corresponding portfolio debt flows. As indicated in the description of Table 6 and Table 7, the graph in Figure 8 is in line with the explanation that a larger share of loans from non-resident banks in per cent of GDP makes MPPs less effective. Figure 9, again in line with the previously described tables, shows that portfolio flows are reduced following the policy.

Figure 8: Loans from Non-resident Banks Reduce the Impact of MPP on Bank Flows

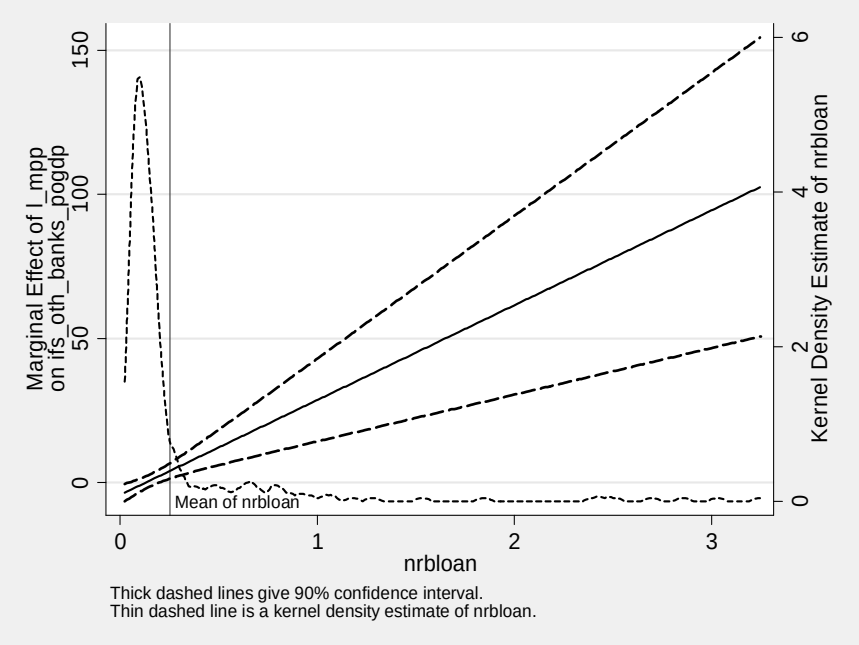
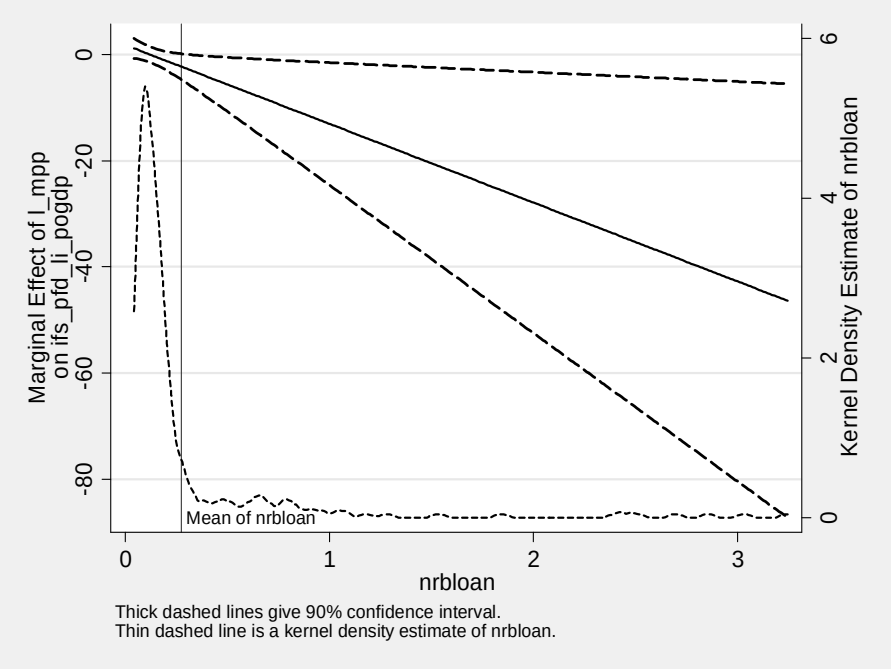


Figure 9: Loans from Non-resident Banks Increase the Impact of MPP on Portfolio Debt Flows



6.2.2. Costs are Small/Non-binding Constraint

Moving on in Figure 1, the next hypothesis that can be tested is whether costs arising from the introduction of an MPP – for both, investors and the financial intermediary – are relatively small and thus the MPP seems to be ineffective as capital flows do not change significantly. To examine this hypothesis, we focus in the context of equation (2) on four different financial threshold variables that are each related to the purpose of an MPP. The four variables comprise International Debt Issues in per cent of GDP, the ratio of Offshore Bank Deposits and Domestic Bank Deposits, Private Credit in per cent of GDP and Liquid Liabilities in per cent of GDP. In order of mention these four variables correspond to the four groups of MPPs: First, "Financial System 1 and 2" from Qureshi et al. (2011), second, "Foreign Exchange 1 and 2" from the same source as well as "Foreign Exchange" from Lim et al (2011), third, Credit Ceilings, and fourth, Maturity Mismatches – where the latter two are also taken from Lim et al. (2011).

Table 8: Size of MPP Costs using Portfolio Shares

Interaction Variable	**Int. Debt Issues**		**Offshore Deposits**		**Private Credit in % of GDP**		**Liquid Liabilities in % of GDP**	
Dep. Variable: Portfolio Share	**Bank**	**PF Debt**	**Bank**	**PF Debt**	**Bank**	**PF Debt**	**Bank**	**PF Debt**
Qureshi et al. (2011)								
Financial System 1	6.849 -131.292	-0.968 87.783						
Financial System 2	3.434 -145.479	1.354 2.690						
Foreign Exchange 1			-16.169** 9.220	2.349 7.921		13.905** -23.175**		
Foreign Exchange 2			-15.549* 13.630	3.880 7.872				
Lim et al. (2011)								
Foreign Exchange			-0.535 -2.845	2.715 -1.669				
Credit Ceilings					-20.561 23.788	-0.760 -2.284		
Maturity Mismatches							0.391 8.569	-17.894*** 33.898***
Capital Requirements								

Notes:
First row - Level effect of the macroprudential policy
Second row - Interaction effect of the macroprudential policy

In all four cases, the argument goes as follows: when the level of the financial threshold variable is relatively high, the introduction of an MPP will have a substantial impact on capital flows. Take the example of international debt issues first. When the amount of international debt of a country is high, the introduction of an MPP regulating investments by non-residents may have a strongly

negative effect on capital inflows. When the amount of international debt issues is low, however, the costs of an MPP may rather be negligible and we would not observe a reduction in capital inflows. We therefore test in all four pairs for the effectiveness of MPPs depending on the corresponding financial threshold variable. Examining jointly Table 8 and Table 9Table 8, it turns out that in most cases MPPs are unaffected by changes in the four financial threshold variables. This in turn suggests that the negligibility of associated costs cannot be a major explanation for the ineffectiveness of MPPs. There are some noteworthy exceptions however. Latter ones are depicted in Figure 10 to Figure 12. First, Figure 10 shows that an increase in Offshore Deposits in per cent of GDP increases the costs arising from the MPP and thus reduces capital inflows in the banking sector (here in per cent of GDP). As suggested above, the mechanism works potentially through an increase in the "tax base" to which the "tax" macroprudential policy applies. A similar result is found for Private Credit in % of GDP and credit growth-related MPPs.

Table 9: Size of MPP Costs using Capital Flows in per cent of GDP

Interaction Variable	**Int. Debt Issues**		**Offshore Deposits**		**Private Credit in % of GDP**		**Liquid Liabilities in % of GDP**	
Dep. Variable: Percent of GDP	**Bank**	**PF Debt**	**Bank**	**PF Debt**	**Bank**	**PF Debt**	**Bank**	**PF Debt**
Qureshi et al. (2011)								
Financial	-0.584	0.019						
System 1	-41.420	-59.657						
Financial	-1.539	2.403						
System 2	-26.788	-78.102						
Foreign			1.285	0.230				
Exchange 1			-4.350	-0.163				
Foreign			2.416	-0.221				
Exchange 2			-23.895**	1.388				
Lim et al. (2011)								
Foreign			1.250***	-0.715				
Exchange			-10.630***	10.853***				
Credit					-1.121	-1.876		
Ceilings					-0.872	0.997		
Maturity							1.638	-4.574
Mismatches							-3.027	7.656
Capital								
Requirements								

Notes:
First row - Level effect of the macroprudential policy
Second row - Interaction effect of the macroprudential policy

When the share of Private Credit in % of GDP increases and thus the constraints that the financial sector faces in fulfilling the requirements of the MPP are higher, the impact of an MPP on capital inflows might even be stronger. Figure 11 shows exactly this point. An increase in the financial threshold variable reduces the portfolio share of debt flows for high threshold values significantly.

Figure 10: Effectiveness and Costs of FX-Related MPP

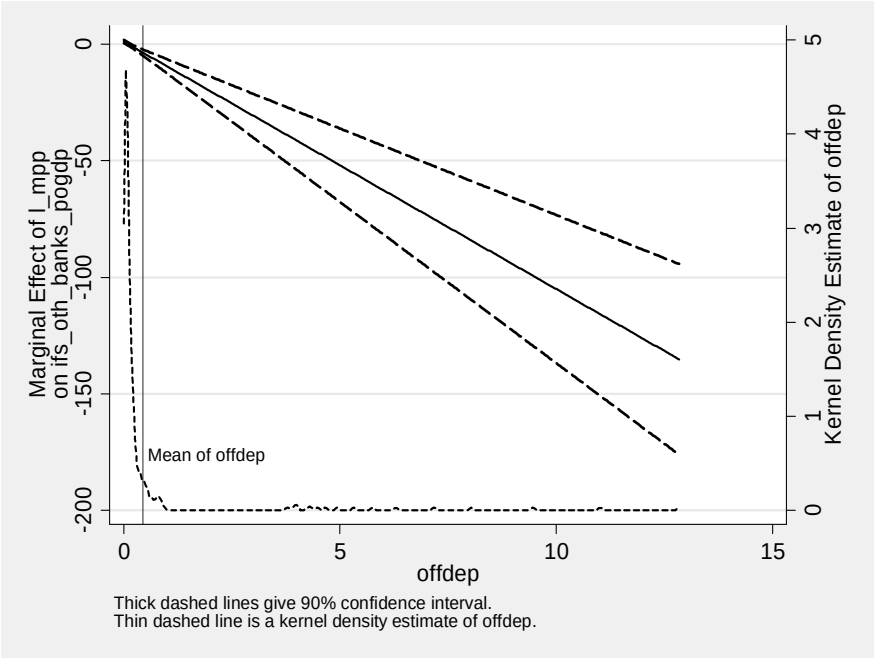
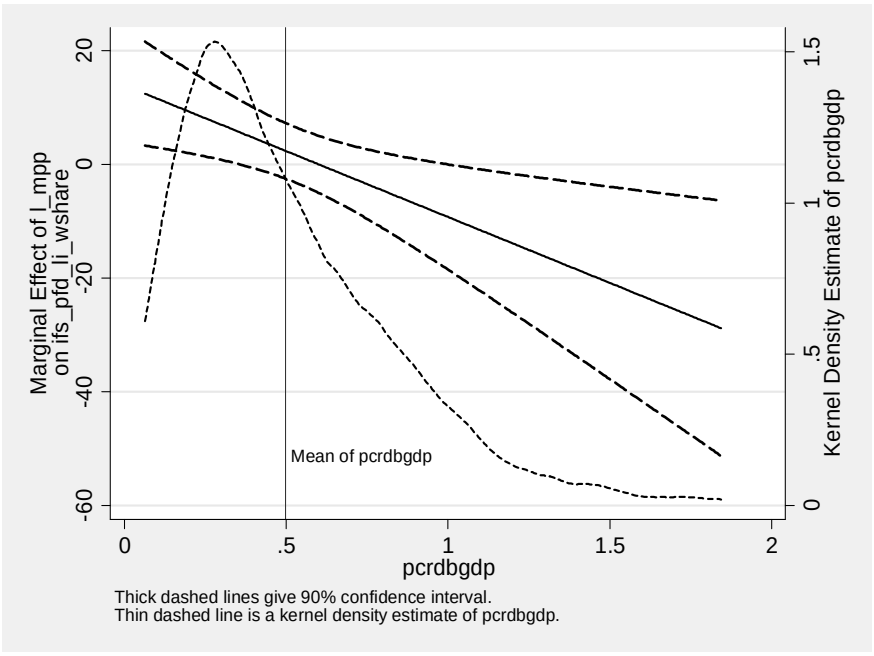
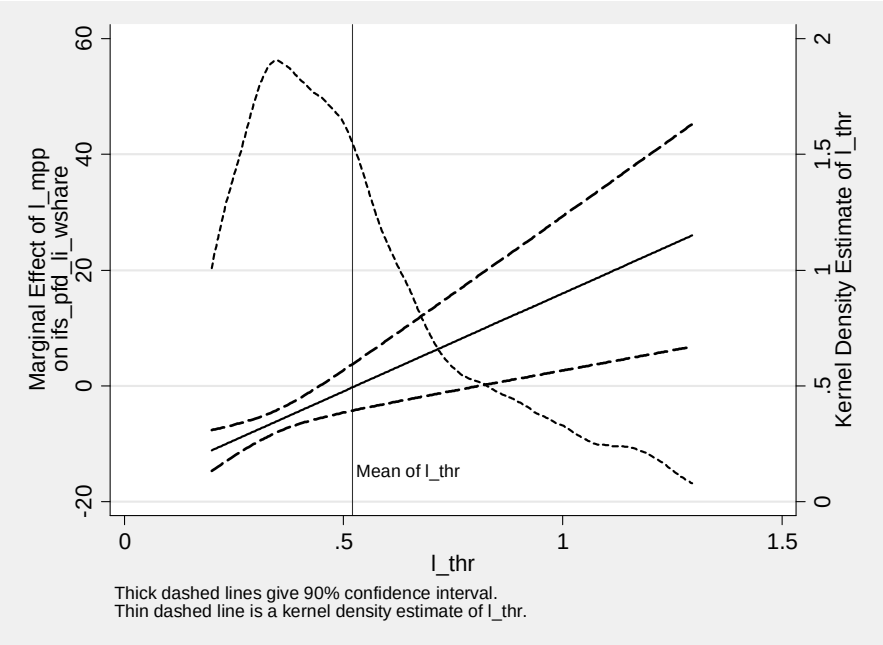


Figure 11: Effectiveness and Costs of Credit Growth-Related MPP



Finally, Figure 12 shows a counter-example. Here, an increase in the financial threshold variable, measured through Liquid Liabilities in per cent of GDP leads to a lower effectiveness of MPPs that are targeted in lengthening maturities. However, the last result should not be overstated as the MPP targeted to reduce maturity mismatches does not show much variation over countries and time and second, an increase in the percentage of GDP value in liquid liabilities may equally be accompanied by an increase in illiquid liabilities.

Figure 12: Effectiveness and Costs of Maturity Related MPP



6.2.3. Costs are Substantial vs. Illegal Circumvention

The final subsection deals with the role of the banking system profitability and here, especially with the cost structure in determining the impact of MPPs on capital inflows. By establishing the link between costs and MPPs, it is possible to differentiate between two explanations for the ineffectiveness of MPPs. Figure 1 presents these two explanations: the first explanation corresponds to the left box in the centre of Figure 1 and the second to its after-next-neighbour, the fifth box from the right. Again all hypotheses are tested using equation (2). The first explanation characterises a situation in which the effectiveness of MPPs is positively dependent on costs. A related story would go as follows. If MPPs become more effective as costs decrease and thus profit conditions improve, one would expect that banks bear the costs in the first place.

Table 10: Effectiveness of MPP Depending on Costs using Portfolio Shares

Interaction Variable:	Overhead Costs		Cost to Income Ratio		Z-Score	
Dep. Variable: Portfolio Share	**Bank**	**PF Debt**	**Bank**	**PF Debt**	**Bank**	**PF Debt**
			Qureshi et al. (2011)			
Financial	-2.863	0.115	12.770	5.468	11.220	-0.862
System 1	100.922	-4.304	-12.650	-7.384	-1.496	0.155
Financial	-1.167	-1.236	1.312	2.160	11.909	1.413
System 2	58.289	40.132	2.081	-2.137	-1.494	-0.005
Foreign	-21.807**	-3.572	-16.822*	-2.605	-3.778	3.272
Exchange 1	139.357	141.239***	4.739	8.334	-1.695	0.188
Foreign	-15.267	-1.504	-10.846	-0.448	10.432	4.257
Exchange 2	0.913	147.217***	-2.409	7.366	-2.074**	0.198
			Lim et al. (2011)			
Foreign	5.612	0.764	16.974	3.159	2.407	-0.010
Exchange	-122.038**	31.490	-25.017	-0.863	-0.394	0.275
Credit	-6.087	-3.265	-28.186	-0.325	0.802	3.059
Ceilings	14.064	45.628	30.598	-1.647	-0.182	-0.695
Maturity	14.505	19.886**	37.687*	13.442	20.724*	17.940
Mismatches	-259.673	-527.523***	-52.036**	-20.202	-1.790**	-1.894*
Capital	46.954	-6.716	30.189	3.853	-43.080***	-2.295
Requirements	-934.228	62.932	-37.210	-11.459	4.387***	-0.155

Notes:
First row - Level effect of the macroprudential policy
Second row - Interaction effect of the macroprudential policy

Then, an increase in bank-related costs or a worsening of profit conditions may make it more difficult for banks to bear such costs and thus render MPPs more effective. The second explanation describes the opposite pattern. Here, the effectiveness of MPPs is negatively dependent on costs and the corresponding argument would go as follows. When banks do not bear the costs of the MPP in the first place and face an increase in costs or a deteriorating profit conditions, banks may be more willing to support their customers by helping them to illegally circumvent the rules related to the policy. An increase in costs may therefore lead to less effective MPPs.

In this subsection, we test these two hypotheses against each other using three financial threshold measures of costs and profit conditions. First, the ratio of Overhead Costs to Total Assets is considered, then the Cost to Income ratio and finally, the Z-score, a measure of the probability of a bank's bankruptcy. While the first two indicate higher costs or deteriorating profit conditions through an increase in the respective measure, the Z-score is inversely defined and decreases in such a situation.

Table 10: Effectiveness of MPP Depending on Costs using Capital Flows in per cent of GDP

Interaction Variable	Overhead Costs		Cost to Income Ratio		Z-Score	
Dep. Variable: Percent of GDP	**Bank**	**PF Debt**	**Bank**	**PF Debt**	**Bank**	**PF Debt**
Qureshi et al. (2011)						
Financial	-0.903	-2.906*	-1.406	-5.257**	-0.184	0.156
System 1	-15.605	46.935	-0.245	5.974**	-0.113	-0.080
Financial	-0.593	-2.574	-1.237	-4.648*	1.400	0.996
System 2	-9.290	50.601*	0.430	5.713*	-0.198	-0.129
Foreign	1.599	-2.961*	4.859*	-4.754**	0.885	0.642
Exchange 1	-16.869	58.801***	-5.218	6.306***	-0.051	-0.068
Foreign	-0.493	-3.778*	1.429	-6.307*	2.183	0.399
Exchange 2	-25.255	92.336***	-3.429	7.683**	-0.146	-0.073
Lim et al. (2011)						
Foreign	0.843	-0.911	-1.170	-2.090	-0.933	1.104
Exchange	-13.844	26.045	1.667	3.469	0.140	-0.071
Credit	-3.892**	-2.766	-8.488*	-5.827	2.677**	0.874
Ceilings	54.869**	35.989	9.522	6.160	-0.492***	-0.274
Maturity	1.790	4.478*	38.053***	9.017	11.422***	0.490
Mismatches	-50.622	-149.013**	-58.798***	-15.164	-1.288***	-0.118
Capital	10.866	-2.709	7.640	-0.963	-6.252	-0.546
Requirements	-263.776	18.844	-12.483	-1.168	0.381**	-0.128**

Notes:
First row - Level effect of the macroprudential policy
Second row - Interaction effect of the macroprudential policy

Table 10 shows the results for portfolio shares as the left-hand side variable and Table 11 shows the corresponding results when capital inflows in per cent of GDP are used. In the first four columns of both tables, i.e. in the columns that present the cost measures, the prevailing pattern turns out to be a negative level effect, measured through the coefficient λ, and a positive interaction effect, indicated by coefficient μ, suggesting an increase in banking-related costs decreases the effectiveness of MPPs. Supporting evidence is found also from the last two columns where the opposite pattern, a positive level term and a negative interaction term, emerges. Both observations strongly support the second of the above mentioned explanations, whereby an increase in costs is negatively related to the effectiveness of MPPs and thus banks may help their customers to circumvent MPPs. In Figure 13 to Figure 16, some key coefficients from the tables are presented graphically. Figure 13 shows that for a low level of overhead costs, the MPP – in this case, the foreign exchange restriction "Foreign Exchange 1" taken from Qureshi et al. (2011) – is indeed effective by reducing the inflow of bank flows when using the portfolio share measure on the left-hand side.

Figure 13: Effectiveness of MPP Depending on Overhead Costs – Bank Flows

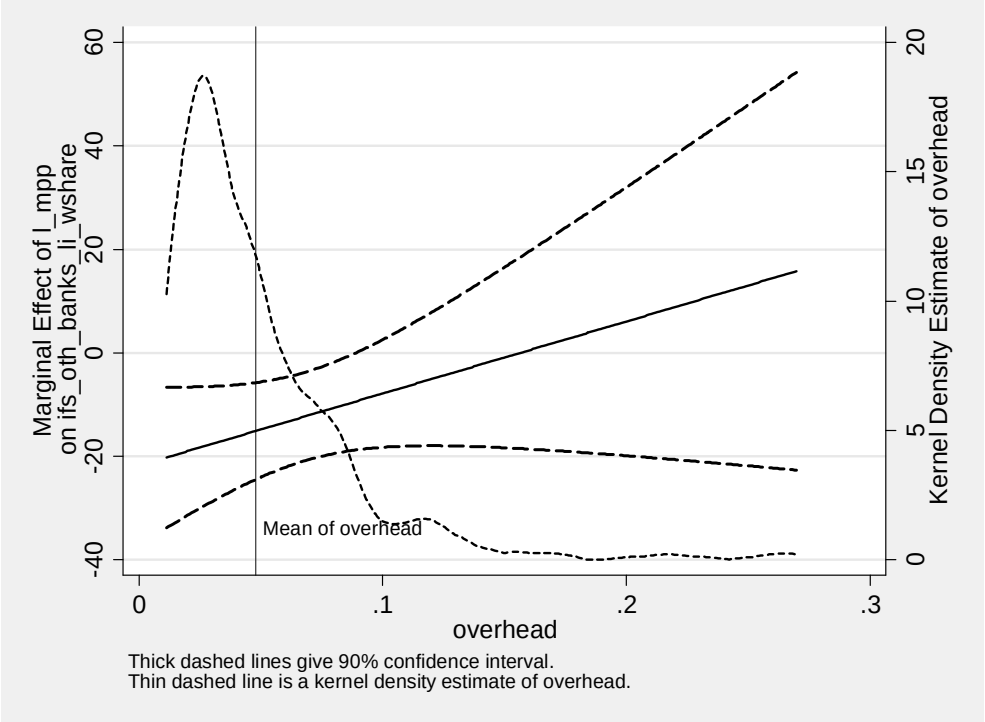


Figure 14: Effectiveness of MPP Depending on Cost-To-Income Ratio – Bank Flows

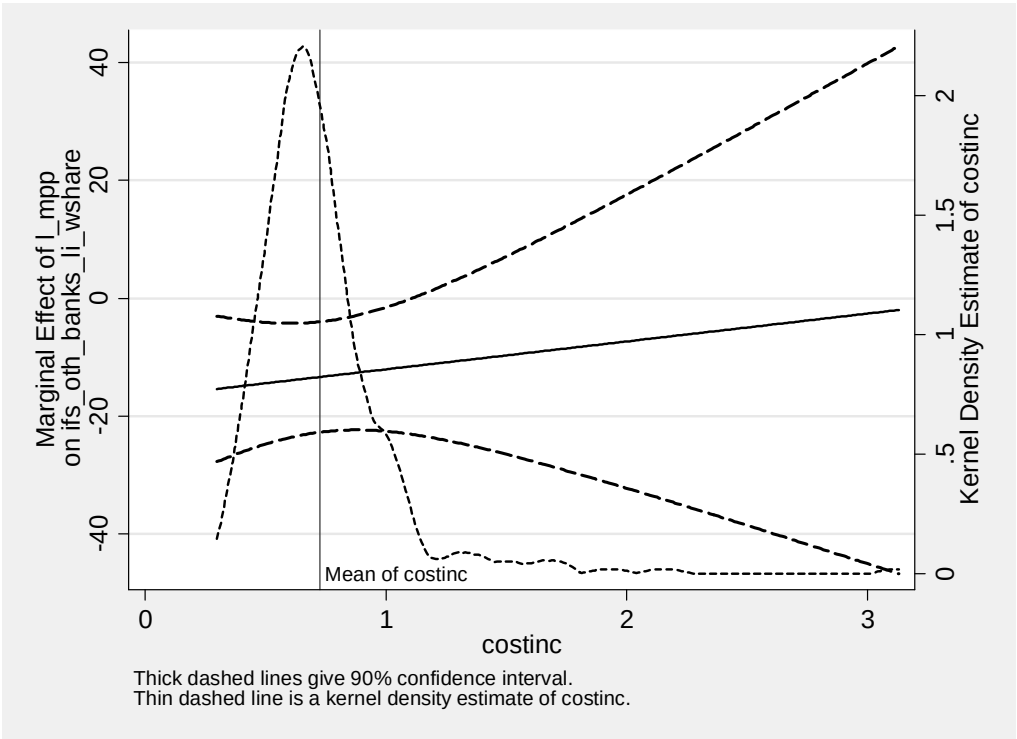


Figure 15: Effectiveness of MPP Depending on Z-Scores – Bank Flows

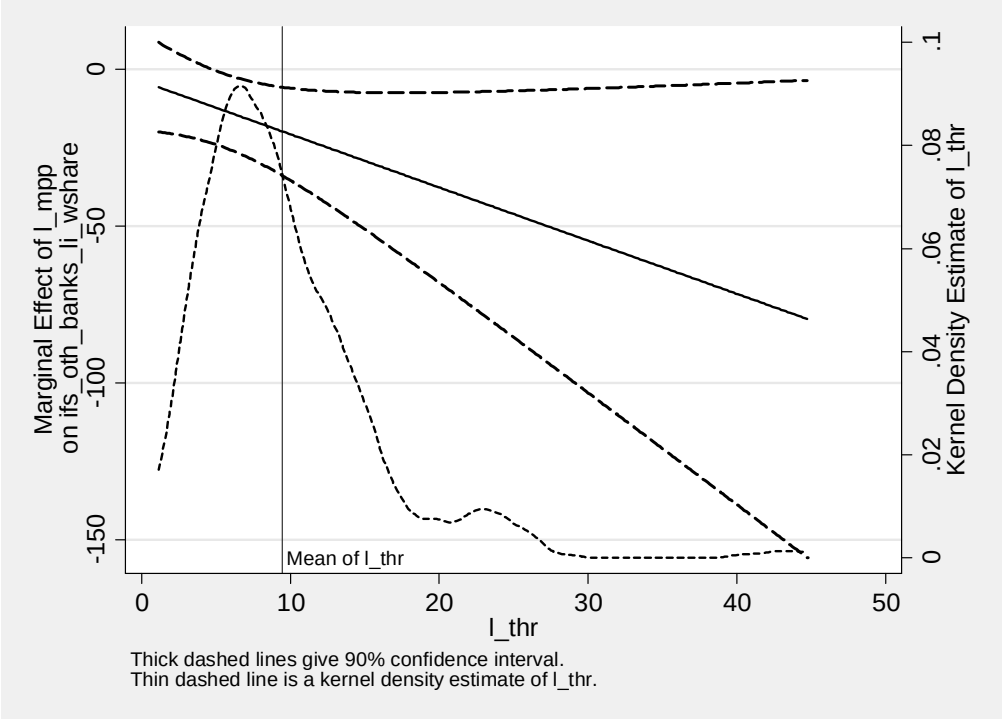
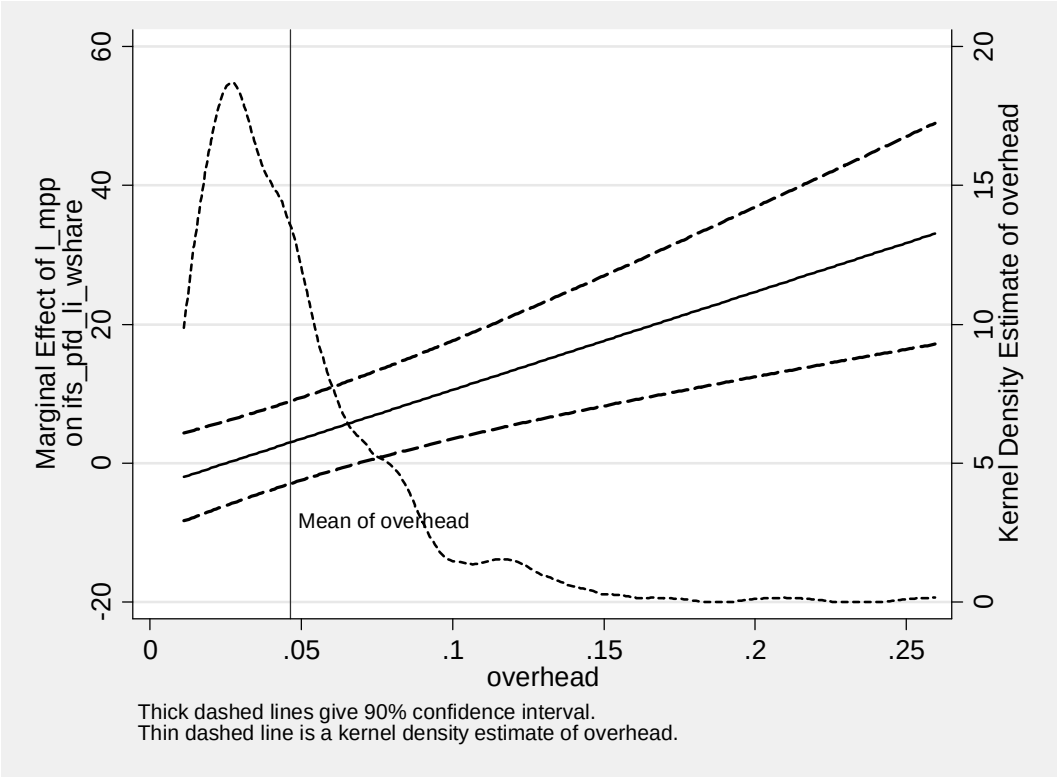


Figure 16: Effectiveness of MPP Depending on Overhead Costs – Debt Flows



As soon as overhead costs increase, however, the MPP becomes less effective and it even becomes entirely ineffective after overhead costs increase beyond some threshold value. Figure 14 confirms this pattern for using the Cost to Income Ratio as a financial threshold variable. Also here, MPPs become ineffective when the Cost to Income Ratio increases beyond a threshold value. Figure 15 serves as a robustness check and confirms that the reverse pattern is true when using the inversely defined Z-score. For low Z-score levels and thus an environment with high costs and low profits, the MPP turns out to be ineffective. For an increasing Z-score, however, the policy becomes more effective in reducing capital inflows. Hence, the Z-score measure also supports the argument that banks, in case they come under pressure, may help customers to circumvent MPPs. Finally, Figure 16 shows the reaction of portfolio debt flows instead of banking flows, again measured as portfolio share following an increase in overhead costs. Although the general pattern looks very similar to Figure 13, even for low cost values, the MPP has no effect. Even more so, for increasing costs, the MPP creates an increase in portfolio debt flows suggesting the presence of spillover effects across capital classes.

6.3. Investor-Dimension: Spillover Analysis

6.3.1. The Main Result

We now turn to the examination of possible spillover effects associated with the introduction of an MPP measure. The spillover analysis considers three types of spillover effects and thus deals with boxes two and three of the testable implications row in Figure 1. First, we test for purely domestic spillover to other asset classes (the third box). An example for this category would be that following the introduction of an MPP, investors would remain with the country but change their asset allocation domestically, for example by switching from bank and debt to equity flows. The second category considers purely geographical spillovers (the second box). In this case, investors remain with the same asset class but change their geographical allocation following the introduction of an MPP. Finally their combination, the third category (a mixture of boxes two and three), describes spillover effects across geographical aggregates and across asset classes and thus represents the most severe case. Here, investors may move out of one country but are still wary of the neighbour country introducing an MPP as well. Hence, they switch across countries and assets.

Table 12 to Table 15 present the results from estimating equation (3) in several variations. The core specification is depicted in Table 12 using standard portfolio shares on the left-hand side, lagged measures of MPPs and the neighbour countries as reference points for geographical spillover effects. The following tables only show the values and significance levels for the coefficient λ, the domestic

effect of the MPP (panel 1 and 2 at the top of the table), and for the coefficient γ, the associated spillover effect of the MPP (panel 3 and 4 at the bottom of the table). Results are organised by asset class and contain a separate row for each MPP-asset class combination.

We first examine the results in Table 12. Starting with the description of those types of flows that one would expect to be primarily affected by MPPs in the first place, i.e. bank and debt flows, it turns out that latter ones seem to have a negative effect in three of the cases. This implies that MPPs are effective to a certain extent – in a sense that they reduce the portfolio share of flows to the implementing country.

Table 11: Portfolio Share (Standard) – Neighbour Countries, Lagged MPP

Measure: Portfolio Share	**Bank**	**PF Debt**	**FDI**	**PF Equity**	**Other**
Domestic Effect of Macroprudential Policies					
Qureshi et al. (2011)					
Financial System 1	2.379	-0.076	-0.969	-0.930	-14.031
Financial System 2	-0.446	0.626	-1.452	-2.354	-14.442
Foreign Exchange 1	-13.177**	3.896	-1.095***	9.486	19.602
Foreign Exchange 2	-18.499***	4.453	-0.893	6.865	-11.022
Lim et al. (2011)					
Foreign Exchange	-0.582	2.494	0.025	-9.767	40.237
Credit Ceilings	-7.917	-2.030	0.443	3.263	-38.095*
Maturity Mismatches	4.962	0.237	0.427	-23.077	-7.520
Capital Requirements	1.307	-3.804*	1.262	-1.370	-3.961
Spillover Effect of Macroprudential Policies					
Qureshi et al. (2011)					
Financial System 1	21.920	4.985	1.602*	6.206	-0.443
Financial System 2	27.228	5.175*	2.047**	8.237	4.317
Foreign Exchange 1	39.310**	5.136	2.708**	17.282**	-20.569*
Foreign Exchange 2	71.156*	10.159	4.590	44.984**	-41.647*
Lim et al. (2011)					
Foreign Exchange	21.446**	-1.831	1.736	-2.754	3.695
Credit Ceilings	21.610	31.236*	10.476	-4.509	102.357
Maturity Mismatches	0.897	-2.873	0.952	-25.822	14.070
Capital Requirements	-54.460***	12.711***	0.944	-6.752***	12.480

When the impact of domestically implemented MPPs is examined on other types of flows, such as FDI, portfolio equity, and other flows, only two coefficients are significant. Latter ones carry a negative sign suggesting that, if anything, MPPs work broadly and thus, their impact rather carries over to other types of capital flows instead of generating negative spillover effects by increasing

these flows. Taking all of the evidence together, foreign exchange-related policies in particular seem to be effective given that most of the coefficients are significant in this case.

In the next step, geographical spillovers (in the form of the average MPP across neighbour countries) are examined. Focusing again on bank and debt flows first, it turns out that seven coefficients are significant of which six carry a positive sign. This suggests that following the introduction of an MPP, this leads to an increase in capital flows to a immediate neighbour country, i.e. that negative spillover effects are evident. Moreover, two-dimensional spillovers can be observed, i.e. spillovers across countries and asset classes.

Table 12: Portfolio Share (Standard) – Corresponding Region, Lagged MPP

Measure: Portfolio Share	**Bank**	**PF Debt**	**FDI**	**PF Equity**	**Other**
Domestic Effect of Macroprudential Policies					
Qureshi et al. (2011)					
Financial System 1	2.970	-0.244	-0.928	-0.620	-11.240
Financial System 2	3.126	0.224	-1.152	-0.628	-6.242
Foreign Exchange 1	-14.531**	3.520	-0.994**	9.337	25.060
Foreign Exchange 2	-14.154**	4.079	-0.002	6.491	-22.122
Lim et al. (2011)					
Foreign Exchange	-0.647	2.475	0.103	-9.592	39.795
Credit Ceilings	-8.270	-1.445	0.618*	2.997	-32.165
Maturity Mismatches	4.967	0.264	0.422	-23.254	-7.776
Capital Requirements	3.691	-4.228**	1.151	-1.403	-5.587
Spillover Effect of Macroprudential Policies					
Qureshi et al. (2011)					
Financial System 1	-330.871**	71.257	-24.450	-97.261	-1,747.608*
Financial System 2	-269.295	138.397*	-32.340	-143.004	-2,520.793*
Foreign Exchange 1	-5.437	52.671	-49.232	-156.442	-1,398.511*
Foreign Exchange 2	186.625	206.652	-150.923	259.504**	-914.883
Lim et al. (2011)					
Foreign Exchange	102.460	-17.891	42.538	43.652	-159.886
Credit Ceilings	-343.163	452.655	150.085**	-222.217	5,393.126
Maturity Mismatches	42.571	12.761	-3.106	-271.050	-1,904.624*
Capital Requirements	-20.621	44.403	-46.055*	-220.335	-697.410*

Equity flows to neighbour countries, in particular, increase significantly following the introduction of MPPs. A potential reason for this finding may be that investors try to increase their investment exposure to the neighbour country but at the same time assign a positive probability for latter to introduce a similar measure. Hence, investors choose an asset class that is less affected by MPPs in

general. The previous specification has shown substantial evidence for negative spillover effects to neighbour countries. The next question that we examine is how far such spillover effects may reach. Will they pertain only to the neighbour country or spread out to the entire region? Table 12 contains therefore the results of a differently defined $MPN_{i,t}$ variable. Now, $MPN_{i,t}$ takes on the weighted average of all MPPs in the region (excluding the country in question). While the results for the domestic effect of MPPs are remarkably similar, it turns out that the geographical spillover effect within an asset class does not carry over to the entire region. All in all, only two coefficients are significant in case of bank and debt flows, each of them even with a different sign. However, there still seems to be a combined spillover effect, especially for other flows that indicates a reduction of flows in this asset class following the introduction of MPP measures somewhere in the region.

6.3.2. Robustness

Apart from the two specifications shown above, we carry out two additional robustness specifications in Table 14 and Table 15. First, the stricter portfolio share measure is used on the left-hand side of equation (3). In this case, the left-hand side variable and the MPP measures comprise a balanced sample for all countries but this comes at the expense of the number of countries in the sample. However, the results of this exercise are remarkably similar and strongly in support of previous findings. Table 14 shows that for the domestic effect of the MPP, nearly exactly the same coefficients are significant as above. In addition, for the spillover effects, the results for bank and debt flows become even stronger leaving eight coefficients significant, with seven of them carrying a positive sign. This suggests strongly the presence of negative spillover effects towards neighbour countries following the introduction of MPPs.

Finally, some of the spillover effects may be expected to occur contemporaneously with the MPP and not with the lag of one year, as the current specifications suggests. Table 14 therefore shows results from allowing all MPP measures (including their spillover counterparts) to enter equation (3) contemporaneously. Also here, the results are largely similar to those presented in the previous specification. However, as now in this specification, the number of significant coefficients is slightly smaller than before, it could be possible that spillover effects do not materialise immediately and investors require some time to adjust their portfolios.

Table 13: Portfolio Share (Strict) – Corresponding Neighbour Countries, Lagged MPP

Measure: Portfolio Share	Bank	PF Debt	FDI	PF Equity	Other
Domestic Effect of Macroprudential Policies					
Qureshi et al. (2011)					
Financial System 1	4.231	1.004	-1.157	-1.528	-11.960
Financial System 2	2.998	2.225	-2.032	-3.623	-13.450
Foreign Exchange 1	-13.875**	7.112	-1.321***	9.026	14.465
Foreign Exchange 2	-21.969**	10.407	-1.168	11.386	-19.127**
Lim et al. (2011)					
Foreign Exchange	-0.929	2.252	0.087	-10.662	33.572*
Credit Ceilings	-7.995	-2.055	0.472	3.477	-26.693*
Maturity Mismatches	5.761	-0.390	0.553	-24.466	-4.844
Capital Requirements	1.674	-4.259**	1.445	-2.117	-8.962
Spillover Effect of Macroprudential Policies					
Qureshi et al. (2011)					
Financial System 1	23.969	21.748***	1.785	5.976	-4.754
Financial System 2	28.816	17.034***	2.329**	7.895	1.241
Foreign Exchange 1	42.817***	12.682***	2.909*	20.005***	-18.274
Foreign Exchange 2	81.981**	31.668***	5.125	41.688*	-37.767
Lim et al. (2011)					
Foreign Exchange	15.970	-0.990	2.440	3.613	-0.132
Credit Ceilings	24.899	30.167	11.250	-6.808	89.381
Maturity Mismatches	60.627	6.269	70.249	-41.428	1,048.470
Capital Requirements	-57.612***	24.489***	1.021	-7.296**	20.947

Table 14: Portfolio Share (Standard) – Corresponding Neighbour Countries, Contemp. MPP

Measure: Portfolio Share	Bank	PF Debt	FDI	PF Equity	Other
Domestic Effect of Macroprudential Policies					
Qureshi et al. (2011)					
Financial System 1	6.336	1.436	-0.509	-3.237	-17.627
Financial System 2	0.567	0.316	-1.216	-3.699	1.657
Foreign Exchange 1	-20.711**	6.859	-1.283***	-3.176	-12.665
Foreign Exchange 2	-19.230**	6.020	-2.191	-13.017	-12.172
Lim et al. (2011)					
Foreign Exchange	-0.509	-0.692	-0.732	3.343	-1.018
Credit Ceilings	10.864	0.334	0.386	-2.828	3.146
Maturity Mismatches	6.521	-1.813	0.745	-3.221	-6.501
Capital Requirements	2.615	-1.457	0.173	-1.469	-25.583
Spillover Effect of Macroprudential Policies					
Qureshi et al. (2011)					
Financial System 1	19.424	11.682	0.861	5.122	5.466
Financial System 2	25.233	12.811**	1.129**	7.115	8.768
Foreign Exchange 1	44.409**	-3.539*	1.920*	17.833**	-12.680*
Foreign Exchange 2	91.318**	-8.743	3.163	55.519***	-15.693
Lim et al. (2011)					
Foreign Exchange	5.558	-1.568	-0.396	0.050	-4.907
Credit Ceilings	-13.201	21.695	1.700	8.400	47.528
Maturity Mismatches	1.385	-3.434	0.153	530.081	14.455
Capital Requirements	37.597***	15.731***	0.217	-20.155***	-10.938

7. Conclusion

This paper has examined the effectiveness of macroprudential policies (MPPs) in reducing capital inflows to emerging market countries. The empirical analysis employed is founded upon a multilateral organising framework to derive a set of testable hypotheses. Using these testable hypotheses, a baseline specification and two follow-up specifications have been estimated. The first follow-up specification was targeted to assess the role of the intermediary, in particular in relation to how the domestic banking system contributes to the effectiveness of the MPP. The second follow-up specification was designed to reflect the investor's perspective and uncover spillover effects across asset classes and across the geographical dimension following the introduction of an MPP. All three specifications are important and allow jointly with the organising framework to identify the reasons for ineffective MPPs as well as the costs associated with MPPs that work well.

Turning to the results, it has been shown that for the average country, the capital inflow reducing effect of MPPs is rather limited. The main finding from the financial threshold analysis and thus the second main result of the paper is that the effectiveness of MPPs is inversely related to cost measures in the domestic banking system. While this finding in combination with others clearly excludes the possibility that MPPs become ineffective due to the banking sector taking over the costs of MPPs, it reinforces concerns that a banking sector with low profitability may render MPPs less effective by facilitating the circumvention of such policies. In terms of policy implications, this calls for the simultaneous introduction of MPPs together with improvements in supervision activities and business practices of the banking system.

Finally, when separating the domestic effect of an MPP from its spillover effect it could be seen that some of the MPPs, in particular those related foreign exchange measures, were slightly more effective. At the same time, it has been shown that for direct neighbour countries, the occurrence of a negative spillover effect appears to be very likely. The danger of such spillover effect relates to the potential emergence of a competitive use of MPPs that may eventually neutralise the positive effects of MPPs across countries – in close analogy to both *competitive devaluations* in the realm of exchange rate adjustments, as well as in relation to tax competition across countries. In terms of policy implications, this finding is important as it provides new empirical evidence for more international policy-coordination, a subject that has recently been addressed prominently in recent years in international policy discussions (e.g. see IMF, 2011d).[10]

Future research could extend the empirical analysis in two broad directions. First, one could use bilateral data on capital flows and data on the profit conditions of the domestic industry sector

[10] Indeed, addressing negative externalities associated with competitive devaluations and tax competition has also carried out by policymakers through the promotion of greater levels of cross-border policy co-ordination and integration.

to test the remaining set of implications that have been suggested by the organising framework in Figure 1. And second, some effort could be dedicated to developing high-frequency measures of MPPs. This in turn would allow working at least with quarterly or potentially even monthly data in the analysis and thus enable researchers to get a clearer picture of the behaviour of capital flows immediately after the introduction of MPPs.

References

Baba, Chikako and Annamaria Kokenyne, 2011, "Effectiveness of Capital Controls in Selected Emerging Markets in the 2000s", IMF Working Paper 11/281.

Beck, Thorsten, Asli Demirgüç-Kunt and Ross Levine, 2000, "A New Database on Financial Development and Structure," *World Bank Economic Review* 14, pp. 597-605.

Benigno, Gianluca , Huigang Chen, Christopher Otrok, Alessandro Rebucci and Eric R Young, 2010a, Revisiting Overborrowing and its Policy Implications, CEPR Discussion Paper No. 7872.

Benigno, Gianluca, Huigang Chen, Christopher Otrok, Alessandro Rebucci and Eric R. Young, 2010b, "Financial Crises and Macro-Prudential Policies", CEPR Discussion Paper No. 1032.

Bianchi, Javier, 2011, Overborrowing and Systemic Externalities in the Business Cycle." *American Economic Review* 101(7), pp. 3400-3426.

BIS, 2010, "Macroprudential instruments and frameworks: a stocktaking of issues and experiences", Committee on the Global Financial System (CGFS) Paper No. 38.

Claessens and Van Horen, 2011, "Trends in Foreign Banking: A Database on Bilateral Foreign Bank Ownership", IMF Working Paper No. 12/10.

Federico, Pablo M., 2011. "Systemic Liquidity Risk-Taking in Emerging Markets", mimeo.

Forbes, Kristin, Marcel Fratzscher, Thomas Kostka, and Roland Straub, 2011, "Bubble Thy Neighbor: Portfolio Effects and Externalities from Capital Controls", ECB Working Paper No. 1456.

Habermeier, Karl, Annamaria Kokenyne, and Chikako Baba, 2011, “The Effectiveness of Capital Controls and Prudential Policies in Managing Large Inflows”, IMF Staff Discussion Note 11/14.

IMF, 2011a, “Macroprudential Policy: An Organizing Framework”, International Monetary Fund, Washington D.C., United States.

IMF, 2011b, “Towards Operationalizing Macroproduential Policies: When to Act?”, Chapter 3 in Global Financial Stability Report, September.

IMF, 2011c, “Recent Experiences in Managing Capital Inflows—Cross-Cutting Themes and Possible Policy Framework”, International Monetary Fund, Washington D.C., United States.

IMF, 2011d, “The Multilateral Aspects of Policies Affecting Capital Flows”, International Monetary Fund, Washington D.C., United States.

IMF, 2010, “The Fund’s Role Regarding Cross-Border Capital Flows”, International Monetary Fund, Washington D.C., United States.

Jeanne, Olivier and Anton Korinek, 2010, “Managing Credit Booms and Busts: A Pigouvian Taxation Approach”, NBER Working Paper No. 16377.

Korinek, Anton, 2010, “Regulating Capital Flows to Emerging Markets: An Externality View”, mimeo.

Lambert, Frederic, Julio Ramos-Tallada and Cyril Rebillard, 2011, “Capital controls and spillover effects: evidence from Latin-American countries”, Banque de France Working Paper 357.

Lim, C., F. Columba, A. Costa, P. Kongsamut, A. Otani, M. Saiyid, T. Wezel, and X. Wu, 2011, “Macroprudential Policy: What Instruments and How to Use Them, Lessons from Country Experiences”, IMF Working Paper 11/238.

Lorenzoni, Guido, 2008. "Inefficient Credit Booms," *Review of Economic Studies* 75(3), pp. 809-833.

Nier, Erlend W., Jacek Osiński, Luis I. Jácome, and Pamela Madrid, 2011, “Towards Effective Macroprudential Policy Frameworks: An Assessment of Stylized Institutional Models”, IMF Working Paper 11/250.

Ostry, Jonathan D., Atish R. Ghosh, Karl Habermeier, Marcos Chamon, Mahvash S. Qureshi, and Dennis B.S. Reinhardt, 2010, "Capital Inflows: The Role of Controls", IMF Staff Position Note 10/04.

Qureshi, Mahvash S., Ostry, Jonathan D., Atish R. Ghosh, and Marcos Chamon, 2011, "Managing Capital Inflows: The Role of Capital Controls and Prudential Policies", NBER Working Paper 17363.

Unsal, D. Filiz, 2011, "Capital Flows and Financial Stability: Monetary Policy and Macroprudential Responses", IMF Working Paper 189.

Zettelmeyer, Jeromin, Piroska M. Nagy, and Stephen Jeffrey, 2010. "Addressing private sector currency mismatches in emerging Europe," EBRD Working Papers 115.

Appendix

Table A.1.: Construction of the Two Macroprudential Policy Measures

Panel a)

Qureshi et al. (2011)

Financial System 1

Capital Controls to the Financial System

- XII.A.1. Borrowing abroad
- XII.A.7. Differential treatment of deposit accounts held by non-residents

Financial System 2

Capital Controls to the Financial System

- Elements of Financial System 1
- Plus: XII.A.2. Maintenance of accounts abroad

Foreign Exchange 1

Regulations for Foreign Exchange Transactions

- XII.A.4. Lending locally in foreign exchange
- XII.A.6. Differential treatment of deposit accounts in foreign exchange

Foreign Exchange 2

Regulations for Foreign Exchange Transactions

- Elements of Foreign Exchange 1
- Plus: XII.A.5. Purchase of locally issued securities denominated in foreign exchange
- Plus: XII.A.9. Open foreign exchange position limits

Panel b)

Lim et al. (2011)

Foreign Exchange

Restrictions on the use of foreign currency

- Caps on Foreign Currency Lending
- Limits on Net Open Currency Positions/Currency Mismatches

Credit Ceilings

Lending related policies that are targeted to reduce the individual credit risk; excluding all foreign exchange restrictions

- Ceilings on Credit or Credit Growth
- Caps to the Loan to Value Ratio (LTV)
- Caps on the Debt to Income Ratio (DTI)

Maturity Mismatches

Liquidity-related policies

- Limits on Maturity Mismatches
- Reserve Requirements that are not part of previous groupings

Capital Requirements

Capital buffer related policies that are targeted at banks

- Countercyclical Capital Requirements
- Time-varying/Dynamic Provisioning
- Restrictions on Profit Distribution

Table A.2. Sample of Countries

The country sample consists of up to 39 emerging market countries. The eventual composition varies slightly across specifications. The sample countries are: Argentina, Belize, Brazil, Bulgaria, Chile, Colombia, Croatia, Czech Republic, Dominican Republic, Egypt, El Salvador, Estonia, Greece, Guatemala, Hungary, Jordan, Korea, Latvia, Lebanon, Lithuania, Malaysia, Mexico, Morocco, Namibia, Panama, Paraguay, Peru, Philippines, Poland, Portugal, Romania, Slovak Republic, Slovenia, South Africa, Swaziland, Thailand, Tunisia, Turkey, and Uruguay

Table A.3.: Data Sources of Main Variables

Variable	Unit	Source	Series Code/Variable Name
Dir. Investment In Rep. Econ., N.I.E.	USD	IFS	IFS.A.111.7.78.BED.Z.F.$$$
Portfolio Investment Liab., N.I.E.	USD	IFS	IFS.A.111.7.78.BGD.Z.F.$$$
PI Equity Securities Liab.	USD	IFS	IFS.A.111.7.78.BMD.Z.F.$$$
PI Debt Securities Liab.	USD	IFS	IFS.A.111.7.78.BND.Z.F.$$$
Other Investment Liab., N.I.E.	USD	IFS	IFS.A.111.7.78.BID.Z.F.$$$
OI Banks Liab.	USD	IFS	IFS.A.111.7.78.BUD.Z.F.$$$
OI Other Sector Liab.	USD	IFS	IFS.A.111.7.78.BVD.Z.F.$$$
Gross domestic product, current prices	USD	WEO	WEO.A.111.NGDPD
Gross domestic product, constant prices	NCU	WEO	WEO.A.111.NGDP_R
Ffund Rate	%	IFS	IFS.A.111.6.60.B$$.Z.F.$$$
Treasury Bill Rate	%	IFS	IFS.A.111.6.60.C$$.Z.F.$$$
Exchange rate	NCU per one USD	WEO	WEO.A.111.ENDA
Exports of goods & services, current prices	NCU	WEO	WEO.A.111.NX
Imports of goods & services, current prices	NCU	WEO	WEO.A.111.NM
Nominal GDP per capita	USD	WEO	WEO.A.111.NGDPDPC
Net ODA received	% of GNI	WDI	DT.ODA.ODAT.GN.ZS
Value of oil exports	USD	WEO	WEO.A.111.TXGO
Land area	Square km	WDI	AG.LND.TOTL.K2
Bank Overhead Costs / Total Assets	Ratio	Fin Struc.	overhead
Bank Cost-Income Ratio	Ratio	Fin Struc.	costinc
Bank Z-Score	Value	Fin Struc.	zscore
International Debt Issues	% of GDP	Fin Struc.	intldebt
Liquid Liabilities	% of GDP	Fin Struc.	llgdp
Loans From Non-Resident Banks (Amt Outstanding)	% of GDP	Fin Struc.	nrbloans
Offshore Bank Deposits / Domestic Bank Deposits	Ratio	Fin Struc.	offdep
Private Credit By Deposit Money Banks	% of GDP	Fin Struc.	pcrdbgdp
Share of Foreign Banks in all Banks	Share	Claessens and Van Horen, 2011	

Table A.4.: Summary Statistics I – Capital Flow Measures

Variable	Obs	Mean	Std. Dev.	Min	Max
Capital Flows in % of GDP					
Dir. Investment In Rep. Econ.	425	4.4	5.0	-3.3	52.1
PI Equity Securities Liab.	354	0.4	1.4	-9.8	6.8
PI Debt Securities Liab.	355	1.5	3.0	-6.6	16.8
OI Banks Liab.	399	1.5	5.3	-35.0	30.9
OI Other Sector Liab.	422	0.9	2.1	-6.8	10.2
Capital Flows PF-Share (Standard)					
Dir. Investment In Rep. Econ.	425	2.6	4.1	-0.4	26.1
PI Equity Securities Liab.	354	3.1	13.3	-111.2	101.5
PI Debt Securities Liab.	355	3.1	10.3	-57.5	63.1
OI Banks Liab.	399	2.8	18.9	-83.7	178.4
OI Other Sector Liab.	422	2.6	50.7	-298.0	569.8
Capital Flows PF-Share (Strict)					
Dir. Investment In Rep. Econ.	363	3.0	4.7	-0.5	27.6
PI Equity Securities Liab.	308	3.6	14.6	-114.5	104.5
PI Debt Securities Liab.	275	4.0	12.5	-76.6	75.3
OI Banks Liab.	330	3.3	21.2	-88.7	168.9
OI Other Sector Liab.	352	3.1	46.6	-240.6	460.2

Table A.5.: Summary Statistics II – Explanatory Variables

Variable	Obs	Mean	Std. Dev.	Min	Max
Macroprudential Policies					
Qureshi et al. (2011), Financial System 1	395	0.3	0.3	0	1
Qureshi et al. (2011), Financial System 2	395	0.3	0.3	0	1
Qureshi et al. (2011), Foreign Exchange 2	418	0.5	0.4	0	1
Qureshi et al. (2011), Foreign Exchange 2	282	0.5	0.3	0	1
Lim et al. (2011), Foreign Exchange	429	0.0	0.2	0	1
Lim et al. (2011), Credit Ceilings	429	0.0	0.2	0	1
Lim et al. (2011), Maturity Mismatches	429	0.0	0.1	0	1
Lim et al. (2011), Capital Requirements	429	0.0	0.2	0	1
Control Variables					
Real Growth Rate	429	3.8	3.8	-17.7	13.1
Short-term Interest Rate	421	8.2	9.9	0.4	93.2
Bilateral Exchange Rate to the USD	429	281.9	910.5	0.4	6407.5
Trade Integration in % of GDP	429	91.7	42.1	20.2	220.4
Threshold Variables					
Bank Cost-Income Ratio	418	0.7	0.3	0.3	3.1
Bank Overhead Costs / Total Assets	417	0.0	0.0	0.0	0.3
Bank Z-Score	350	9.7	6.4	1.1	44.7
International Debt Issues	393	0.2	0.2	0.0	1.2
Liquid Liabilities in % of GDP	390	0.5	0.3	0.2	1.3
Loans From Non-Resident Banks (Amt Outstanding)	429	0.3	0.5	0.0	3.2
Offshore Bank Deposits / Domestic Bank Deposits	423	0.4	1.3	0.0	12.8
Private Credit By Deposit Money Banks	404	0.5	0.3	0.1	1.8
Share of Foreign Banks in all Banks	418	44.0	22.2	5.0	94.0