Capital Controls and Macroprudential Policies: Are they countercyclical?*

Tatsiana Kliatskova**

This draft: May, 2018

Abstract

Since the global financial crisis, a growing theoretical literature and international policy-makers advocate the countercyclical use of macroprudential policies and capital controls on net capital inflows. This paper builds a novel dataset on easing and tightening of capital controls on inflows and outflows for 24 emerging economies for the period 1997-2014 at a quarterly frequency and examines a time-varying adjustment of capital controls and macroprudential policies (Cerutti et al., 2017b) along global and local business and financial cycles. The results suggest that macroprudential policies and capital controls on inflows are imposed in a countercyclical manner with respect to global business and financial variables, showing that foreign developments have an influence on domestic policies. At the same time, capital controls on outflows behave procyclically along local business and financial cycles. The pattern of loosening and tightening of macroprudential policies and capital controls differs across instruments and categories of assets.

JEL Classification Numbers: F38, F44, G18

Keywords: capital controls, macroprudential policies, business and financial cycles.

*The earlier version of this paper was presented at the DIW Graduate Center 2017 Summer Workshop (Potsdam, Germany), 10th FIW Research Conference in International Economics (Vienna, Austria), and 5th Bordeaux Workshop in International Economics and Finance (Bordeaux, France).

**Tatsiana Kliatskova: Free University of Berlin and German Institute for Economic Research (DIW Berlin), Mohrenstr., 58 10117 Berlin, Germany. E-mail: tkliatskova@diw.de.

1 Introduction

The ability of capital flow management (CFM) measures, macroprudential policies and capital controls, to smooth economic and financial fluctuations by putting "sand in the wheels" of international borrowing (by Tobin, 1978) is widely debated by academics and policymakers (IMF, 2011). The theoretical literature suggests that restrictions on net capital inflows and macroprudential regulations should be tightened during booms and relaxed during busts; this way CFM measures promote financial stability (Jeanne and Korinek, 2010; Benigno et al., 2016) and improve macroeconomic adjustment (Schmitt-Grohé and Uribe, 2016). Additionally, Korinek and Sandri (2016) show that it is desirable to employ both types of instruments as macroprudential regulations reduce indebtedness of leveraged borrowers, while capital controls induce more precautionary behaviour for the economy as a whole.

Indeed, during the global financial crisis of 2007-2009 many emerging market economies (EMEs) reintroduced capital controls (e.g., Brazil 2008-10, Colombia 2007-08) using them as a countercyclical tool. At the same time, some countries such as China and India that have had capital controls in place are now gradually liberalizing their capital account with no regard to business or financial developments. Additionally, many countries started using macroprudential policies not only as domestic prudential regulations, but also as tools for managing capital flows. In this paper, I investigate whether countries in practice adjust capital controls and macroprudential policies along global and/or local business and financial cycles as it is suggested by the theoretical literature and as it is advised by policymakers.

For this purpose, I construct a novel dataset on tightening and easing of capital controls on outflows and inflows for 5 types of assets (portfolio equity, portfolio bonds, FDI, banking/other, and derivatives) in 24 emerging economies for the period 1997-2014 at a quarterly frequency. The existing datasets on capital controls mostly gauge the existence of policies at aggregated (Chinn and Ito, 2006) or disaggregated (Fernandez et al., 2015a) levels. They describe whether capital controls are in place or not for a given country at a certain year. Yet, they do not capture time-varying adjustment of the restrictions. Other datasets, such as Pasricha (2012), Ahmed et al. (2015), and Chantapacdepong and Shim (2015), account for subsequent changes of capital controls by incorporating tightening and easing of the policies. The dataset constructed for this paper contributes to the recent efforts in measuring changes in capital controls and improves on country, time, and asset type coverage. As the subsequent analysis suggests, more granular data on capital controls with a disaggregation by asset types and direction of the policy is needed as policymakers may have different motivation for tightening and easing of the policies for various types of

assets. Additionally, I construct an index for capital controls on outflows while the previous literature (with the exception of Pasricha (2012)) concentrated on capital controls on inflows only.

Further, the constructed capital controls indexes and the macroprudential policy indexes by Cerutti et al. (2017b) are related to global and local cyclical components of GDP, credit to private NFC, real effective exchange rates, and financial conditions indicators. There is no consensus in the literature on whether capital controls are imposed countercyclically or not. While Fernandez et al. (2015b) find that capital controls are largely acyclical, Fratzscher (2012), Aizenman and Pasricha (2013), and Pasricha (2017) show that capital controls are adjusted based on concerns about an overheating of the domestic economy as well as foreign exchange (FX) policy objectives. This paper contributes to the literature by relating capital controls to global business and financial cycles, thus, showing that domestic policies might be affected by the developments from abroad. Additionally, the analysis is performed for capital controls disaggregated by categories of assets they are designed for, while previous studies analysed aggregated indexes only.

For macroprudential policies, Cerutti et al. (2017b) and Federico et al. (2014) find that reserve requirements, are used in a countercyclical fashion with respect to domestic cycles defined as GDP gap and/or credit growth. This paper adds to the literature by analyzing behaviour of macroprudential policies along global business and financial cycles for a bigger number of macroprudential instruments.

The main results of this paper support findings of the theoretical literature; they suggest that capital controls on inflows and macroprudential policies are adjusted countercyclically with respect to global business and financial variables. At the same time, capital controls on outflows behave procyclically along local business and financial cycles. The behaviour of CFM measures, however, varies across prudential instruments and capital restrictions on different categories of assets. Only local and foreign reserve requirements behave countercyclically, while the other instruments are not related to the cycles. Additionally, the obtained results for capital controls on inflows are mostly driven by restrictions on banking flows.

The remainder of the paper is organized as follows. Section 2 provides a literature review. Section 3 describes the data on capital controls and macroprudential policies and gives a definition for financial and business cycles. Section 4 presents tested hypotheses. Section 5 performs unconditional correlation analysis between CFM measures and the main financial and macroeconomic variables. Section 6 studies behaviour of CFM around the global financial crisis of 2007-2009. Section 7 describes econometric methodology and discusses the main empirical findings on the cyclicality of CFM measures. Section 8 concludes.

2 Literature review

This paper aims to assess whether central banks and other regulators systematically adjust, tighten or ease, macroprudential policies and capital controls on net capital inflows in a countercyclical fashion. Therefore, it is directly related to the following strands of literature: (1) datasets on existence and adjustment of capital controls and macroprudential policies; (2) cyclicality of capital flow management measures along global and local financial and business cycles.

First, there is a growing number of datasets on the level of and change in capital account restrictions. Cross-country time series of capital controls are usually drawn from the IMF Annual Report on Exchange Arrangements and Exchange Restrictions (AREAER) and are sometimes supplemented by country-specific information from news and press releases. These datasets are mostly used to analyze effectiveness of the policies. The first type of datasets measures the existence of capital controls aggregated across different asset classes as in Chinn and Ito (2006) or at a disaggregated level as in Schindler (2009) and Fernandez et al. (2015a). The recent dataset by Fernandez et al. (2015a) presents information on capital restrictions on inflows and outflows for 10 categories of assets for 100 countries over the period of 1995 to 2014 at an annual frequency. It codes capital controls as one if there are some restrictions in place and zero, otherwise. These measures, however, do not capture time-varying changes in the intensity of restrictions[1].

The second type of datasets account for subsequent adjustment of capital controls by incorporating tightening and easing of the policies. This is done in papers by Pasricha et al. (2017), Garcia (2017), Forbes et al. (2015), Chantapacdepong and Shim (2015), and Ahmed and Zlate (2014). These datasets usually cover either a short time span or a small number of countries. The datasets that are the closest to this paper are the ones by Pasricha et al. (2017) and Ahmed et al. (2015). Pasricha et al. (2017) calculates the number of easing and tightening steps for capital controls on inflows and outflows for 17 emerging markets over the period 2001-2011 at a daily frequency disaggregating them by an assets type and classifying them into quantitative, monitoring, and price-based measures. Then a cumulative index is constructed by weighting changes in policies by the share of country's total international assets or liabilities that the measure is designed to influence. Ahmed et al. (2015) calculates the number of steps that countries undergo to put new restrictions in place, tighten or ease them, or remove them altogether. The indexes measure capital controls on inflows for 4 types of assets (portfolio equity, portfolio

[1]For example, Brazil changed IOF, the tax on portfolio inflows, 4 times during the period of 2008-2010. This change in intensity is not reflected in these datasets and it is simply coded as a presence of the capital control.

bond, FDI, and banking/other) for 19 countries for the period of 2002-2012 at a quarterly frequency.

Second, a few global datasets on macroprudential policies were recently constructed. In particular, Lim et al. (2011) present a dataset of 10 types of macroprudential measures for 42 economies over 2000-2010. More recently, the Global Macroprudential Policy Instruments Survey by the IMF was conducted. This survey provides a comprehensive view on the timing and use of different macroprudential policies across 125 countries. The information is provided by country authorities and it is cross-checked by the IMF country desk economists. Using this survey, the dataset by Cerutti et al. (2017a) documents the use of macroprudential policies for 119 countries over the period of 2000-2013 covering 12 instruments. This paper relies on the dataset by Cerutti et al. (2017b) that focuses on changes in intensity in the usage of 5 types of prudential tools (capital buffers, interbank exposure limits, concentration limits, loan to value ratio (LTV) limits, and reserve requirements) for 64 countries over the period 2000-2014 at a quarterly frequency.

Finally, a number of papers relate capital flow management measures to global and local financial and business cycles. Fernandez et al. (2015b) find that capital controls are remarkably acyclical; that is, there is no movement in capital controls during booms and busts in aggregate activity. More formally, Fratzscher (2012) shows that the (re-) introduction and persistence of capital controls was motivated by FX policy objectives and concerns about an overheating of the domestic economy. Using data on changes in capital controls, Aizenman and Pasricha (2013) claim that capital controls on outflows were adjusted due to overheating and foreign exchange valuation concerns arising from net capital inflows pressure as well as for financial and macroeconomic stabilization. Additionally, Pasricha (2017) finds that policymakers respond to mercantilists concerns, promotion of exports by manipulating the terms of trade or preventing foreign control of strategic industries, by using both instruments – inflow tightening and outflow easing, while they use only inflow tightening in response to macroprudential concerns.

For macroprudential policies, Cerutti et al. (2017b) find that LTV ratios and reserve requirements are used in a countercyclical fashion with regard to local credit, policy rates, and house prices by most of the countries, while the other macroprudential instruments are aimed at achieving structural objectives. Federico et al. (2014) claim that around two thirds of developing countries have used reserve requirements as a macroeconomic stabilization tool substituting monetary policy that is usually procyclical.

3 The data

The cyclicality of capital controls and macroprudential policies is assessed in a sample of 24 emerging economies[2]. The sample period spans from 1997 to 2014 for capital controls (based on the availability of extended AREAER reports) and from 2000 to 2014 for macroprudential policies. The use of quarterly as compared to annual data is beneficial as in practice policies are often adopted and adjusted at a high frequency in order to counteract movements in exchange rates or moderate highly volatile financial indicators. Therefore, use of annual data might provide a muted picture. At the same time, use of higher frequency data is complicated as most of the macroeconomic variables are not available at a monthly or daily frequency.

3.1 Data on capital controls and macroprudential policies

Capital flow management measures typically include capital controls and macroprudential policies. While capital controls are defined as restrictions on cross-border financial activities that discriminate based on the residency of transactors, macroprudential policies are aimed to regulate the overall domestic banking sector and do not directly target capital flows.

At this paper, I use information on easing and tightening of 5 types of macroprudential policy instruments obtained from Cerutti et al. (2017b); for capital controls, a novel dataset on adjustment of capital controls on inflows and outflows for 5 types of assets is constructed. Both datasets include information on the number of tightening and easing steps as well as CFM policies direction. First, I calculate the number of easing and tightening measures for each type of asset or macroprudential instrument implemented by each country in each quarter. "Easing" steps indicate mitigation or removal of the existing barriers and are entered with a negative sign. "Tightening" steps mean augmentation of the existing or imposition of new regulations and are coded with a positive sign. The cumulative index is computed as a sum of the number of steps for 5 categories of assets for capital controls or 5 types of instruments for macroprudential policies. Second, I identify the direction of the policy in a given quarter that is summarized as follows:

[2]Countries in the sample: Argentina, Brazil, Bulgaria, Chile, China, Colombia, Czech Republic, Hungary, India, Indonesia, Israel, Korea, Malaysia, Mexico, Peru, Philippines, Poland, Romania, Russia, Slovak Republic, Slovenia, South Africa, Thailand, and Turkey.

$$CFM_{i,t} = \begin{cases} -1, & \text{if \# of steps} < 0 \\ 0, & \text{if \# of steps} = 0 \\ +1, & \text{if \# of steps} > 0 \end{cases} \quad (1)$$

Although the intensity of restrictions is captured imperfectly by this type of coding, the indexes can indicate the direction of a policy change in a given country over time. At the same time, the indexes do not allow assessing the difference in restrictiveness of the regulations across countries as policy instruments may be qualitatively and quantitatively different.

Data on macroprudential policies measures adjustment of 5 types of macroprudential instruments: capital buffers (general and sector specific), interbank exposure limits, concentration limits, loan to value (LTV) ratio limits, and domestic and foreign currency reserve requirements (RR). General capital requirements index is based on regulatory changes introduced by Basel Accord and sector specific capital buffers capture regulatory changes that are aimed at curtailing growth in bank claims to specific sectors of the economy. Concentration limits and interbank exposures prohibit large exposures to a single borrower or a group of borrowers and banks respectively. LTV ratio limits restrict the maximum amount that an individual or a firm can borrow against their collateral. For the observed period, macroprudential policies were mostly tightened with 305 tightening and 162 easing episodes (see Table 1). LTV ratios and reserve requirements (on foreign and local currency) have the highest number of loosening and tightening episodes. At the same time, the other instruments were not changed often. For example, capital requirements and interbank exposure limits were only tightened at the observed period.

Data on capital controls presents information on tightening and easing of restrictions on outflows and inflows for 5 types of assets (portfolio equity, portfolio debt, FDI, banking, and derivatives). For construction of a dataset, I track changes that occurred in each quarter for each country using information at the Section – Changes for "Capital transactions" and "Provisions specific to the financial sector" at the end of the AREAER reports and the datasets by Chantapacdepong and Shim (2015), Ahmed et al. (2015), and Pasricha et al. (2017). The new measures are entered as of an implementation date[3]. The resulting dataset includes 631 easing and 239 tightening episodes as it is shown in Table 2. As opposed to macroprudential policies, capital accounts for residents and non-residents were mostly liberalized for the observed period. As expected, rather volatile banking, debt, and equity flows have the highest number of easing and tightening episodes for both capital

[3]The detailed information on a construction of the dataset is presented in Appendix A.1. The data is available upon request.

inflows and outflows. At the same time, changes in capital account restrictions on more stable FDI flows are not frequent. This is in line with a "pecking order" that suggests that capital controls are usually imposed on the assets that contribute to financial instability the most (Ostry et al., 2010).

Based on the example of China, the indexes on capital controls on inflows and outflows presented in this paper are compared to the capital account openness index by Chinn and Ito (2006) and the overall inflow and outflow restriction indexes by Fernandez et al. (2015a). As the Figure 1 suggests, the index by Chinn and Ito (2006) is flat indicating no changes in capital account openness. The indexes on capital controls on inflows and outflows by Fernandez et al. (2015a) exhibit almost no variation and have a value close to one, suggesting that China had a closed capital account with almost no adjustment in restrictions at the observed period of time. My index, in contrast, captures the evolution of capital controls policies documenting an increased openness of China to inflows and outflows of capital.

Main statistics for CFM measures is reported in Table 3. The standard deviations for both capital controls and macroprudential policies are rather high indicating active adjustment of the policies. Next, while the theory predicts that in order to discourage net capital inflows policymakers should increase capital controls on inflows and ease them on outflows, the observed correlation between changes in capital controls on inflows and outflows is positive. It reveals lack of a systematic use of capital controls to limit procyclicality of net capital inflows. At the same time, correlations between changes in macroprudential policies and capital controls is nil indicating lack of coordination between the two types of policies.

Further, changes in capital controls and macroprudential policies exhibit some variation across time and countries. As shown in Figure 2, changes of capital flow management measures vary widely across the sample period. Easing of capital controls on inflows was largely implemented in 1997-2004 and around the global financial crisis. The number of easing episodes dropped significantly post-crisis. At the same time, tightening episodes of capital controls on inflows were mostly introduced pre- and post-crisis. Capital controls on outflows were liberalized during the whole period with a slight decline in a number of episodes after 2009. Therefore, EMEs were largely liberalizing their capital accounts pre-crisis and during the crisis even though they were undertaking measures to restrict certain types of capital inflows. For the case of macroprudential policies, loosening episodes coincide with the global financial crisis, while the wave of tightening episodes occurs thereafter. Additionally, there were important differences between countries in terms of the frequency in using CFM measures (see Figure 3) as well as in their reliance on tightening or easing of the restrictions.

3.2 Definition of business and financial cycles

To assess the cyclicality in imposition of capital controls and macroprudential policies, I distinguish between business and financial cycles. Though business and financial cycles exhibit some degree of synchronization (Claessens et al., 2012), financial variables usually follow economic variables with a lag and are much more volatile. In this paper, the business cycle is defined as the fluctuation in economic activity that an economy, or its real sector, experiences over the period of time. It is measured as a deviation of gross domestic product in the US dollars from its trend (or output gap). While there is no consensus definition of the financial cycle, broadly defined it is characterized by fluctuations of financial variables including both quantities and prices (BIS, 2014). At this study, I use credit to private non-financial corporations (NFC) for a definition of the financial cycle. Additionally, I employ real effective exchange rate (REER) as in Magud et al. (2011) and financial conditions indicator (FCI)[4] to assess the cyclicality of CFM measures. Data on REER and GDP in USD is extracted from Haver Analytics. Credit to NFC in USD is obtained from BIS[5]. The FCIs come from IMF GFSR[6]. All variables are at a quarterly frequency.

Further, I distinguish between two types of cycles (Kose et al., 2003):

1. global cycle;

2. local (or country-specific) cycle.

At this paper, an assumption is made that global markets are not affected by economic and financial developments at the local economies, while local economies follow global trends (Rey, 2015)[7]. To "clean" local variables from innovations that come from global developments, I derive an orthogonal component for each local variable by regressing them on global variables and taking the residuals. Further, to eliminate country-specific trend and seasonal effects, I use HP-filtering with $\lambda = 1,600$ for a quarterly data.[8] I refer to the deviation of a variable from its trend as its cyclical component.

[4]The FCIs are estimated based on TVP-FAVAR model by Koop and Korobilis (2014). The vector of financial variables includes corporate spreads, term spreads, interbank spreads, sovereign spreads, the change in long-term interest rates, equity and house price returns, equity return volatility, the change in the market share of the financial sector, and credit growth.

[5]For Bulgaria, Romania, Slovakia, Slovenia, Peru, and Philippines, I use claims on private sector by other deposit taking corporations from IMF IFS.

[6]For Romania, Slovakia, and Slovenia, I use financial stability indicators from Cardarelli et al. (2011).

[7]It is accepted in the literature that the global cycle is mostly driven by the developments in the US (Rey, 2015), while a contribution of other individual countries is marginal. However, due to the increasing trade and financial intergeneration of the EMEs, the role of the EMEs in shaping the global economy is growing (GFS, 2016). Further, the EMEs now account for more than 75 % of global growth in output and consumption, almost double the share of just two decades ago (WEO, 2017). Therefore, the assumption made in this paper should be taken with caution.

[8]Deseasonalization of the variables and removal of a (log-)quadratic trend as well as estimations in growth rates produce similar results.

4 Tested hypotheses

Based on the theoretical literature, capital controls on net capital inflows and macroprudential policies that are imposed in a countercyclical manner can promote financial stability (Jeanne and Korinek, 2010; Benigno et al., 2016; Korinek and Sandri, 2016) and improve macroeconomic adjustment (Schmitt-Grohé and Uribe, 2016). Therefore, policymakers should tighten capital controls on inflows and relax them on outflows during expansions, and *vice versa* during contractions. Similarly, prudential regulations should be strengthened during the periods of a high growth and loosed in times of a recession.

First, this paper tests whether policymakers adjust macroprudential policies and capital controls on net inflows in a countercyclical manner along global and local business and financial cycles as measured by GDP and credit to NFC gaps respectively. When there is a surge in local or global economic and/or financial activities, policymakers tighten macroprudential policies and capital controls on inflows in order to constrain international and domestic borrowing and limit overheating of the economy. The opposite happens in times of busts as easing of the policies should attract additional capital from abroad and, in turn, facilitate investment and consumption. Further, capital controls on outflows are tightened during recessions so that capital does not fly away from the country, and *vice versa* during boosts. This way, macroprudential policies and restrictions on net capital inflows are used as stabilization tools, or "lean against the wind."

Second, I check whether capital controls and macroprudential policies are adjusted due to fear of appreciation (Calvo and Reinhart, 2002) and changing financial conditions. With capital inflows comes an upward pressure on the exchange value of the currency, which makes domestic firms less competitive in global markets. As discussed by Magud et al. (2011), a desire to stem such an appreciation results in tightening of CFM measures. Additionally, when financial conditions are worsening (in this paper, measured as an increase in financial conditions indicator), obtaining internal and external financing for firms and households becomes difficult due to banking distress or downturn in securities or foreign exchange markets (Cardarelli et al., 2011). Therefore, policymakers might be wiling to ease CFM measures in order to facilitate lending and borrowing (Fratzscher, 2012).

Finally, I test whether CFM measures are changed along local cycles, global cycles, or both. While most of the empirical studies discussed above relate CFM policies to local cyclical variables, there is no clear guidance on this issue from the theoretical perspective. On the one hand, financial and economic stability is the main priority for policymakers and, therefore, they should be guided by local economic and financial developments. On the other hand, policymakers might be willing to closely follow global economic and financial variables due to the presence of a global financial cycle in capital flows, asset prices and

in credit growth (Rey, 2015). This is particularly the case for the EMEs as their markets are more sensitive to the global cycle due to dependence on credit inflows.

5 Cyclicality of capital flow management measures: correlation analysis

This section analyzes whether changes in capital controls and macroprudential policies in each country are correlated with the variables defining global and local financial and business cycles as discussed in Section 3.2. For macroprudential policies, correlations with all local variables and global credit and REER gaps are mostly statistically insignificant and may take positive and negative values almost equally likely as it is shown in Figure 4. Remarkably, most of the correlations between macroprudential policies and a global output gap are on a positive side and are statistically significant for nine countries. Further, worsening of global financial conditions is associated with the relaxation of macroprudential regulations for the majority of countries in the sample. Thus, macroprudential policies show some countercyclical behaviour along global business and financial cycles.

Figure 5 displays country-by-country correlations of capital controls on inflows and local and global cyclical components of GDP, credit to private NFC, REER, and FCIs. Most countries display insignificant correlations and the sign of the correlations can be positive or negative with a roughly equal probability. Similarly, capital controls on outflows (see Figure 6) behave acyclically with regard to local and global variables. Exceptionally, most of the countries exhibit negative correlations between capital controls on outflows and local REER and GDP gap and positive correlations with local financial conditions, though the correlations are mostly not statistically significant. Therefore, the results suggest that capital controls on inflows and outflows are largely acyclical.

Additionally, I check correlations of a one quarter and a one year lags and leads of CFM measures and cyclical components of the variables (the corresponding Figures are not reported) as policies either can take some time to be adjusted or are changed based on expectations of future macroeconomic and financial developments at home and abroad. For this exercise, a similar pattern emerges for correlations with the slow moving variables such as GDP and credit gaps. At the same time, correlations become statistically insignificant or even change the sign for the fast moving variables such as REER and FCIs.

6 Capital flow management measures during the global financial crisis

In this section, I study a co-movement between CFM measures and global and local economic and financial variables along the global financial crisis of 2007-2009. As highlighted by Fernandez et al. (2015b), regulators are often not responsive to small and short-term movements in financial and economic variables. Therefore, unconditional correlations presented in Section 5 might not be able to fully capture countercyclical behaviour of CFM measures, as fluctuations in economic and financial activities are largely dominated by the small deviations of global and local variables from trend. At the same time, the regulators might be willing to use capital controls and/or macroprudential policies once they face large and long-lived fluctuations as the ones observed during the recent financial crisis.

Additionally, the successfully implemented capital controls and macroprudential policies can mild down local business and financial cycles (Forbes et al. (2015), Klein (2012), Ostry et al. (2010), among others). That might also be the reason for zero or statistically insignificant correlations that are observed in Figures 4 - 6. Analyzes of the behaviour of CFM measures around the global financial crisis helps address the endogeneity problem. This event is exogenous to all countries in the sample as the crisis originated in the US and then spilled over around the globe.

Figure 7 displays behaviour of major economic and financial indicators as well as capital controls and macroprudential policies during the period of 2007-2009. Both local and global GDP, credit to NFC, and REER were picking in 2008 and dropped dramatically thereafter. Additionally, financial markets contracted at the second and third quarters of 2008 that is displayed as a peak in financial conditions indicators. At the same time, capital controls on inflows and outflows display almost no cyclical movement during the crisis. If at all, both of them were slightly eased at the first quarter of 2008. In addition, capital controls on outflows were liberalized before 2008. In contrast, easing of macroprudential policies coincides with worsening of global financial conditions and precedes troughs in global and local business and financial activities. Thus, macroprudential policies display a clear countercyclical behaviour along business and financial cycles around the period of the Great Contraction.

7 Capital flow management measures & fundamentals: Econometric analysis

This section tests empirically whether countries adjust, ease and tighten, macroprudential policies and capital controls over the business and financial cycles. I assume that decisions on adjustment of macroprudential policies and capital controls are taken independently, as central banks are mostly responsible for macroprudential policies, while national governments (in limited cases, central banks) decide on imposition of capital controls (IMF, 2018).

7.1 Methodology

At the first step, I assume that a policymaker at country i chooses between tightening and easing of CFM measures after observing all available information $\Omega_{i,t} = (Local\_cycle_{i,t}, Global\_cycle_t, CFM\_prev_{i,t})$ at time t. To estimate the policymaker's choice, I use the following logit model:

$$\begin{aligned} Prob(CFM_{i,t} = 1|\Omega_{i,t}) = F(\alpha + \beta \times Local\_cycle_{i,t} + \\ + \gamma \times Global\_cycle_t + \theta \times CFM\_prev_{i,t}) \end{aligned} \tag{2}$$

where $F()$ is logistic;

$$CFM_{i,t} = \begin{cases} 1, & \text{if policy is tightened} \\ 0, & \text{if policy is eased.} \end{cases}$$

$\{Local\_cycle_{i,t}, Global\_cycle_t\}$ are defined by cyclical components of slow-moving variables as GDP and credit to private NFC and fast-moving variables as REER and FCI as specified in a Subsection 3.2;

$CFM\_prev_{i,t}$ indicates policy direction at the previous year (Pasricha, 2017). It takes the value of 1 if the previous policy action was tightening, the value of -1 if the policy action was easing, and 0, otherwise. This variable captures cycles in policy assuming that the probability of tightening/easing increases if the previous policy action was tightening/easing[9].

As additional control variables, I use monetary and fiscal policy stance that take the value of 1 if the policy was tightened, -1 if the policy was eased, and 0 if there was no

[9]Policy direction at the previous quarter and at the previous three years produces similar results.

change in the policy (Pasricha, 2017). Fiscal policy stance is defined as fiscal balance in USD extracted from Haver Analytics. Monetary policy stance is approximated by a change in policy rate downloaded from the IMF IFS. Tightening of a fiscal or monetary policy is resulted in an upward pressure on interest rates, thus, making investment in the country more attractive and increasing capital inflows. Therefore, policy-makers might be willing to respond by tightening CFM measures. Further, I include political risk rating from PRS Group (low number represents a high risk) assuming that countries with unstable political environment and weak institutions might have different motivation to implement CFM policies.

At the second step, I estimate a multinomial logit model assuming that a policymaker chooses between $K = 3$ options, that are easing, tightening, and no change of a policy. The following model is used:

$$\begin{aligned} Prob(CFM_{i,t} = k|\Omega_{i,t}) = F(\alpha_i + \beta \times Local\_cycle_{i,t} + \\ + \gamma \times Global\_cycle_t + \theta \times CFM\_prev_{i,t}) \end{aligned} \tag{3}$$

The probability that the policymaker at country i chooses policy option k at time t is given by:

$$Prob(CFM_{i,t} = k|\Omega_{i,t}) = \frac{exp(\alpha_i^k + \beta^k \times \Omega_{i,t})}{\sum_{K=1}^{3} exp(\alpha_i^K + \beta^K \times \Omega_{i,t})} \tag{4}$$

Each equation (3) has country-specific coefficients α_i that measure time-invariant characteristics of a country that might affect its decision on adjustment of CFM measures. These models are estimated by maximum likelihood assuming independence of irrelevant alternatives (based on Hausman-McFadden test)[10].

As mentioned in Section 6, coefficients for local business and financial cycles can suffer from an endogeneity problem as an adjustment of CFM measures may lead to changes in cyclical variables. As in the previous literature (Klein, 2012; Cerutti et al., 2017a), I assume that the effect from policies takes place with a lag and the direction of a cycle is not changed as the result of a policy implementation because financial and business cycles are mostly driven by other fundamentals.

[10]The nested logit model that assumes that a policymaker, first, chooses whether to adjust a CFM policy or not and, second, selects between tightening and easing of the policy produces similar results.

7.2 Empirical results

This subsection discusses the empirical results for adjustment of macroprudential policies and capital controls on inflows and outflows along financial and business cycles based on logit and multinomial logit models.

7.2.1 Logit model

The results for the baseline logit models that explain adjustment of CFM measures along global and local business and financial cycles are presented in Tables 4- 6. Due to concerns about a high correlation between the explanatory variables, I estimate the regressions with global and local GDP, credit to NFC, REER, and FCI gaps separately in columns (1)–(8) and then all together including additional controls in columns (9)-(12) of the Tables.

Table 4 reports the estimates for tightening and easing of macroprudential policies. Countries that tightened macroprudential policies over the previous year tend to tighten them at the current period indicating that CFM policy changes come in cycles as in Pasricha (2017). Contrary to the previous literature (Cerutti et al., 2017b), local variables have little or no power in explaining adjustment of macroprudential policies. At the same time, macroprudential policies are adjusted in a countercyclical fashion along global financial (measured by credit to private NFC and FCI) and business cycles. As an economic or financial boom is usually accompanied by surge in capital flows, tightening of macroprudential policies seems to be used to put "sand in the wheels" of international borrowing. Additionally, in times of worsening of global financial conditions, macroprudential instruments might be relaxed in order to support vulnerable domestic financial sector and attract additional financial flows from the rest of the world. It is worth mentioning that other control variables such as monetary and fiscal policy stance and political risk have no statistical power in explaining imposition of macroprudential policies.

Similarly to macroprudential policies, capital controls on inflows (see Table 5) are imposed in cycles, that is if the policy was tightened in a previous year, the probability that the next action will be a tightening increases. Further, coefficients on local variables are not statistically significant, indicating a low or no influence of local economic and financial developments on adjustment of the capital controls on inflows. Contrary to the previous literature (Pasricha, 2017; Fratzscher, 2012), changes in real exchange rates and GDP are not significantly correlated with changes in capital controls on inflows. At the same time, worsening of global financial conditions or drop in credit to the NFC increase the probability of easing of the policies.

For capital controls on outflows (see Table 6), tightening of capital restrictions last year increases the probability of tightening them now due to the persistence of the policies.

Global financial and economic variables have a low power in explaining imposition of capital controls on outflows. At the same time, these policies are adjusted procyclically with regard to local business and financial (measured by REER and FCI) cycles as in Aizenman and Pasricha (2013); that is, the probability of tightening them increases in times of economic or financial busts preventing domestic agents from pushing capital abroad. To the contrary, economic or financial boom in a domestic economy increases the probability of easing them, thus, allowing to cool down the economy or its financial sector. The prevalence of local factors in explaining imposition of capital controls on outflows can be attributed to the fact that these policies restrict purchase of assets abroad by residents or sale of assets locally by non-residents that might be mostly driven by domestic push factors.

The overall results show that countries are systematically using capital controls on outflows in a procyclical fashion along local business and financial cycles as it is suggested by the theoretical literature. At the same time, while macroprudential policies and capital controls on inflows are adjusted countercyclically along global business and financial cycles, the coefficients on local cyclical variables are not statistically significant. The later finding might either suggest that policymakers at the EMEs are closely following global developments and coordinate the regulations or coefficients on local variables are biased downwards due to the problem of an endogeneity discussed in Section 6.

7.2.2 Multinomial logit model

The results for a multinomial logit model that assumes that a policymaker chooses between no action, tightening, and easing of CFM measures after observing global and local business and financial variables are presented in Table 8. Each column of the Table presents the coefficients for choosing one option over a baseline option (for example, choosing tightening over no change of a policy, easing over no action, or tightening over easing of a CFM measure).

As for a logit model described in Subsection 7.2.1, macroprudential policies and capital controls on inflows are imposed countercyclically along global financial (measured by FCI and credit to NFC) and business cycles, while local variables play a minor role and are not statistically significant. Exceptionally, the probability of easing capital controls on inflows increases when local real exchange rates depreciate as in Pasricha (2017). At the same time, the probability of tightening over no change of a policy stays unaffected along fluctuations of REER. This finding might be explained by foreign currency debt accumulation at the EMEs and a subsequent fear of depreciation rather than depreciation (Yeyati and Rey, 2006). In addition, capital controls on outflows are adjusted procyclically along local

financial (measured by REER and FCI) and business cycles. The results, however, are driven by tightening of capital controls on outflows, while liberalization of a capital account goes independently of financial or economic considerations.

To give a more in depth explanation for the obtained results, the average predicted probabilities from multinomial logit models are computed as follows:

$$\frac{\partial Prob_{i,k,t}}{\partial \Omega_{i,t}} = Prob_{i,k,t}(\beta^k - \sum_{K=1}^{3} Prob_{i,K,t} \times \beta^K) \tag{5}$$

where i is a country and $k = \{Nochange, Tightening, Easing\}$. The predicted probability of choosing easing, tightening or no change of the policy by country i are computed at different values of the continuous predictor variables, holding all other variables at their current values. Then probabilities are averaged across countries.

Figure 8 shows average predicted probabilities of changes in CFM measures along different values of global variables. While the probabilities of tightening and easing of capital controls on outflows are close to zero and remain almost unchanged along global business and financial cycles, capital controls on inflows behave countercyclically (that is, the probability of tightening them in times of economic or financial boom increases by about 10%). Additionally, the probability of tightening macroprudential policies increases in times of a boom in global business and financial activities. For example, the probability of tightening is around 30% at the peak of a global business and financial cycles. The probability of easing macroprudential policies changes along global economic and financial conditions; that is, at the peak of global FCI (the financial conditions are the worst) and the trough in global GDP the probability of easing macroprudential policies increases to more than 60% and 30% respectively.

Next, Figure 9 displays average predicted probabilities of adjustment of CFM measures along local business and financial cycles. While the probabilities of policy changes remain almost unchanged for different values of local GDP, credit to private NFC, and REER, some changes in the use of capital controls and macroprudential policies along different local financial conditions are observed. The probability of easing capital controls on outflows increases from zero to almost 20% and the probability of tightening to 15% at the time of good and bad local financial conditions respectively. The small probabilities for tightening and easing of capital controls on outflows are not surprising as a change of these policies is a rare event and it is observed in about 10% of the sample only. Additionally, the probability of easing macroprudential policies and capital controls on inflows raises to 20% in times of unfavourable local financial conditions, while the probability of tightening remains almost constant.

7.3 Robustness checks and extensions

This subsection provides robustness checks (the corresponding regression results are not reported) as well as some extensions of the analysis. For robustness of the results, I check whether the main conclusions hold when I use one quarter and one year lags as well as 4-quarters cumulative explanatory variables. The intuition is that a policymaker takes a decision on adjustment of CFM measures based on financial and business variables observed in the past. The regression results, however, become weaker in terms of statistical significance when I use one quarter lags or 4-quarters cumulative explanatory variables and statistically insignificant or with a different sign for one year lagged explanatory variables. It suggests that for the given sample of countries policymakers base their decisions on the current state of the economy and financial markets. The results, however, are not driven by a single country or a single explanatory variable and they become stronger in terms of a statistical significance when I estimate the regressions on a reduced sample of countries that actively adjusted CFM measures[11].

7.3.1 Disaggregation by asset category and macroprudential instrument

As an extension of the main results, I analyze the cyclicality of capital controls for each category of assets and of macroprudential policies for each prudential instrument (see Table 7).

For macroprudential policies, I run regressions using adjustment of financial institution-targeted instruments (all instruments excluding LTV ratios as in Cerutti et al. (2017b)), LTV ratios, and reserve requirements on local and foreign currency-denominated accounts as dependent variables. I do not run separate regressions for capital buffers, concentration limits, and interbank exposure limits due to a small number of tightening and easing episodes. The results obtained for a cumulative index are mostly driven by local reserve requirements that are introduced countercyclically along global business and financial cycles. Additionally, the probability of easing foreign reserve requirements and LTV ratios increases in times of worsening financial conditions. The results are in line with the previous literature that finds positive correlation between the evolution of reserve requirements and credit growth (Cerutti et al., 2017b) and countries real GDP growth (Federico et al., 2014).

For capital controls on inflows and outflows, I estimate the regressions using changes in controls on non-FDI, banking, equity and debt flows as dependent variables. Restrictions

[11]Reduced sample: Argentina (from 2004), Brazil, Chile, China, Colombia, India, Indonesia, Israel, Korea, Malaysia, Mexico, Peru, Philippines, South Africa, Thailand, Russia (from 2002), Turkey (from 2004).

on banking inflows are introduced countercyclically; the probability of tightening capital restrictions increases in times of a global economic and/or financial boom, and *vice versa* during busts. Additionally, worsening economic conditions coincide with easing of capital controls on all types of inflows. The finding supports the idea that in times of a recession capital restrictions are alleviated in order to attract additional financing from abroad, mostly, in the form of credits. For capital controls on outflows, the coefficients for all asset types have the right sign, but are not statistically significant. It might partially be due to a small number of observations at each category of assets. All in all, these results indicate the importance of analyzing capital controls separately for each type of asset as opposed to cumulative indexes used in the previous literature.

7.3.2 Intensity of capital flow management measures

When changes in financial or economic fundamentals are small, policymakers might opt for no change or only moderate changes in CFM measures. At the same time, when significant swings in economic or financial variables are observed, policymakers may intensify their use of CFM policies. As the main measure of capital controls and macroprudential policies employed in this paper indicates the direction of a policy, tightening or easing, it does not allow capturing intensity with which policies are used. To partially account for this drawback, Table 9 presents the results for ordered logit model as in Pasricha (2017) that uses the number of easing and tightening steps made by each country at each quarter as a dependent variable. It is worth mentioning, however, that intensity is captured not precisely by this type of measurement as the country that undertakes many small tightening or easing steps will be classified as the one that uses CFM policies more intensively as compared to the country that undertakes one significant change in a CFM measure. The results are in line with the previous models suggesting that macroprudential policies and capital controls on inflows are introduced countercyclically along global business and financial cycles and capital controls on outflows are imposed procyclically along local business and financial cycles. Additionally, both capital controls on inflows and outflows are responsive to fluctuations in local REER.

8 Conclusion

A growing theoretical literature and policymakers argue that macroprudential policies and capital controls on net capital inflows should "put sand in the wheels" of international borrowing by being tightened during booms and relaxed during busts in economic and/or financial activities. In this paper, I show that indeed macroprudential policies and

capital controls on inflows are adjusted in a countercyclical fashion along global financial and business cycles. At the same time, capital controls on outflows respond procyclically to local financial and business developments. The results, however, exhibit some heterogeneity across different prudential instruments and restrictions on different categories of assets.

This paper presents a new dataset on easing and tightening of capital controls on inflows and outflows for 5 types of assets for 24 emerging economies for the period 1997-2014 at a quarterly frequency. Using this dataset together with a dataset on changes in macroprudential policies by Cerutti et al. (2017b), I analyze patterns of a co-movement of CFM measures with different macroeconomic and financial variables using correlation analysis, inference around the global financial crisis, and regression analysis. I distinguish between global and local business and financial cycles that are proxied by slow-moving variables as GDP and credit to private NFC and fast-moving variables as REER and financial conditions indicator.

The main findings of this paper suggest that policymakers in EMEs are systematically using capital controls on outflows in a procyclical fashion and macroprudential policies and capital controls on inflows in a countercyclical manner as it is suggested by the theoretical literature. More specifically, worsening of global financial conditions and/or slowing down of a global economic growth increases the probability of easing the restrictions on capital inflows and macroprudential policies, thus, allowing to attract additional financing from abroad and facilitating consumption and investment. For capital controls on outflows, global financial and economic variables have a low power in explaining their imposition. At the same time, these policies are adjusted procyclically along local business and financial (as measured by REER and FCI) cycles; that is, the probability of tightening them increases in times of economic or financial busts preventing domestic agents from pushing capital abroad.

The findings differ across the instruments: local and foreign reserve requirements behave countercyclically, while the other instruments are imposed with more structural objectives (address long-term aspects of the economy as opposed to short-term recession-fighting measures) in mind. Capital controls on banking inflows exhibit a clear countercyclical behaviour, while restrictions on other capital inflows are adjusted along changing financial conditions only. With more emphasis on the use of capital controls by policymakers, it will be interesting to check whether the observed pattern changes over time.

References

(2011). *IMF Strategy, Policy and Review Department "Recent Experiences in Managing Capital Inflows: Cross-Cutting Themes and Possible Policy Framework"*.

(2014). *BIS 84th Annual Report*.

(2016). *Global Financial Stability Report "Fostering Stability in a Low-Growth, Low-Rate Era"*.

(2017). *World Economic Outlook: Gaining Momentum?*

(2018). *The IMF's Annual Macroprudential Policy Survey – Objectives, Design, and Country Responses*.

Ahmed, S., Curcuru, S., Warnock, F., and Zlate, A. (2015). Decomposing international portfolio flows. dataset on capital controls (2002q1-2012q4, 19 countries), mimeo.

Ahmed, S. and Zlate, A. (2014). Capital flows to emerging market economies: A brave new world? *Journal of International Money and Finance*, 48:221–248.

Aizenman, J. and Pasricha, G. K. (2013). Why do emerging markets liberalize capital outflow controls? fiscal versus net capital flow concerns. *Journal of International Money and Finance*, 39:28–64.

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

Calvo, G. A. and Reinhart, C. M. (2002). Fear of floating. *The Quarterly Journal of Economics*, 117(2):379–408.

Cardarelli, R., Elekdag, S., and Lall, S. (2011). Financial stress and economic contractions. *Journal of Financial Stability*, 7(2):78–97.

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

Cerutti, E., Correa, R., Fiorentino, E., and Segalla, E. (2017b). Changes in prudential policy instruments – a new cross-country database. *International Journal of Central Banking*, 13(1):477–503.

Chantapacdepong, P. and Shim, I. (2015). Correlations across asia-pacific bond markets and the impact of capital flow measures. *Pacific-Basin Finance Journal*, 34:71–101.

Chinn, M. D. and Ito, H. (2006). What matters for financial development? capital controls, institutions, and interactions. *Journal of Development Economics*, 81(1):163–192.

Claessens, S., Kose, M. A., and Terrones, M. E. (2012). How do business and financial cycles interact? *Journal of International Economics*, 87(1):178–190.

Federico, P., Vegh, C. A., and Vuletin, G. (2014). Reserve requirement policy over the business cycle. *NBER Working Paper 20612*.

Fernandez, A., Klein, M. W., Rebucci, A., Schindler, M., and Uribe, M. (2015a). Capital control measures: A new dataset. *NBER Working Paper 20970*.

Fernandez, A., Rebucci, A., and Uribe, M. (2015b). Are capital controls countercyclical? *Journal of Monetary Economics*, 76:1–14.

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

Fratzscher, M. (2012). Capital controls and foreign exchange policy. *ECB Working Paper Series 1415*.

Garcia, C. A. C. (2017). Effects of capital controls on foreign exchange liquidity. *BIS Working Papers 659*.

Jeanne, O. and Korinek, A. (2010). Managing credit booms and busts: A pigouvian taxation approach. *NBER Working Paper 16377*.

Klein, M. W. (2012). Capital controls: Walls versus gates. *NBER Working Paper 18526*.

Koop, G. and Korobilis, D. (2014). A new index of financial conditions. *European Economic Review*, 71:101–116.

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

Kose, M. A., Otrok, C., and Whiteman, C. H. (2003). International business cycles: World, region, and country-specific factors. *American Economic Review*, 93(4):1216–1239.

Lim, C. H., Columba, F., and Costa, A. (2011). Macroprudential policy : What instruments and how to use them? lessons from country experiences. *IMF Working Papers 11/238*.

Magud, N. E., Reinhart, C. M., and Rogoff, K. S. (2011). Capital controls: Myth and reality—a portfolio balance approach. *NBER Working Paper 16805*.

Ostry, J. D., Chamon, M., Ghosh, A., Qureshi, M. S., and Reinhardt, D. (2010). Capital inflows: The role of controls. *IMF Working Paper 2010/04*.

Pasricha, G., Falagiard, M., Bijsterbosch, M., and Aizenman, J. (2017). Domestic and multilateral effects of capital controls in emerging markets. *NBER Working Paper 20822*.

Pasricha, G. K. (2012). Recent trends in measures to manage capital flows in emerging economies. *The North American Journal of Economics and Finance*, 23(3):286–309.

Pasricha, G. K. (2017). Policy rules for capital controls. *BIS Working Papers 670*.

Rey, H. (2015). Dilemma not trilemma: The global financial cycle and monetary policy independence. *NBER Working Paper 21162*.

Schindler, M. (2009). Measuring financial integration: A new data set. *IMF Staff Papers*, pages 222–238.

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

Yeyati, E. L. and Rey, H. (2006). Financial dollarization: Evaluating the consequences. *Economic Policy*, 21(45):61–118.

A Appendix

A.1 Description of a capital controls dataset

This dataset provides information on tightening and easing of capital controls on inflows and outflows for 5 types of assets for the period 1997-2014 at a quarterly frequency. The primary source of information for the dataset is the Annual Report on Exchange Arrangements and Exchange Restrictions by the International Monetary Fund for the years 1997-2014. I focus on the end of the section for each country that reports any changes in capital flow management policies that occurred over the year. Additionally, I supplement the AREAER with the information from the papers by Ahmed et al. (2015), Chantapacdepong and Shim (2015), and Pasricha et al. (2017).

For this dataset, "Easing" indicates mitigation or removal of the existing barriers and it is entered with a negative sign. "Tightening" means augmentation of the existing or imposition of new regulations and it is coded with a positive sign. To construct the data, first, I calculate the number of steps (actions) made by regulators for each category of assets. Further, I identify the direction of the policy: if the total number of steps is a negative number, the policy is eased; and if it is positive, the policy is tightened. The index is coded as 0 if either no changes occur or the number of tightening and easing actions is equal.

The dataset provides information on adjustment of capital controls on inflows and outflows for 5 types of assets that correspond to the types of transactions at the balance of payment (BoP) disaggregated as follows:

- "Debt" includes information on capital controls on portfolio investment in debt instruments; that is, money market instruments and bonds (Debt securities in the BoP);
- "Equity" provides information on capital controls of individual companies ("equities") or of mutual funds or other investment trusts ("collective investments") (Equity securities in the BoP);
- "Derivatives" include information on controls on derivatives and other instruments (Financial derivatives in the BoP);
- "Credits" inform on capital controls on financial credits, commercial credits, and guarantees and sureties (Other investment in the BoP);
- "FDI" refers to the controls on investments that involve active participation in the management of the acquired entities (Direct investment in the BoP).

Further, I distinguish between capital controls on inflows and outflows following Fernandez et al. (2015a). For three types of assets, that are Debt, Equity, and Derivatives, capital controls on inflows include controls on the Purchase of assets locally by non-residents and Sale or issue of assets abroad by residents. Capital controls on outflows refer to controls on the Purchase of assets abroad by residents and Sale or issue of assets locally by non-residents. For Credit operations and Direct investment, there are capital controls on inflows and outflows without further disaggregation.

Examples of the measures that are considered to be capital controls are:

- Change in limits on the amount of loans in FX or the allowed amount of cross-border flows;
- Change in tax rates or non-remunerated reserve requirements;
- Change in minimum stay requirements;
- Change in a permitted maturity of an asset;
- Permission or prohibition to purchase/sale/issue some instruments freely within specific group of countries, under certain conditions, or in a specific currency;
- Easing or tightening of a transaction for a specific agent (banks or mutual funds);
- Change of conditions on the use of proceeds.

Measures that are NOT considered to be capital controls:

- Changes in macroprudential regulations that do not discriminate on residency;
- Limits on capital flows that target a specific country, a specific industry (with an exception of a financial sector and pension funds), and/or are imposed on government transactions (defence, security, etc.). If a control refers to more than one sector where private entrepreneurship is common, then it is categorized as a control;
- Capital controls related to sanctions for political reasons;
- Changes in rules related to foreign purchases of land;
- Authorization, approval, permission, and clearance are considered to be controls, while reporting, registration, notification, and declaration are not a control (Fernandez et al., 2015a);
- Capital controls imposed on FDI flows that concern only natural persons.

A.2 Figures

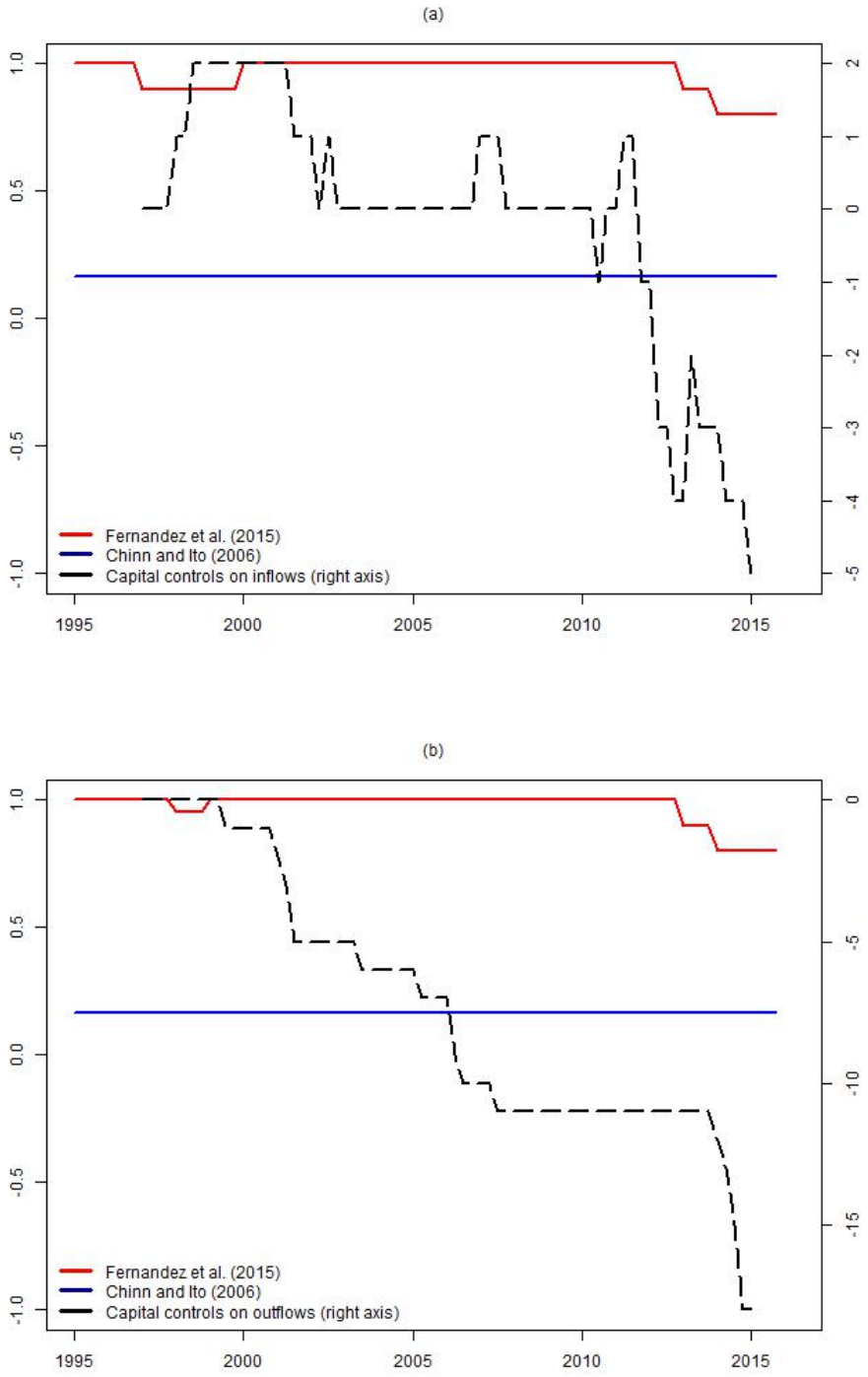

Figure 1: Comparison of indexes on capital controls on inflows (a) and capital controls on outflows (b) with the other capital account restriction indexes for the case of China.

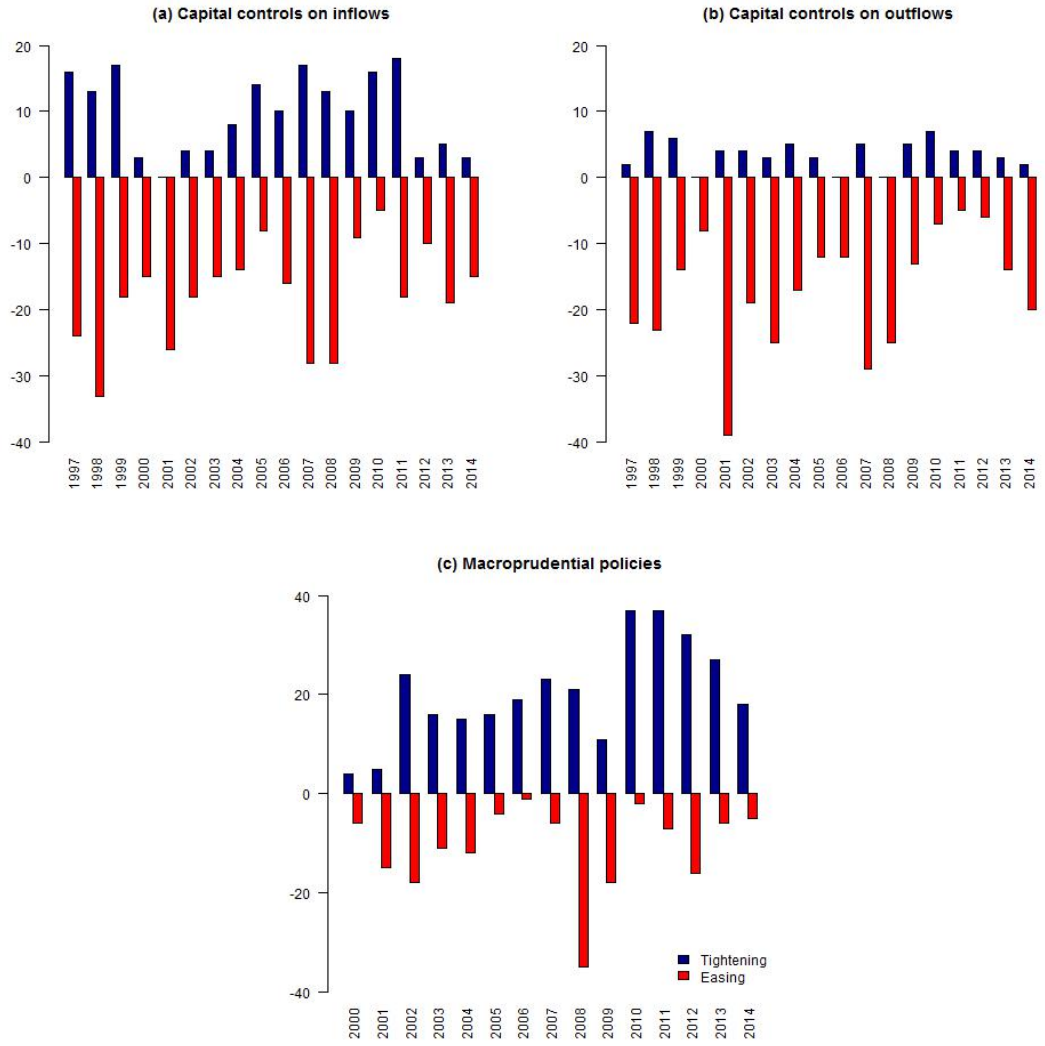

Figure 2: Capital flow management measures across time. *N*ote: Each bar indicates the number of tightening and easing steps made by all countries in the sample at a given year.

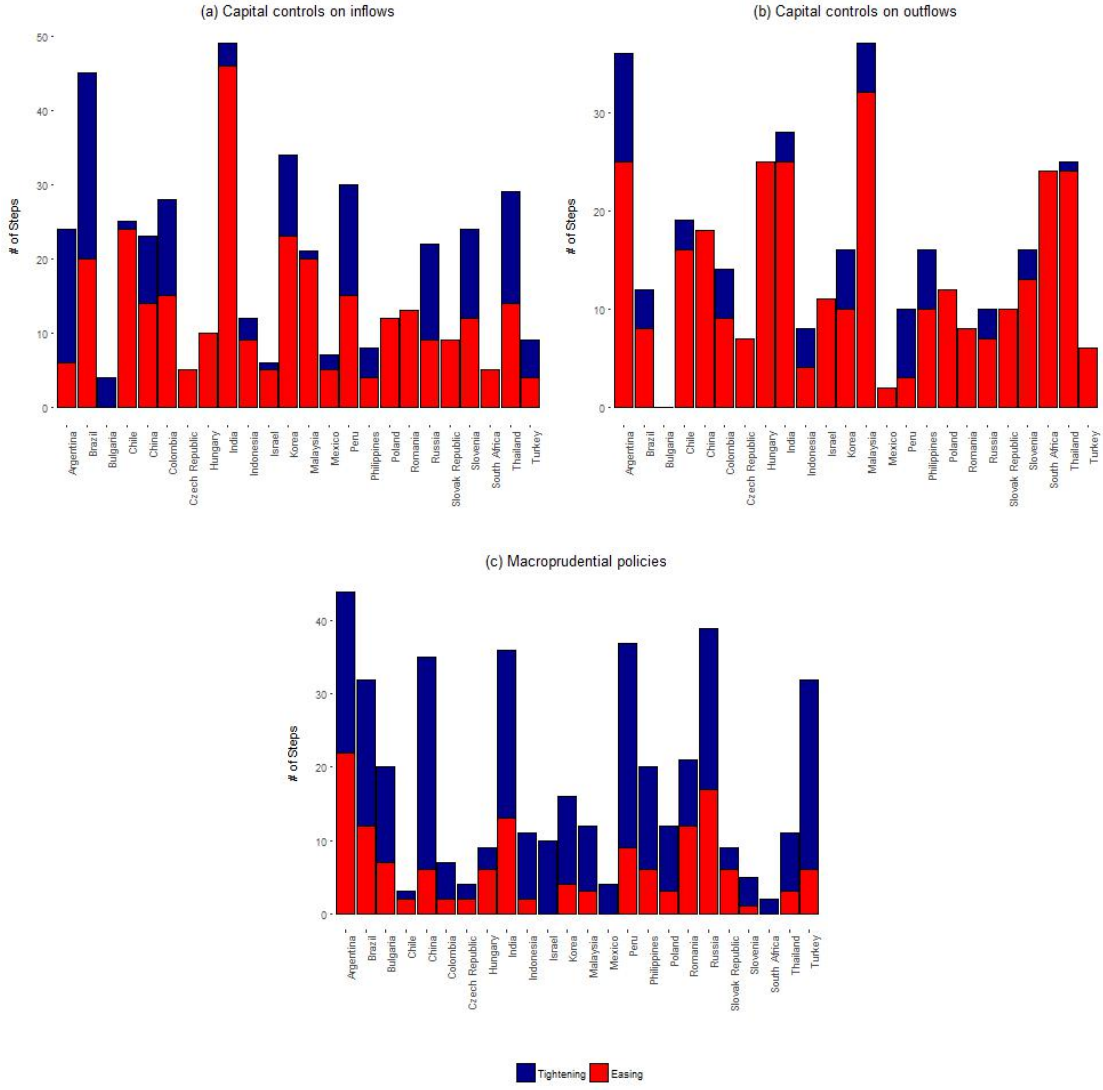

Figure 3: Capital flow management measures across countries. *N*ote: Each bar indicates the number of tightening and easing steps made by a country over the period 1997-2014 for capital controls and 2000-2014 for macroprudential policies.

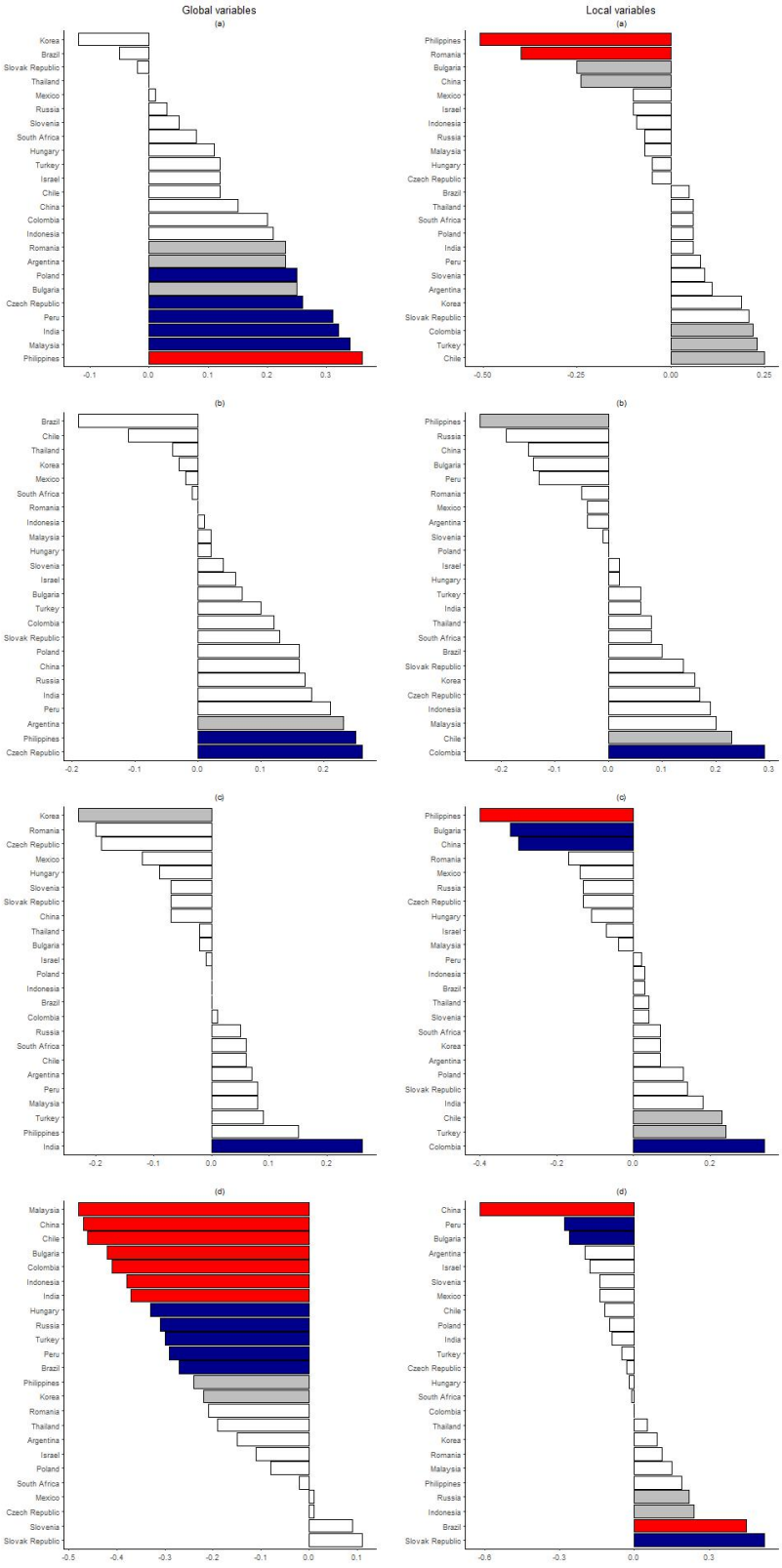

Figure 4: Country-by-country correlations between macroprudential policies and (a) GDP gap; (b) credit gap; (c) REER gap; and (d) FCI gap. *Note*: Correlations are computed using CFM indexes and cyclical components of the corresponding time series. Red, blue, and grey bars indicate statistical significance at 1, 5, and 10 percent levels respectively. Missing bars indicate covariances equal to zero.

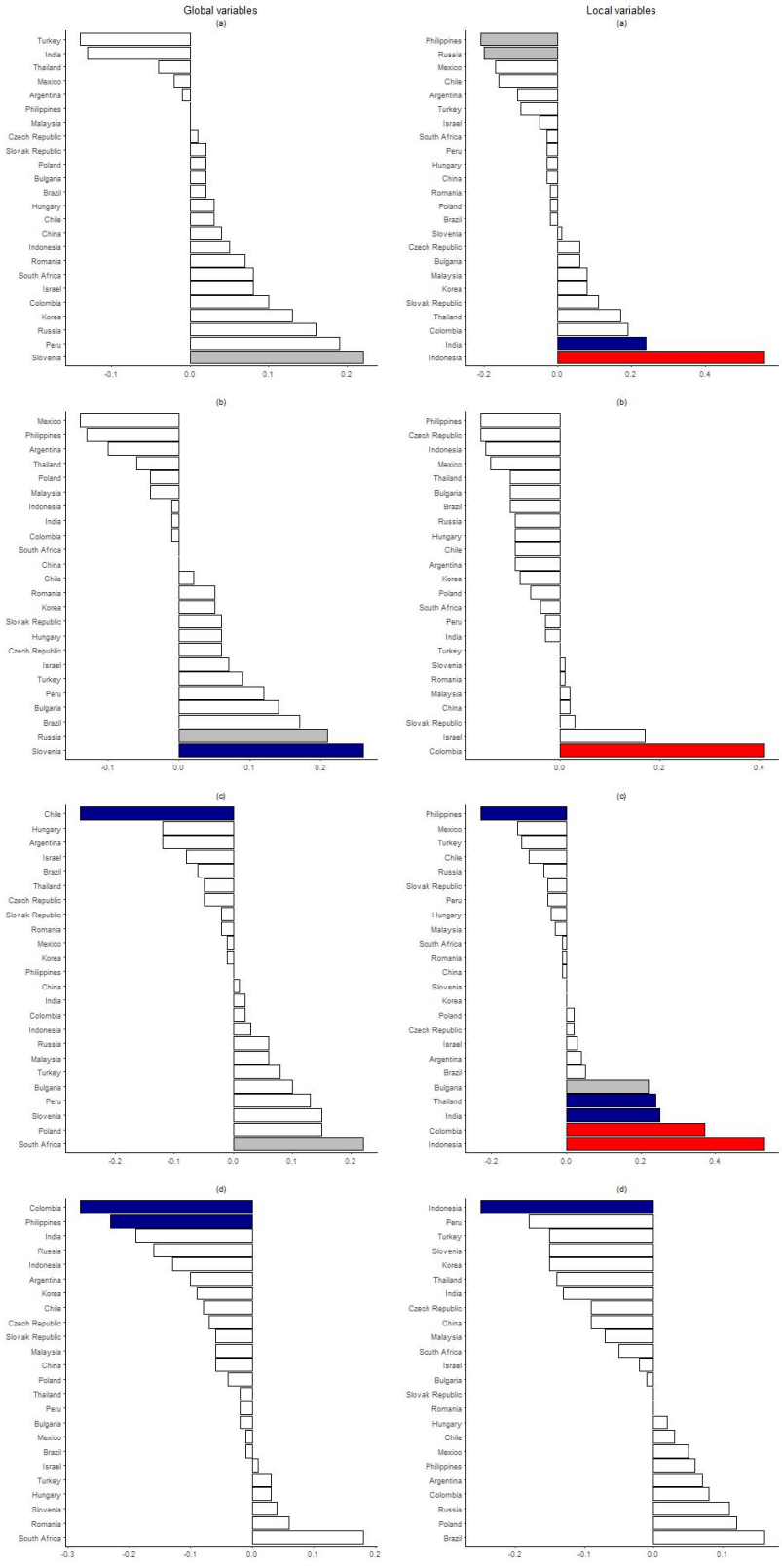

Figure 5: Country-by-country correlations between capital controls on inflows and (a) GDP gap; (b) credit gap; (c) REER gap; and (d) FCI gap. *Note*: Correlations are computed using CFM indexes and cyclical components of the corresponding time series. Red, blue, and grey bars indicate statistical significance at 1, 5, and 10 percent levels respectively. Missing bars indicate covariances equal to zero.

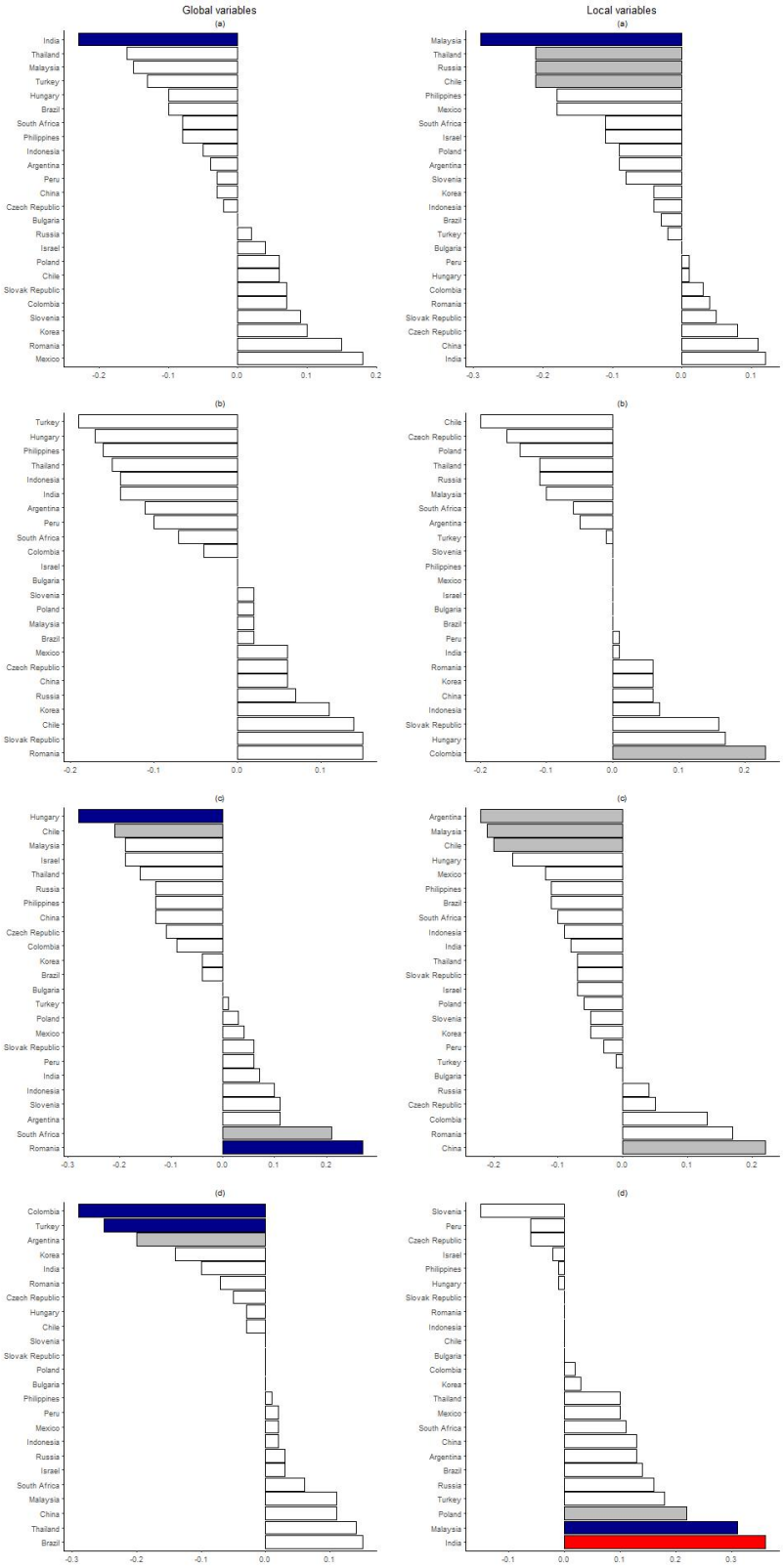

Figure 6: Country-by-country correlations between capital controls on outflows and (a) GDP gap; (b) credit gap; (c) REER gap; and (d) FCI gap. *Note*: Correlations are computed using CFM indexes and cyclical components of the corresponding time series. Red, blue, and grey bars indicate statistical significance at 1, 5, and 10 percent levels respectively. Missing bars indicate covariances equal to zero.

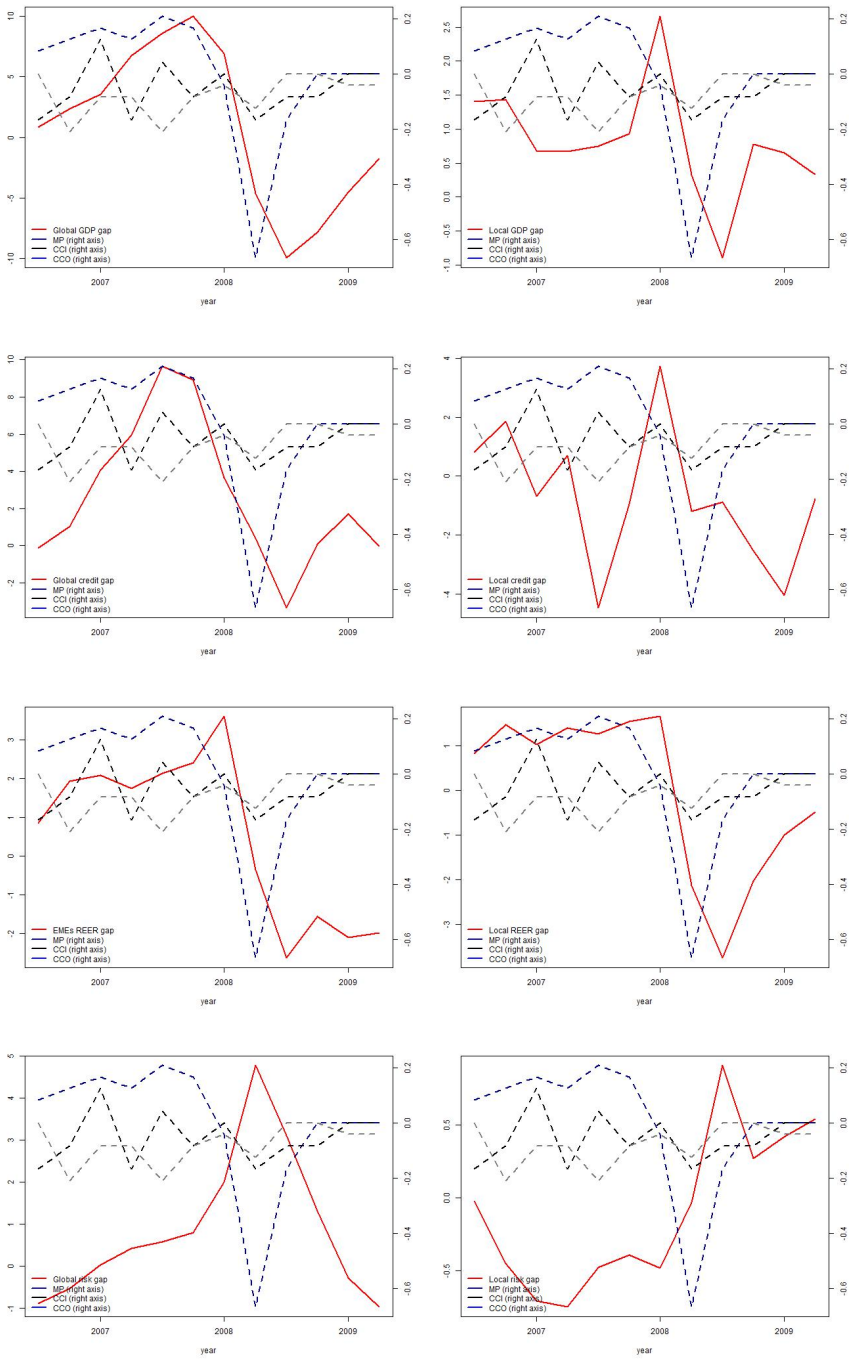

Figure 7: CFM measures during the global financial crisis of 2007-2009. *Note*: The Figure displays a co-movement between global and local economic and financial variables (solid lines, red) and CFM measures (dashed lines) during the period 2007-2009. The local economic and financial variables are averaged across countries.

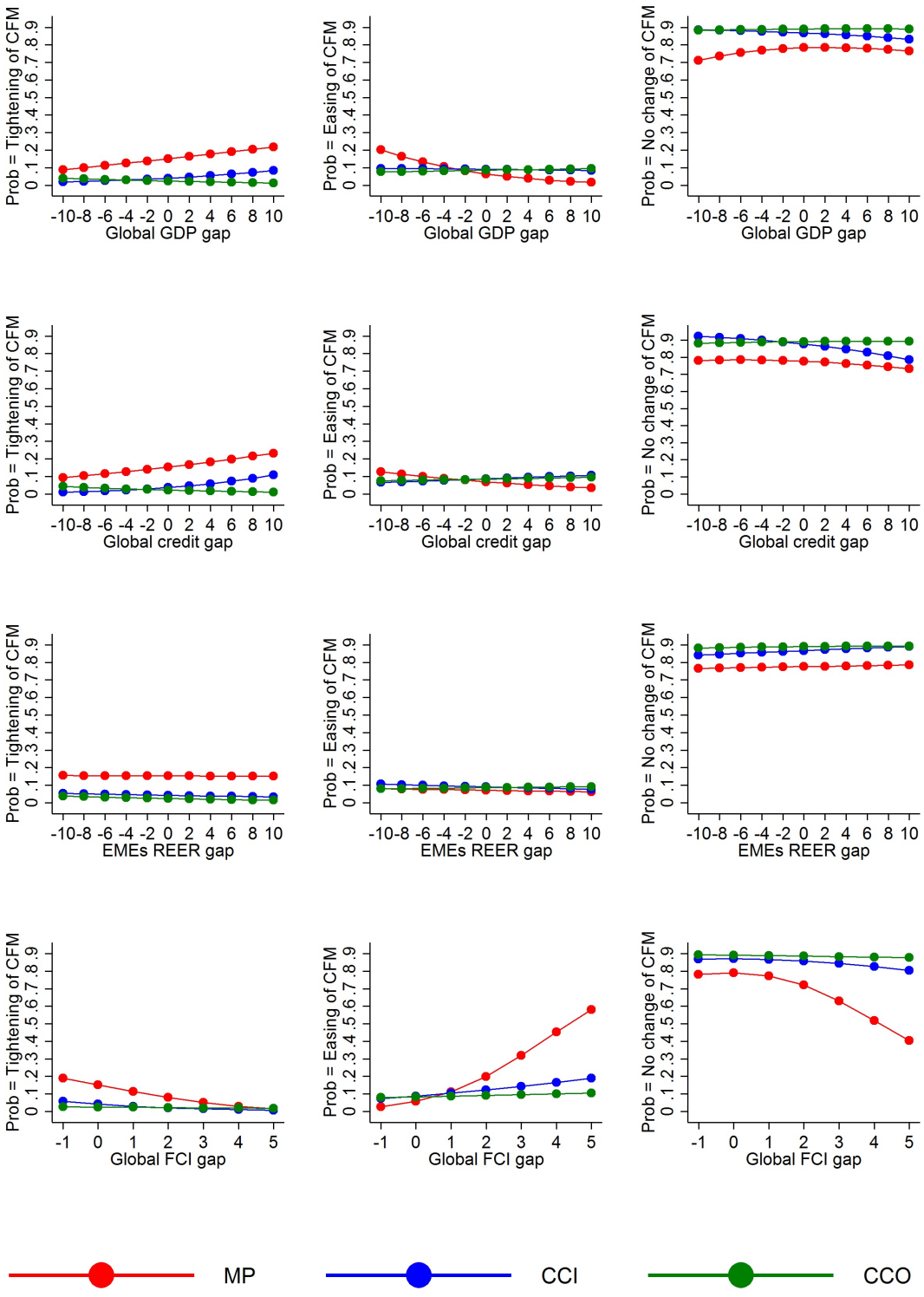

Figure 8: Average predicted probabilities of tightening (right column), easing (middle column), and no change (left column) of CFM measures along global economic and financial developments. *Note*: X-axis displays gaps in global variables and y-axis displays probabilities of tightening, easing, and no change of the policies.

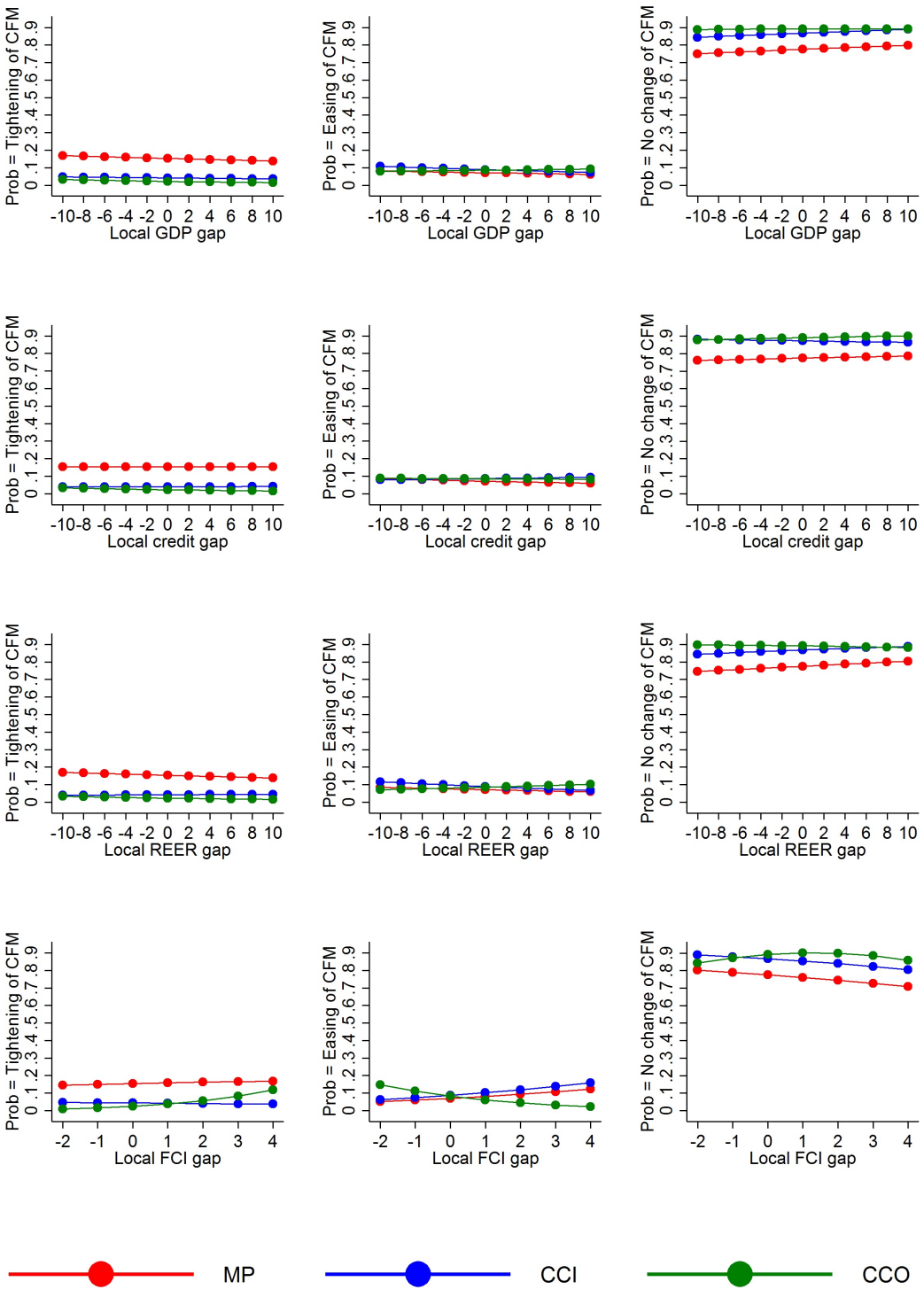

Figure 9: Average predicted probabilities of tightening (right column), easing (middle column), and no change (left column) of CFM measures along local economic and financial developments. *Note*: X-axis displays gaps in local variables and y-axis displays probabilities of tightening, easing, and no change of the policies.

A.3 Tables

Table 1: Macroprudential policies (MP): easing vs. tightening steps

	Tightening	Easing
Sector-specific capital buffers	42	12
Capital requirements	39	0
Concentration limit	14	2
Interbank exposure limit	9	0
LTV capital ratio	34	10
RR foreign	65	42
RR local	102	96
Total	305	162

Note: The Table shows the number of tightening and easing steps for different macroprudential instruments made by all countries in the sample for the period 2000-2014.

Table 2: Capital controls (CC): easing vs. tightening steps

	CC on outflows		CC on inflows	
	Tightening	Easing	Tightening	Easing
Equity	14	79	23	59
Debt	14	71	33	50
Credits	23	65	85	110
FDI	3	47	8	37
Derivatives	10	50	26	63
Total	64	312	175	319

Note: The Table shows the number of tightening and easing steps for different categories of assets made by all countries in the sample for the period 1997-2014.

Table 3: Main statistics

	MP	CCI	CCO
Mean	0.08	-0.05	-0.07
St.dev.	0.43	0.34	0.30
Corr with MP		0.14	0.03
Corr with CCI			0.35

Note: The sample includes the period 1997-2014 for capital controls and 2000-2014 for macroprudential policies.

Table 4: Regression results – logit model

	Dependent variable:											
	Macroprudential policies: 1 - tightening, 0 - easing											
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Local GDP gap	0.0004	0.005							−0.028	−0.024		
	(0.014)	(0.014)							(0.029)	(0.029)		
Global GDP gap		0.166***									−0.049	−0.059
		(0.039)									(0.072)	(0.073)
Local credit gap			0.007	0.020					0.008	0.005		
			(0.016)	(0.017)					(0.025)	(0.025)		
Global credit gap				0.120**							0.177**	0.184**
				(0.049)							(0.083)	(0.083)
Local REER gap					0.010	0.010			0.031	0.030		
					(0.017)	(0.017)			(0.028)	(0.028)		
EMEs REER gap						−0.004					−0.009	−0.011
						(0.039)					(0.041)	(0.041)
Local risk gap							−0.179	−0.187	−0.208	−0.191		
							(0.177)	(0.202)	(0.198)	(0.201)		
Global risk gap								−0.890***			−0.986***	−0.994***
								(0.159)			(0.180)	(0.181)
MP (prev. year)	0.752***	0.478***	0.747***	0.649***	0.747***	0.750***	0.657***	0.721***	0.654***	0.620***	0.783***	0.754***
	(0.162)	(0.176)	(0.162)	(0.167)	(0.162)	(0.166)	(0.167)	(0.188)	(0.168)	(0.172)	(0.205)	(0.207)
Monetary policy										0.115		0.165
										(0.147)		(0.166)
Fiscal policy										0.022		−0.043
										(0.141)		(0.158)
Pol. risk										−0.012		−0.014
										(0.020)		(0.022)
Constant	0.606***	0.740***	0.609***	0.654***	0.612***	0.610***	0.662***	0.810***	0.663***	1.464	0.760***	1.694
	(0.131)	(0.142)	(0.131)	(0.135)	(0.131)	(0.132)	(0.136)	(0.153)	(0.137)	(1.370)	(0.151)	(1.480)
McFadden R2	0.093	0.146	0.093	0.110	0.094	0.094	0.139	0.292	0.143	0.145	0.266	0.270
Observations	302	302	302	302	302	302	287	287	287	287	302	302
Log Likelihood	−177.512	−167.148	−177.427	−174.104	−177.351	−177.347	−168.487	−138.566	−167.776	−167.342	−143.560	−142.924
Akaike Inf. Crit.	361.024	342.295	360.853	356.207	360.702	362.693	342.974	285.131	347.551	352.685	299.120	303.848

Note:: p<0.1*; p<0.05**; p<0.01***. Reported coefficients are log of odds ratios. All continuous explanatory variables are computed using hp-filter as discussed in Subsection 3.2. Standard errors are in parenthesis.

Table 5: Regression results – logit model

	Dependent variable:											
	Capital controls on inflows: 1 - tightening, 0 - easing											
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Local GDP gap	−0.001	−0.002							−0.067*	−0.080*		
	(0.014)	(0.014)							(0.039)	(0.043)		
Global GDP gap		0.064									−0.083	−0.127
		(0.044)									(0.091)	(0.100)
Local credit gap			−0.011	−0.004					−0.009	−0.009		
			(0.022)	(0.023)					(0.027)	(0.030)		
Global credit gap				0.088*							0.208**	0.203*
				(0.051)							(0.099)	(0.107)
Local REER gap					0.030	0.030			0.082*	0.106**		
					(0.022)	(0.022)			(0.048)	(0.052)		
EMEs REER gap						−0.004					0.005	−0.007
						(0.042)					(0.052)	(0.058)
Local risk gap							−0.128	−0.196	−0.483	−0.196		
							(0.264)	(0.281)	(0.347)	(0.360)		
Global risk gap								−0.616**			−0.960***	−0.791***
								(0.242)			(0.315)	(0.299)
CCI (prev. year)	0.729***	0.665***	0.602***	0.542**	0.730***	0.730***	0.691***	0.725***	0.513**	0.344	0.607***	0.484**
	(0.206)	(0.210)	(0.219)	(0.221)	(0.207)	(0.207)	(0.209)	(0.216)	(0.226)	(0.239)	(0.233)	(0.247)
Monetary policy										0.310		0.334*
										(0.194)		(0.197)
Fiscal policy										0.437**		0.458**
										(0.181)		(0.182)
Pol. risk										−0.008		−0.030
										(0.025)		(0.025)
Constant	−0.674***	−0.716***	−0.709***	−0.791***	−0.659***	−0.660***	−0.602***	−0.624***	−0.673***	−0.205	−0.921***	1.093
	(0.153)	(0.157)	(0.159)	(0.169)	(0.152)	(0.152)	(0.155)	(0.161)	(0.169)	(1.668)	(0.195)	(1.664)
McFadden R2	0.149	0.156	0.232	0.242	0.156	0.156	0.193	0.222	0.287	0.338	0.286	0.342
Observations	217	217	194	194	217	217	202	202	180	174	194	186
Log Likelihood	−129.085	−128.028	−116.469	−114.992	−128.041	−128.037	−122.406	−118.026	−108.254	−100.393	−108.399	−99.888
Akaike Inf. Crit.	264.171	264.056	238.938	237.985	262.082	264.074	250.813	244.052	228.508	218.786	228.797	217.775

Note:: p<0.1*; p<0.05**; p<0.01***. Reported coefficients are log of odds ratios. All continuous explanatory variables are computed using hp-filter as discussed in Subsection 3.2. Standard errors are in parenthesis.

Table 6: Regression results – logit model

	Dependent variable:											
	Capital controls on outflows: 1 - tightening, 0 - easing											
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Local GDP gap	−0.059**	−0.059**							−0.027	−0.034		
	(0.025)	(0.027)							(0.052)	(0.051)		
Global GDP gap		−0.105*									−0.167	−0.204*
		(0.061)									(0.106)	(0.108)
Local credit gap			−0.023	−0.036					0.030	0.043		
			(0.031)	(0.033)					(0.044)	(0.046)		
Global credit gap				−0.102							0.024	0.048
				(0.069)							(0.113)	(0.116)
Local REER gap					−0.061*	−0.059*			−0.044	−0.035		
					(0.033)	(0.034)			(0.052)	(0.052)		
EMEs REER gap						−0.043					−0.053	−0.049
						(0.050)					(0.054)	(0.055)
Local risk gap							0.668*	0.674**	0.037	0.255		
							(0.342)	(0.343)	(0.477)	(0.501)		
Global risk gap								−0.079			−0.474	−0.436
								(0.256)			(0.359)	(0.332)
CCO (prev. year)	1.153***	1.248***	1.152***	1.196***	1.180***	1.185***	1.107***	1.093***	0.972***	0.761**	1.199***	1.036***
	(0.298)	(0.312)	(0.299)	(0.306)	(0.295)	(0.296)	(0.297)	(0.300)	(0.311)	(0.331)	(0.315)	(0.325)
Monetary policy										0.415*		0.444*
										(0.248)		(0.238)
Fiscal policy										0.050		0.086
										(0.231)		(0.232)
Pol. risk										0.011		−0.014
										(0.027)		(0.026)
Constant	−1.192***	−1.191***	−1.152***	−1.159***	−1.119***	−1.123***	−1.054***	−1.059***	−1.134***	−1.883	−1.210***	−0.267
	(0.205)	(0.207)	(0.203)	(0.205)	(0.199)	(0.200)	(0.201)	(0.202)	(0.212)	(1.804)	(0.216)	(1.753)
McFadden R2	0.197	0.212	0.221	0.233	0.183	0.187	0.201	0.202	0.261	0.282	0.252	0.280
Observations	179	179	166	166	179	179	167	167	154	151	166	161
Log Likelihood	−79.479	−77.989	−77.080	−75.934	−80.843	−80.465	−79.058	−79.008	−73.111	−71.016	−74.059	−71.267
Akaike Inf. Crit.	164.957	163.979	160.160	159.868	167.685	168.930	164.115	166.016	158.222	160.032	160.118	160.534

Note:: p<0.1*; p<0.05**; p<0.01***. Reported coefficients are log of odds ratios. All continuous explanatory variables are computed using hp-filter as discussed in Subsection 3.2. Standard errors are in parenthesis.

Table 7: Regression results – disaggregation by asset type and instrument

	Dependent variable: CFM policy: 1 - tightening, 0 - easing											
	MP policy			CC on inflows					CC on outflows			
	Fin. inst.-target	RR local	RR foreign	LTV ratio	Non-FDI	Equity	Debt	Banking	Non-FDI	Equity	Debt	Banking
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Local GDP gap	0.0004	0.003	−0.006	0.042	−0.016	−0.023	−0.011	−0.032*	−0.055**	−0.058	−0.044	−0.054
	(0.014)	(0.017)	(0.018)	(0.059)	(0.017)	(0.054)	(0.034)	(0.019)	(0.027)	(0.039)	(0.027)	(0.035)
Global GDP gap	0.165***	0.129***	0.032	0.138	0.069	−0.036	0.017	0.143**	−0.134**	−0.036	−0.072	−0.088
	(0.039)	(0.044)	(0.063)	(0.132)	(0.044)	(0.116)	(0.091)	(0.055)	(0.064)	(0.095)	(0.090)	(0.098)
Observations	269	179	89	32	197	50	56	128	162	72	66	67
Log Likelihood	−148.226	−104.144	−51.138	−18.625	−118.758	−25.927	−32.049	−79.545	−75.021	−31.304	−30.438	−30.662
Akaike Inf. Crit.	304.453	216.288	110.277	45.249	245.517	59.855	72.098	167.089	158.042	70.609	68.877	69.325
Local credit gap	0.011	0.001	−0.048	0.198**	0.004	−0.033	0.039	−0.031	−0.025	−0.056	−0.044	−0.020
	(0.017)	(0.020)	(0.030)	(0.101)	(0.025)	(0.054)	(0.053)	(0.028)	(0.033)	(0.053)	(0.046)	(0.048)
Global credit gap	0.111**	0.108*	−0.066	0.416	0.105**	0.022	0.083	0.126**	−0.109	0.078	−0.043	−0.171
	(0.049)	(0.059)	(0.081)	(0.298)	(0.053)	(0.112)	(0.111)	(0.062)	(0.072)	(0.087)	(0.097)	(0.120)
Observations	269	179	89	32	178	47	52	115	150	66	61	60
Log Likelihood	−155.365	−106.755	−49.794	−16.720	−106.393	−25.317	−28.975	−71.759	−72.913	−29.326	−29.612	−26.820
Akaike Inf. Crit.	318.730	221.510	107.589	41.440	220.785	58.634	65.949	151.517	153.826	66.653	67.224	61.640
Local REER gap	0.009	0.006	0.016	−0.016	0.021	−0.043	0.211**	−0.001	−0.060*	−0.021	−0.039	−0.071
	(0.018)	(0.022)	(0.029)	(0.063)	(0.027)	(0.076)	(0.087)	(0.029)	(0.034)	(0.049)	(0.032)	(0.050)
EMEs REER gap	−0.010	−0.008	−0.048	0.174	0.005	−0.176*	−0.086	0.053	−0.042	−0.066	0.024	−0.048
	(0.041)	(0.045)	(0.088)	(0.152)	(0.044)	(0.106)	(0.098)	(0.056)	(0.050)	(0.074)	(0.072)	(0.068)
Observations	269	179	89	32	197	50	56	128	162	72	66	67
Log Likelihood	−157.992	−108.748	−51.106	−18.616	−120.076	−24.469	−27.718	−83.570	−77.992	−32.037	−31.624	−31.340
Akaike Inf. Crit.	323.984	225.495	110.211	45.232	248.151	56.937	63.437	175.139	163.984	72.073	71.248	70.680
Local risk gap	−0.221	−0.213	−0.018	−1.216	−0.124	−0.749	−0.505	0.022	0.615*	0.198	0.230	0.794
	(0.210)	(0.251)	(0.360)	(1.628)	(0.280)	(0.717)	(0.663)	(0.308)	(0.337)	(0.454)	(0.475)	(0.514)
Global risk gap	−0.862***	−0.918***	−1.096***	−2.032*	−0.546**	−1.840**	−1.236*	−0.411*	−0.079	0.265	−0.112	−0.251
	(0.159)	(0.215)	(0.353)	(1.165)	(0.242)	(0.882)	(0.698)	(0.225)	(0.255)	(0.301)	(0.390)	(0.424)
Observations	257	168	82	30	182	44	50	117	153	67	62	61
Log Likelihood	−124.503	−84.627	−38.304	−12.039	−110.236	−20.568	−26.729	−76.238	−76.635	−29.678	−31.384	−30.036
Akaike Inf. Crit.	257.006	177.253	84.608	32.079	228.472	49.137	61.458	160.475	161.271	67.357	70.767	68.072

*N*ote:: p<0.1*; p<0.05**; p<0.01***. Reported coefficients are log of odds ratios. Coefficients for a constant term and CFM policies at the previous year are omitted All continuous explanatory variables are computed using hp-filter as discussed in Subsection 3.2. Standard errors are in parenthesis.

Table 8: Regression results – multinomial logit model

	Dependent variable: CFM policy: 1 - tightening, -1 - easing, and 0 - no change.								
	MP policy			CC on inflows			CC on outflows		
	1 vs.0	-1 vs.0	1 vs.-1	1 vs.0	-1 vs.0	1 vs.-1	1 vs.0	-1 vs.0	1 vs.-1
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Local GDP gap	−0.015	−0.018	0.003	−0.017	−0.024**	0.006	−0.042***	0.008	−0.050***
	(0.013)	(0.013)	(0.016)	(0.013)	(0.010)	(0.015)	(0.014)	(0.013)	(0.018)
Global GDP gap	0.042*	−0.134***	0.176***	0.083**	−0.003	0.086**	−0.059	0.011	−0.070
	(0.023)	(0.031)	(0.036)	(0.036)	(0.025)	(0.042)	(0.049)	(0.025)	(0.054)
Observations	1344	1344	1344	1632	1632	1632	1632	1632	1632
Log Likelihood	-787.396	-787.396	-787.396	- -681.471	-681.471	-681.471	-574.577	-574.577	-574.577
Akaike Inf. Crit.	1,682.792	1,682.792	1,682.792	1,470.941	1,470.941	1,470.941	1,257.153	1,257.153	1,257.153
Local credit gap	−0.002	−0.021	0.019	0.005	0.011	−0.006	−0.038	−0.005	−0.033
	(0.012)	(0.015)	(0.018)	(0.019)	(0.013)	(0.022)	(0.026)	(0.013)	(0.028)
Global credit gap	0.053**	−0.062	0.115***	0.133***	0.037	0.096*	−0.069	0.012	−0.081
	(0.026)	(0.038)	(0.043)	(0.042)	(0.031)	(0.050)	(0.059)	(0.030)	(0.064)
Observations	1344	1344	1344	1536	1536	1536	1536	1536	1536
Log Likelihood	-796.723	-796.723	-796.723	-612.174	-612.174	-612.174	-533.934	-533.934	-533.934
Akaike Inf. Crit.	1,701.446	1,701.446	1,701.446	1,332.348	1,332.348	1,332.348	1,175.868	1,175.868	1,175.868
Local REER gap	−0.016	−0.024	0.008	0.003	−0.032***	0.035*	−0.035**	0.020	−0.055**
	(0.015)	(0.017)	(0.020)	(0.017)	(0.012)	(0.020)	(0.017)	(0.015)	(0.022)
EMEs REER gap	−0.003	−0.014	0.011	−0.027	−0.021	−0.006	−0.051	0.007	−0.058
	(0.023)	(0.030)	(0.035)	(0.036)	(0.025)	(0.042)	(0.048)	(0.025)	(0.053)
Observations	1344	1344	1344	1632	1632	1632	1632	1632	1632
Log Likelihood	-799.843	-799.843	-799.843	-683.192	-683.192	-683.192	-576.795	-576.795	-576.795
Akaike Inf. Crit.	1,707.687	1,707.687	1,707.686	1,474.383	1,474.383	1,474.383	1,261.589	1,261.589	1,261.589
Local risk gap	0.053	0.212	−0.159	−0.020	0.186	−0.206	0.449*	−0.340*	0.789***
	(0.161)	(0.164)	(0.214)	(0.244)	(0.159)	(0.281)	(0.248)	(0.180)	(0.300)
Global risk gap	−0.261**	0.740***	−1.001***	−0.351*	0.188**	−0.539**	−0.071	0.054	−0.125
	(0.129)	(0.088)	(0.145)	(0.204)	(0.087)	(0.217)	(0.211)	(0.099)	(0.229)
Observations	1279	1279	1279	1531	1531	1531	1531	1531	1531
Log Likelihood	-710.683	-710.683	-710.683	-631.644	-631.644	-631.644	-535.986	-535.986	-535.986
Akaike Inf. Crit.	1,529.366	1,529.366	1,529.366	1,371.288	1,371.288	1,371.288	1,179.971	1,179.972	1,179.972

*N*ote:: p<0.1*; p<0.05**; p<0.01***. Reported coefficients are log of odds ratios. Coefficients for country dummies and CFM policies at the previous year are omitted. All continuous explanatory variables are computed using hp-filter as discussed in Subsection 3.2. Standard errors are in parenthesis.

Table 9: Regression results – ordered logit model

	Dependent variable: Number of tightening (+) or easing (-) steps		
	MP policy	CC on inflows	CC on outflows
	(1)	(2)	(3)
Local GDP gap	−0.00003	0.008	−0.027***
	(0.010)	(0.009)	(0.010)
Global GDP gap	0.071***	0.034*	−0.028
	(0.018)	(0.020)	(0.022)
Observations	1,344	1,632	1,632
Log Likelihood	-1109.687	-992.778	-843.68
Akaike Inf. Crit.	2,245.374	2,067.556	1,765.360
Local credit gap	0.005	−0.005	−0.005
	(0.010)	(0.011)	(0.012)
Global credit gap	0.059***	0.032	−0.027
	(0.021)	(0.025)	(0.026)
Observations	1,344	1,536	1,536
Log Likelihood	-1093.907	-895.335	-784.111
Akaike Inf. Crit.	2,259.815	1,872.670	1,646.221
Local REER gap	0.004	0.027***	−0.032***
	(0.012)	(0.010)	(0.012)
EMEs REER gap	0.008	0.002	−0.018
	(0.018)	(0.020)	(0.022)
Observations	1,344	1,632	1,632
Log Likelihood	-1097.778	-991.176	-844.334
Akaike Inf. Crit.	2,267.556	2,064.351	1,766.668
Local risk gap	−0.126	−0.107	−0.115
	(0.129)	(0.116)	(0.116)
Global risk gap	−0.230***	−0.216***	−0.202***
	(0.079)	(0.076)	(0.077)
Observations	1,279	1,531	1,531
Log Likelihood	-714.334	-914.851	-915.235
Akaike Inf. Crit.	1,510.669	1,911.701	1,912.470

*N*ote:: p<0.1*; p<0.05**; p<0.01***. Reported coefficients are log of odds ratios. Coefficients for country dummies and CFM policies at the previous year are omitted. All continuous explanatory variables are computed using hp-filter as discussed in Subsection 3.2. Standard errors are in parenthesis.