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Domestic and Multilateral Effects of Capital Controls in Emerging Markets
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ABSTRACT

Using a novel dataset on changes in capital controls and currency-based prudential measures in 17 major emerging market economies (EMEs) over the period 2001-2011, this paper provides new evidence on domestic and spillover effects of capital controls before and after the global financial crisis. Our results, based on panel VARs on quarterly data, suggest that capital control actions do not allow countries to avoid the trade-offs of the monetary policy trilemma. Where they have a desired impact on the trilemma variables – net capital inflows, monetary policy autonomy and the exchange rate – the size of that impact is generally small. While we find some evidence of effectiveness before the global financial crisis, the usefulness of these measures weakened in the post-crisis environment of abundant global liquidity and relatively strong economic growth in EMEs. Our results also show that capital control policies can have unintended consequences, as resident outflows offset the impact of capital control actions on gross inflows (or vice versa). These findings highlight the importance of the macroeconomic context and of the increasing role of resident flows in understanding the effectiveness of capital inflow management. Using panel near-VARs, we find significant spillovers of capital control actions in BRICS (Brazil, Russia, India, China and South Africa) to other EMEs during the 2000s. Spillover effects were more important in the aftermath of the global financial crisis than before the crisis, and arose from inflow tightening actions, rather than outflow easing measures. The channels through which these policies spilled over to other countries were exchange rates as well as capital flows (especially cross-border bank lending). Spillovers seem to be more prevalent in Latin America than in Asia, reflecting the greater role of cross-border banking and more open capital accounts in the former countries. These results are robust to various specifications of our models.

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Non-technical summary

As the size and volatility of international capital flows have increased over the past decade, the policy debate about how to manage these flows has intensified. Capital controls are increasingly being recognized as valid tools of macroeconomic and macro-prudential management. However, just as concerns have been raised about spillovers of non-conventional monetary policies in advanced economies on emerging market economies (EMEs), so have policy-makers in the latter countries raised concerns about the use of capital controls in other EMEs. This paper provides new evidence on whether capital controls are useful as tools for macroeconomic management, and if so, what the channels are through which they affect net capital flows. In addition, we provide evidence on the spillover effects of capital control actions by the major EMEs. In order to address these questions, we use a novel dataset of policy changes or capital control actions in 17 EMEs over the period 1 January 2001- 31 December 2011.

Our results suggest that capital control actions only had a limited impact on net capital inflows, monetary policy autonomy or the exchange rate. They did not allow countries to avoid the trade-offs of the monetary policy trilemma. When they had a desired impact on these variables, the size of that impact was generally small. While we find some evidence of effectiveness before the global financial crisis, the usefulness of these measures in rounding the corners of the trilemma weakened in the post-crisis environment of abundant global liquidity, greater openness of and strong economic growth in EMEs. Our results also show that capital control policies can have unintended consequences, as resident flows offset the impact of capital control actions on gross inflows. These findings highlight the importance of the macroeconomic context and of the increasing role of resident flows in understanding the effectiveness of capital inflow management. The results are consistent with evidence in the literature that, in the past decade, EMEs have become more important as a source of capital in addition to being a recipient of capital. This implies that the behavior of net capital flows depends more than in the past on resident flows.

Spillover effects of capital flow policies may have been more important than generally thought. We find strong evidence that during the 2000s capital flow policies in large EMEs – net inflow tightening measures, but not outflow easing measures – had significant implications for other countries. Capital flow policies seem to have had an impact on other countries both via

exchange rates as well as net capital flows. Spillovers mainly occurred via exchange rates, but also via capital flows (especially cross-border bank lending, i.e. other investment flows). Spillovers of capital flow policies seem to have become more important in the aftermath of the global financial crisis than before the crisis. They seem to have been more prevalent in Latin America than in Asia, reflecting the greater role of cross-border banking and more open capital accounts in the former countries.

The findings of this paper have important policy implications for the debate on the effectiveness of capital controls. First, caution should be exercised when using capital controls as an instrument for macroeconomic management because their impact seems to be limited and situation-specific, they may have unintended consequences for other flows and they generate spillovers to other countries. Second, our results underline the growing prominence of outward investment flows from EMEs. As these resident flows gain further in importance, policy-makers in EMEs will increasingly need to take into account the impact of their capital control policies on those flows. Third, the importance of spillover effects across emerging economies highlights the scope for international coordination and the need for policy-makers in EMEs to incorporate such externalities in their decision-making on capital controls.

1. Introduction

As the size and volatility of international capital flows have increased over the past decade, the policy debate about how to manage these flows has intensified. A key question being debated is how useful capital controls are as tools to manage capital inflow waves. Proponents argue that capital controls are effective in stemming large and volatile inflows in recipient countries and can therefore be valid tools of macroeconomic and macro-prudential management (IMF, 2011a). However, the empirical evidence of effectiveness of capital controls in meeting domestic policy objectives is mixed. [1] The skeptics' case was well summarized in 2013 by Felipe Larraín, former Finance Minister of Chile, who was cited in The Economist as having said that *"Controls have little effect on exchange rates. At best they change the composition of capital inflows a bit (only because one form of capital is disguised as another). And they increase the cost of capital for businesses and individuals."*

While the evidence on the domestic effects of capital controls may be limited, what makes capital controls an issue of heated *international* debate is the concern that these controls may have spillover effects – that they may distort the global allocation of resources by diverting flows to other economies and that they can be used as tools in a currency war, to resist currency appreciation pressures. Just as concerns have been raised about spillovers of non-conventional monetary policies in advanced economies on emerging market economies (EMEs), so have policy-makers in the latter countries raised concerns about the use of capital controls in other EMEs. An illustration is the following quotation by Manuel Ramos-Francia, Deputy Governor of the Bank of Mexico: *"Emerging markets that have implemented capital controls to stem volatile capital flows have deflected such flows towards economies with no controls in place, thereby creating political tension."* The two types of spillovers may also interact, in the sense that spillovers stemming from capital controls may be larger in an environment of uneven global growth and easy monetary policies in advanced economies.

[1] Recent literature overviews suggest that capital flow measures have little effect on overall capital flows, although they may have an impact on the composition of flows (Magud et al., 2011). Effects of capital flow measures may vary markedly across the types of capital controls, with those on debt and equity flows being more effective in influencing capital flows than others (Binici et al., 2010). There is also evidence that controls may increase the maturity of inflows (De Gregorio, Edwards and Valdes, 2000). Capital flow measures may have asymmetric effects on the volume of capital inflows and outflows in the sense that restrictions on inflows may be less effective than those on outflows (Binici et al., 2010), although the opposite has also been found (Ariyoshi et al., 2000).

This paper provides new evidence on both questions: First, are capital controls useful as tools of macroeconomic management, and if so, what are the channels through which they affect net capital flows (impact on residents' vs non-residents' flows, specific types of capital flows etc.)? Second, what are the spillover effects of capital control actions by the major EMEs, and have these spillovers become more important in the post-global financial crisis environment of abundant global liquidity? In order to address these questions, we use a novel dataset of 754 policy changes or capital control actions (CCAs) in 17 EMEs over the period 1 January 2001-31 December 2011, along with information about their precise implementation dates.

To answer the first question, we use panel vector autoregressions (VARs) on quarterly data to investigate whether capital control actions allow policy-makers to ease the constraints of the monetary policy trilemma, i.e. the impossibility of simultaneously achieving a fixed exchange rate, an independent monetary policy and an open capital account. Effectiveness of capital controls in this context would mean that inflow tightenings allow policy-makers to reduce net capital inflows (leading to a more closed capital account), achieve a depreciation of the exchange rate (or a halt in an appreciation trend) and simultaneously increase monetary policy autonomy. Using panel VARs allows us to take into account the endogeneity of capital control decisions and the other variables of the trilemma. We conduct several robustness checks, including controlling for reserve accumulation as well as allowing for the forward-looking nature of capital control policies by using only unanticipated changes in capital controls.

On the second question of spillover effects of capital controls, we go further than the existing literature and provide a comprehensive assessment of the effects of capital control actions in the five major EMEs, namely the BRICS (Brazil, Russia, India, China and South Africa) on other EMEs. In order to allow for capital control changes in other countries to be exogenous, we use panel near-VARs (as well as country-specific near-VARs) to assess the spillover effects. We use several alternative specifications of the baseline model as robustness checks.

Our results show that capital control actions had a limited impact on the variables of the trilemma.[2] Most measured responses to an innovation in capital controls are small and statistically not very significant. Nevertheless, there is limited evidence that outflow easing measures, which constituted the majority of net capital inflow reducing measures before 2008,

[2] Our definition of net capital inflows excludes foreign direct investment (FDI) and official flows.

reduced net capital inflows, but with a delay. While these liberalization steps led to a loss of monetary policy autonomy, they did not have an impact on the exchange rate. Inflow tightening measures, which became the most important type of net capital inflow measures after the start of the crisis, were not effective in reducing net capital inflows, and the impact on monetary policy autonomy and the exchange rate was consistent with the constraints of the trilemma.

To further understand these results, we look at the impact of composition of flows and find that, as the literature has well documented, tightening of controls on "hot money" inflows increases FDI inflows reflecting a decline in FDI outflows as EME residents seek more domestic investment opportunities. Indeed, the behavior of resident outflows and of the external environment seems increasingly important for determining the effectiveness of inflow tightening measures in reducing net capital inflows. In the pre-crisis period, net inflow tightening measures significantly reduced gross inflows (mainly driven by non-residents), but they reduced gross outflows (mainly driven by residents) as well, thus resulting in a non-significant impact on net capital inflows.[3] In the post-crisis period, neither gross inflows nor outflows fell in response to these tightening measures. For gross inflows, net inflow tightening measures may have lost their effectiveness in the post-crisis period due to abundant global liquidity and the brighter economic performance of emerging economies relative to advanced economies. The latter factor – the reduced profitability of external investment opportunities – may have also depressed gross outflows from EMEs in the post-2008 period. Our results are consistent with evidence in the literature that in the past decade EMEs have become more important as a source of capital in addition to being a recipient of capital, implying that the behavior of net capital flows depends more than in the past on resident flows than on non-resident flows (Karolyi et al., 2013).

As concerns spillover effects, we find that during the 2000s, a tightening of inflow controls in the BRICS had significant implications for other countries, in particular via exchange rates but also through net capital inflows. These spillover effects seem to have been more important among the BRICS countries themselves than between the BRICS and other, smaller EMEs. They have also become more important in the aftermath of the global financial crisis than they were before the crisis. Banking flows were more important than portfolio flows as a channel

[3] Gross inflows measure the net accumulation of claims on residents by non-residents, and gross outflows measure the net accumulation of claims on non-residents by residents. However, the "other investment" component of gross inflows comprises mostly foreign bank loans taken by residents, and is at least partly (if not mainly) driven by residents.

for transmission of spillovers of capital controls. Spillovers seem to have been more prevalent in Latin America than in Asia, reflecting the greater role of cross-border banking and more open capital accounts in the former countries.

The paper is organized as follows: Section 2 places the contributions of our paper in the context of the existing the literature. Section 3 explains our dataset on changes in capital flow policies (i.e. capital control actions or CCAs) and Section 4 describes recent trends in measures to manage capital flows. Section 5 discusses our empirical methodology. Section 6 presents the results for domestic effects of capital controls, while Section 7 deals with spillover effects. Section 8 presents robustness checks and Section 9 concludes.

2. Contributions to the literature

Although there is a large body of empirical literature assessing the effectiveness of capital controls, there are several aspects that remain neglected. We fill some gaps in the literature by using a new database, which contains information on capital control actions (CCAs), along with information about the precise dates when the changes were made effective. This allows us to measure more precisely the effectiveness of capital controls. We extend the Pasricha (2012) database from 2001 to 2011. Further, in order to increase the cross-country comparability of changes, we weigh each change by the share of the country's foreign assets or liabilities the capital control measure is designed to influence. This results in a dataset of comparable capital control actions that can be used in a panel setting, allowing us to obtain more precise estimates of their impact.

Our first key contribution is that we extend the literature on the effectiveness of capital controls by focusing on the increased role of outward investment from EMEs during the 2000s. As EMEs continued to grow strongly during the 2000s and their financial markets developed further, capital flows into but also out of these economies gained in importance. As households in EMEs become richer and achieved higher levels of savings, they sought opportunities abroad to diversify their portfolios. Corporations in EMEs, including institutional investors, also looked for foreign investment opportunities as they expanded their operational bases internationally. An analysis of the effectiveness of capital controls in the 2000s needs to take these trends into

account and we do that by looking at the impact of capital flow policies on gross inflows (i.e. by non-residents) and gross outflows (by residents).

A second key contribution of this paper is that it provides evidence on spillover effects of capital controls. Such policy spillovers may arise from extraordinary monetary policies in advanced economies, but also from changes in capital controls in EMEs themselves, as the use of capital controls may divert capital flows from one country to another. The two types of spillovers may interact with each other. Spillovers from capital controls may become more important when global growth is uneven and accommodative monetary policy in advanced economies may result in higher capital flows to emerging economies. The empirical evidence of spillover effects of EME capital controls is currently limited. The available evidence either pertains to post-crisis years and the impact of one country's capital controls only (Forbes et al., 2012; Lambert et al., 2011) or uses less refined measures of capital controls that do not capture the intensity of controls or the precise dates of change (Giordani et al., 2014; Beirne and Friedrich, 2014). We provide a comprehensive assessment, using a dataset of capital control actions taken in the BRICS and assessing their impact on other EMEs.

Third, our econometric analysis conducted using quarterly frequency data allows us to analyze the domestic and cross-border impact of capital controls focusing on a horizon that is relevant for policy-makers. This adds to the literature as most existing cross-country studies on the effectiveness of capital controls tend to use annual measures of existence of capital controls across countries. For policy-makers looking to achieve exchange rate stability while maintaining monetary policy autonomy, the relevant time horizon may be as short as one quarter, especially when exchange rate pressure is high, and it is usually no more than two years. Our analysis based on quarterly figures is more relevant for macroeconomic decision-making, than most existing cross-country studies on the effectiveness of capital controls, which tend to use annual measures of capital controls across countries. These measures take a bird's eye view of regulations across countries and do not capture the intensive margin of changes in capital controls. For example, for India, the Chinn-Ito index (Chinn and Ito, 2008) is constant and the Schindler's index (Schindler, 2009) shows very little variation for our entire sample period. According to our measure, in this period India took 147 capital control actions – including tightening of inflow controls in periods of exchange rate appreciation (2004-06) and reversing these tightening measures when the tide turned in 2008-09. For day-to-day macroeconomic management, policy-makers do not change

entire structures of capital flow regulations, but rather make incremental changes to existing regulations – which is what our dataset captures.

Finally, we analyze the impact of changes in capital controls using a multi-dimensional approach, instead of a partial approach taken in many existing empirical studies (which tend to focus on the impact on capital flows only). Capital flow measures may, however, not only be used to influence the volume or composition of capital flows, but they can also be aimed at limiting exchange rate movements or preventing the loss of monetary policy autonomy associated with large capital flows.[4] Our multi-dimensional approach takes into account the fact that these policy targets are likely to be related via the monetary policy trilemma, i.e. the impossibility of simultaneously achieving a fixed exchange rate, an independent monetary policy and an open capital account. In addition, there is evidence that countries actively modify capital controls to manage pressure of inflows (Aizenman and Pasricha, 2013), creating an endogeneity problem. This endogeneity is addressed in our paper as we use a system of equations. More specifically, we estimate panel VARs for capital control actions, capital flows, a monetary policy autonomy index and exchange rates and use a range of global control variables as additional explanatory variables. While VARs have been commonly used in country-specific studies examining impact of capital controls, we are among the first to use VARs in a panel setting, and, to our knowledge, the first to do this for spillover effects of capital controls.[5]

3. Measuring Capital Control Actions (CCAs)

Capital controls are regulations on cross-border trade in assets that discriminate between residents and non-residents. For example, a tax on non-residents' investments in domestic

[4] In this regard, the empirical evidence on the effectiveness of capital controls is also mixed. For instance, Klein and Shambaugh (2013) finding that with pegged exchange rates, capital controls provide greater monetary autonomy only when they are long standing and extensive. Miniane and Rogers (2007) show that countries with more stringent capital controls were not more insulated from foreign monetary policy shocks. Hutchison, Pasricha and Singh (2013) find that even in a country with extensive capital controls, these controls were able to sustain a covered interest rate differential between onshore and offshore markets only in periods in which these controls were actively tightened. Further capital controls do not seem to have a clear effect on currency appreciation in most cases (Pandey et al., 2015; Jinjarak et al., 2013), with the exception of Chile in the 1990s (Edwards and Rigobon, 2009).

[5] Saborovski et al. (2014) use panel VARs to assess the effectiveness of capital outflow restrictions in EMEs. Studies using country-specific VARs include Cardoso and Goldfajn (1998), De Gregorio et al. (2000) and Baba and Kokenyne (2011).

securities that does not apply to residents' investments in the same securities is a capital control. In addition to these, EMEs often have also regulations on trade in assets that discriminate based on the currency of transaction. For example, an additional reserve requirement on foreign currency deposits in the banking sector (whether by residents or non-residents) is a currency-based measure.[6,7] The two groups of measures together can be referred to as "capital flow measures", as both can influence cross-border transactions in assets (capital flows). In this paper, we use data on both types of regulations, but we do not differentiate between the effects of the two types of regulations. Further, as the number of measures that are currency-based is relatively small, for ease of exposition, we use the terms "capital control actions" and "capital flow measures" interchangeably.

A cross-country empirical study of the effects of a certain policy hinges on the quality of the measurement of that policy. Measuring capital controls is a challenging task. The pre-global financial crisis literature used annual indices of the level of capital controls.[8] These indices are better at capturing the extensive margin of controls (how many types of transactions are regulated) than the intensive margin (how the restrictions change over time for each type of transaction). In order to assess the effectiveness of controls, it is important to capture the intensive margin, i.e. how restrictive the controls are for each asset class and how they change over time.

The recent literature has tried to improve the measurement of the intensive margin by collecting data on changes in regulations (Pasricha, 2012; Forbes et al., 2013, Pandey et al., 2015). The benefit of this approach is that it allows us to precisely capture the nature of the policy intervention as well as the date of the intervention. However, the question of whether

[6] Most of the currency-based measures are prudential tools, as they apply to the domestic financial sector and seek to limit foreign currency risks in individual firms' balance sheets. However, currency-based measures also include those that limit the non-financial sector's ability to trade foreign currency denominated assets. Our definition is therefore broader than Qureshi et al. (2011), who focus on currency-based measures applied only to the financial sector.

[7] There is a grey area between currency-based measures and capital controls. A number of regulations that are actually restrictions on resident-to-non-resident transactions are enforced through restrictions on foreign currency purchases and sales. For example, Brazil's *Imposto sobre Operações Financeiras* (IOF) is collected at the time of the sale of foreign exchange by non-residents for investment in Brazil's domestic market, but it is actually a capital control as it is collected only from non-residents. Further, some regulations differentiate according to both currency and residency. For example, limits on residents' foreign currency lending to non-residents (Malaysia). We classify such regulations as capital controls, not currency-based measures. Currency-based measures are classified as those that discriminate based on currency and not on residency. Having said that, we acknowledge that there is subjectivity in the final classification.

[8] See for example Magud et al. (2011), Schindler (2009), and Chinn and Ito (2008).

different policy actions are comparable over time and across countries continues to be as relevant for these datasets as for the older, less granular datasets of extensive margins. This question becomes more pressing for studies that seek to assess the impact of controls, rather than just the broad direction of policy. For example, should a change in the tax on portfolio inflows in Brazil be expected to have the same impact on net inflows as an increase in the quantitative limit for foreign investment in government bonds in India? Or, should an increase in the quantitative limit for foreign purchases of government bonds in India be expected to have the same impact on net capital inflows as an increase in the interest rate ceiling for Indian corporate foreign borrowing?

3.1 Constructing a comparable measure of capital control actions

An improvement in the comparability of quantitative measures of policy actions (or policy changes) is essential if we want to precisely evaluate the impact of changes in controls, particularly in a cross-country context. Past studies have used different approaches to address this question. These approaches can broadly be grouped under two headings: splitting the changes approach and computing the tax equivalent of certain changes. In this paper, we suggest a third approach, which combines elements of both approaches: split the changes and then weigh them by their importance for the economy in question.

The "splitting the changes" approach aims to arrive at changes that are all relatively small and are expected to have relatively homogeneous and marginal impact on capital flows by decomposing a potentially complex controls into smaller, more homogenous subcomponents. First, very minor changes that are not expected to have measurable impact on capital flows (for example, minor procedural changes to reporting requirements) are dropped and then the major policy announcements (e.g. a removal of all remaining restrictions on FDI and portfolio outflows) are split into smaller, more homogeneous ones. This approach is used by Forbes et al. (2013), Pasricha (2012) and Pandey et al. (2015), in increasing degrees of refinement, and necessarily involves using judgment. Chantapacdepong and Shim (2014) also use this approach for 12 Asia-Pacific economies. Forbes et al. (2013) drop all "very minor changes" and those that can be reasonably judged to have not been motivated by macroeconomic or macro-prudential management concerns, but rather by foreign policy or other domestic policy concerns. For example, they drop from the database changes on personal capital transactions, changes relating to specific industries or countries (due to economic sanctions). However, they count all

remaining changes announced on one date as one change, as long as they are in the same direction (e.g.: inflow easing, inflow tightening, etc.). This approach still leaves a large number of changes of varying intensity.

Pasricha (2012) controls for the degree of restrictiveness of capital controls by counting changes separately in eight different asset classes and within each asset class, separately for quantitative, monitoring and price-based measures. The asset classes include direct investment, capital and money market instruments, real estate transactions, etc. A policy change is a change in regulation related to each asset class. When a policy announcement has an impact on more than one asset classes, it is counted as many times as the categories of flows (asset classes) it affects. Further, for policy changes within an asset class and announced on the same day, Pasricha (2012) splits the changes into quantitative, monitoring and price-based changes.[9]

Pandey et al. (2015) go further in this direction by counting separately every regulatory instrument for controls on foreign borrowing in India. For example, they split quantitative changes further into those relating to minimum maturity of loans, end-use restrictions on foreign borrowing, etc. This yields a very detailed dataset with actions on each policy instrument. However, this methodology is not easily scalable for comparing changes across different countries with different regulatory structures and regimes, nor to changes for different asset classes of transactions.

The second approach to increasing comparability of policy measures is to compute an implicit tax rate of the measures. This approach has been used in past literature for evaluating Chile's capital controls (Valdés-Prieto and Soto, 1996; De Gregorio et al., 2000), and has recently been taken by Baba and Kokenyne (2011).[10] A limitation of this approach, however, is that the effective tax rate can only be computed for certain kinds of policy instruments (e.g. unremunerated reserve requirements). Most quantitative or monitoring measures (e.g. changes in limits of total foreign portfolio investment) are not amenable to this transformation. Quantitative and monitoring CCAs constitute about 80% of our database, while the price-based measures

[9] Price-based changes are those that seek to restrict or influence the price of transactions, like, for example, taxes on inflows, reserve requirements (as a tax equivalent is easily computed for these) and ceilings on interest rate payable on foreign borrowings. Monitoring changes are those that require that parties to the transaction submit information to the authorities on the transactions undertaken or obtain approval in advance. Quantitative changes are the residual category and include limits on size of transactions, minimum stay requirements on new inflows and all other restrictions that are neither price-based not monitoring.

[10] Baba and Kokenyne (2011) count the non-price changes by AREAER categories, but with 13 asset classes instead of the 8 used in Pasricha (2012).

constitute the remaining 20%. Further, there are differences among regions in the use of price-based measures. Latin American countries tend to use price-based measures, such as taxes on inflows more frequently than Asian countries – about 32% of all the measures in Latin America during our sample were price-based compared to only 12% in Asia. As such analysis using effective tax rates may omit the broad majority of capital control actions in the dataset.

In this paper, we suggest a hybrid approach.[11] We follow Pasricha (2012) and count policy changes separately by asset class and price, quantitative or monitoring type and then weigh the changes by the share of the country's total international assets or liabilities that the measure is designed to influence. For example, a tax on portfolio equity inflows is weighted by the (lagged) share of portfolio equity liabilities in the total international liabilities of the country imposing the tax. A restriction on foreign direct investment by domestic residents (FDI outflows) is weighted by the share of FDI assets in total international assets of the country. A change that influences all asset classes of inflows (or outflows) has the highest weight equal to 1. Weighing the measures allows us to more precisely estimate the impact of the measures on the other macroeconomic variables as it controls for the size of the change. A change in capital controls that affects only a small portion of a country's foreign transactions is unlikely to lead to a large change in net capital inflows. A change that affects all the asset classes is likely to have a greater impact. Although our main results are based on weighted changes in capital controls, we also cross-check our results using unweighted data. Unweighted changes could provide a more accurate picture of the impact of easing of capital control changes if the existing restrictions are longstanding and tight resulting in a small starting asset positions to which the controls pertain. This is in particular the case for some outflows (i.e. resident acquisitions of assets abroad), which are still small but have increased in size in recent years as EMEs eased restrictions on such flows and expanded their financial sectors.

The international investment position data are available at an annual frequency. Our dataset on CCAs is daily, which we aggregate into a quarterly dataset. In order to control for endogeneity, the weights are lagged by one year, i.e. CCAs on each day in a calendar year are weighted by the IIP positions as at the end of the previous calendar year. We then sum the weighted CCAs in each quarter for each country, based on the economic classifications discussed in the next two sub-sections.

[11] For further details on the data, including a full list of the asset classes, please see Appendix A.

This approach allows us to obtain the most comparable dataset to date on capital control actions for a large number of economies and for a recent period, covering more than a decade. For the initial data on CCAs, we follow the more comprehensive approach used in Pasricha (2012) of supplementing information in the IMF's Annual Report on Exchange Arrangements and Exchange Restrictions (AREAER) with regulators' press releases/notifications, news sources, and other research papers.[12] We focus on controls on capital transactions only, excluding controls on transfers and payments for current account transactions. The data for the weights are from the updated and extended Lane and Milesi-Ferretti (2007) database.

Our dataset contains changes in capital account regulations for 17 major EMEs between 2001 and 2011. It contains 754 CCAs at a daily frequency, which after weighing, sum to 193 CCAs (less than the number of unweighted changes as many measures do not affect all asset classes and thus receive a weight of less than 1). The weighted and unweighted changes show a similar pattern over time (Figure 1). The number of modifications to capital control policies seems to have reached a peak in the pre-global financial crisis years, 2007-08, when net capital inflows to these economies were surging, before declining sharply during the crisis. EMEs' reliance on capital control policies recovered after the crisis and reached a plateau in 2010-11. The weighted series lies above the unweighted series in the years up to 2004, but below the unweighted series between 2006 and 2011. This suggests that the changes introduced up to 2004 were more broad-based, i.e. they affected greater categories of transactions, than changes introduced after 2006.[13]

3.2 Classifying CCAs into inflow or outflow control actions

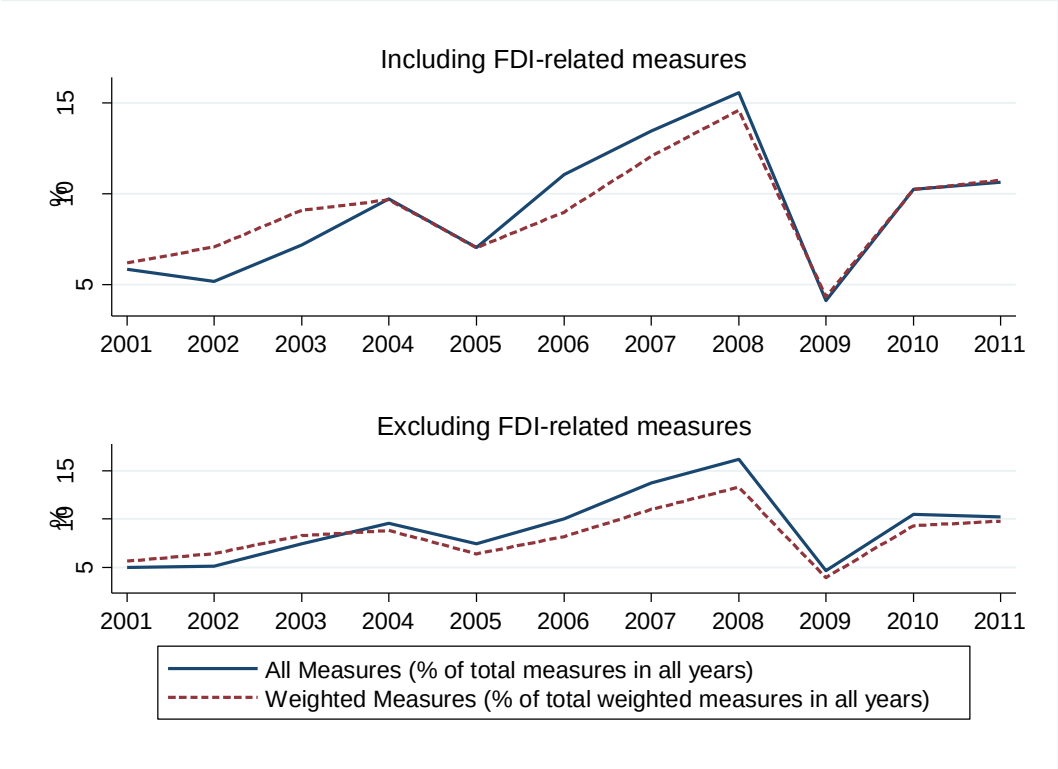
The weighting scheme weighs the changes in inflow controls in each asset class by the share of that asset class in the international liability position of the country and the outflow control changes in each asset class by the share of that asset class in the international asset position of the country. The first step in the database construction is classifying the changes into

[12] Roughly 25% of the CCAs in the final dataset are from non-AREAER sources (the proportion in the initial dataset – i.e. before dropping small changes and other revisions – was higher). For several CCAs included in the AREAER, corrections were made to the AREAER dates and other information by cross-verifying information from regulators' websites.

[13] Note that some of the measures in the database are partial or full reversals of earlier measures. Brazil's tax on inflows, for example, was tightened and eased several times in the time period covered in our database.

inflow and outflow controls. Central bank circulars/notifications do not provide this classification.[14]

Figure 1: Weighted and un–weighted changes in capital controls follow similar patterns over time



Notes: Figure 1 plots the weighted and un–weighted CCAs aggregated on an annual basis (both series expressed as a percentage of total weighted/un–weighted CCAs in the dataset).

[14] For example, an excerpt from an RBI notification dated 23 November 2011 DBOD.Dir.BC. 59/13.03.00/2011-12 entitled "Interest Rates on Non-Resident (External) Rupee (NRE) Deposits and FCNR(B) Deposits" reads as follows:
"1. Interest Rates on Non-Resident (External) Rupee (NRE) Deposits
Please refer to paragraph 1 of our circular DBOD.No.Dir.BC.82/13.03.00/2008-09 dated November 15, 2008 on Interest Rates on Deposits held in Non-Resident (External) Rupee (NRE) Accounts. In view of the prevailing market conditions, it has been decided that until further notice and with effect from close of business in India as on November 23, 2011, the interest rates on Non- Resident (External) Rupee (NRE) Term Deposits will be as under:
Interest rates on fresh Non-Resident (External) Rupee (NRE) Term Deposits for one to three years maturity should not exceed the LIBOR/SWAP rates plus 275 basis points, as on the last working day of the previous month, for US dollar of corresponding maturities (as against LIBOR/SWAP rates plus 175 basis points effective from close of business on November 15, 2008). The interest rates as determined above for three year deposits will also be applicable in case the maturity period exceeds three years. The changes in interest rates will also apply to NRE deposits renewed after their present maturity period."
Since this notification relates to deposits held by non-resident Indians in commercial banks located in India, using funds remitted from abroad and converted into Indian rupees, it constitutes a change in inflow controls.

Many changes are similarly straightforward to classify as inflow or outflow controls, once one understands the underlying transaction/asset that the CCA relates to. However, there are two special cases where the inflow/outflow control classification is not straightforward: (i) treatment of repatriation requirements and (ii) treatment of currency-based measures and other measures that are not clearly inflow or outflow measures. We address both in line with the treatment accorded to them in the balance of payment statistics.

As far as repatriation requirements are concerned, we follow the existing conventions in the balance of payments statistics and define inflow policy as all controls on flows by non-residents (as in Pasricha, 2012). That is, restrictions on repatriation of proceeds from sale of foreigners' investments in the domestic economy are counted as inflow controls. Similarly, capital outflow controls include all changes related to the repatriation of past outflows by residents.[15] This classification allows us to have a close correspondence between capital controls data and balance of payments data on capital flows, which measure net inflows by non-residents (gross inflows) and the net outflows by residents (gross outflows). Classifying control changes by residency also allows us to recognize that easing repatriation requirements on non-residents can encourage more inflows, as non-residents will be more willing to bring capital in if they are assured of being able to repatriate when desired. Although conceptually important, this classification affects only a small proportion of changes in the dataset (only about 20 un–weighted changes relate to repatriation requirements).

Currency-based measures include measures that discriminate based on the currency of transaction, not on the residency of transactor, and are often applied to the domestic financial sector. Such measures include reserve requirements on foreign currency deposits and limits on open foreign currency positions of resident banks. Unlike Ostry et al. (2011), we classify the limits on open short positions in foreign currency as inflow controls (as these discourage inflows) and in long positions as outflow controls.[16] However, limits on banks' net open positions in foreign currencies are not classified as being specific to either inflows or outflows. Further, balance of payments statistics do not count transactions in foreign currency between

[15] Certain restrictions constitute at once an inflow and outflow, such as the use of external borrowing to invest abroad. These are included as both inflow and outflow controls, and counted twice.

[16] A short position in foreign currency refers to an excess of foreign currency liabilities over foreign currency assets on the balance sheet.

residents nor those in domestic currency between non-residents.[17] Therefore, restrictions that apply only to such transactions (for example, changes in reserve requirements on foreign currency deposits) are classified as not being specific to inflows or outflows. Of the 754 un–weighted changes, 110 are currency-based measures out of which only 21 are classified as purely inflow- or outflow-related (as above) and the remaining 89 are not classified as inflow or outflow specific. Another 27 measures are classified as capital controls, but are not specific to inflow or outflows (most of these relate to domestic trading of currency derivatives). Together, 114 policy changes could not be classified as either pertaining to inflows or to outflows and are therefore not included in our analysis.[18]

3.3 Economic classification of CCAs

The dataset provides information on the changes in capital account regulations (or capital control actions), by date of announcement and by when they enter into force.[19] We use the effective dates of the CCAs. We classify each change as representing either an easing or a tightening of policy (as described in the previous sub-section) and then count the number of easings and tightenings per quarter.

In a typical quarter, an emerging economy takes capital control actions in all four categories: inflow easing, inflow tightening, outflow easing and outflow tightening. For economic analysis, we need summary measures that capture the net direction of policy in a period. For the baseline model, we use the following classification:

1. Net inflow tightening measures: This variable is the number of measures that represent tightening of controls on inflows in a quarter, less the number of measures that represent easing of inflow controls.
2. Net outflow easing measures: This variable is the number of measures that represent the easing of controls on outflows in a quarter, less the number of measures that represent tightening of outflow controls in the same quarter.

[17] Foreign currency transactions are only included in the balance of payments statistics when they involve one resident and one non-resident entity. See the Sixth Edition of the IMF's Balance of Payments and International Investment Position Manual (BPM6).
[18] All results in this paper are robust to including these measures. As the inflow/outflow categorization of these measures is not clear, in the robustness checks we include them on both the inflow and the outflow side.
[19] The effective date differs from the announcement date for 20% of the CCAs.

We choose this specification for the baseline model as these summary measures can be expected to have an intuitive impact on monetary policy autonomy, thus enabling us to link our model to the trilemma. For example, according to the trilemma, a closing of the capital account – represented either by net inflow tightening or net outflow tightening measures – should lead to greater monetary policy autonomy.

However, EME policy is often geared towards reducing the pressure of net capital inflows, which are defined as net inflows by non-residents less net outflows by residents during a quarter. Since both outflows easings as well as inflows tightenings would tend to reduce the pressure of net capital inflows, we also group the measures into whether they would encourage or discourage Net Capital Inflows (NKI), i.e. the difference between inflows and outflows, as in Pasricha (2012). This gives us the following categories, which we use to describe the dataset and in the robustness checks:

1. NKI Reducing Measures: These are measures that represent tightening of inflows, easing of outflows or other tightening.
2. NKI Increasing Measures: These are measures that represent easing of inflows, tightening of outflows or other easing.
3. Net NKI Restricting Measures = NKI Reducing Measures - NKI Increasing Measures.

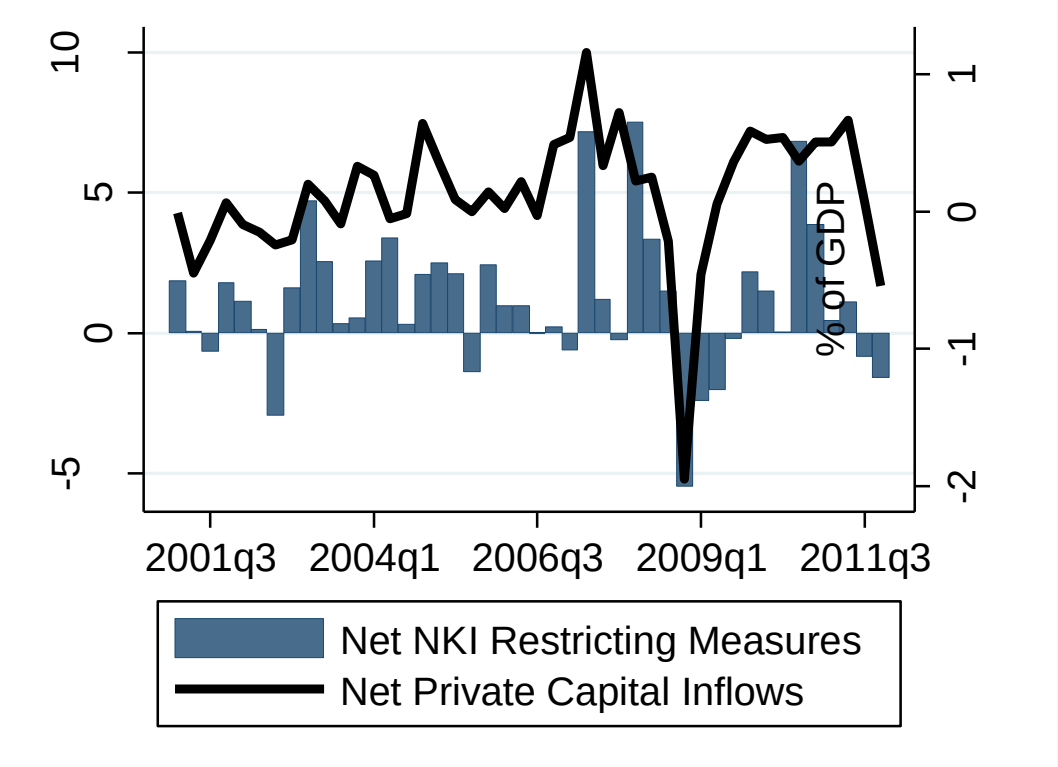
In what follows, we use only CCAs that do not relate to FDI, as FDI-related changes are more likely to be determined by long term considerations about the openness of the economy rather than short term macroeconomic management motivations. However, as a robustness check, we run the models using all measures, including FDI-related CCAs. Henceforth, all references to capital control measures (and net capital inflows) refer to non-FDI CCAs (and non-FDI capital flows), unless otherwise specified.

4. Recent trends in capital control actions and their composition

This section summarizes trends in capital flow measures in EMEs, based on the weighted capital control actions for non-FDI measures in our dataset. Capital control actions in EMEs since 2000 have largely mirrored fluctuations in net capital inflows into these economies. Net NKI restricting measures summarize the overall stance of policy towards restricting inflows.

EME policy turned sharply restrictive during 2007Q1-2008Q2 as net "hot money" inflows to these economies surged (Figure 2). The number of net NKI restricting measures turned negative during 2008Q3-2009Q4 as the events during the global financial crisis engendered EME attempts to reverse the sudden stop. In 2010, however, the number of NKI restricting measures picked up sharply again, coinciding with a recovery in capital inflows into EMEs. This pick-up in capital inflows reflected the relatively strong growth performance of EMEs and accommodative monetary policies in advanced economies.

Figure 2: Net NKI Restriction Measures Peaked in 2007 and 2010

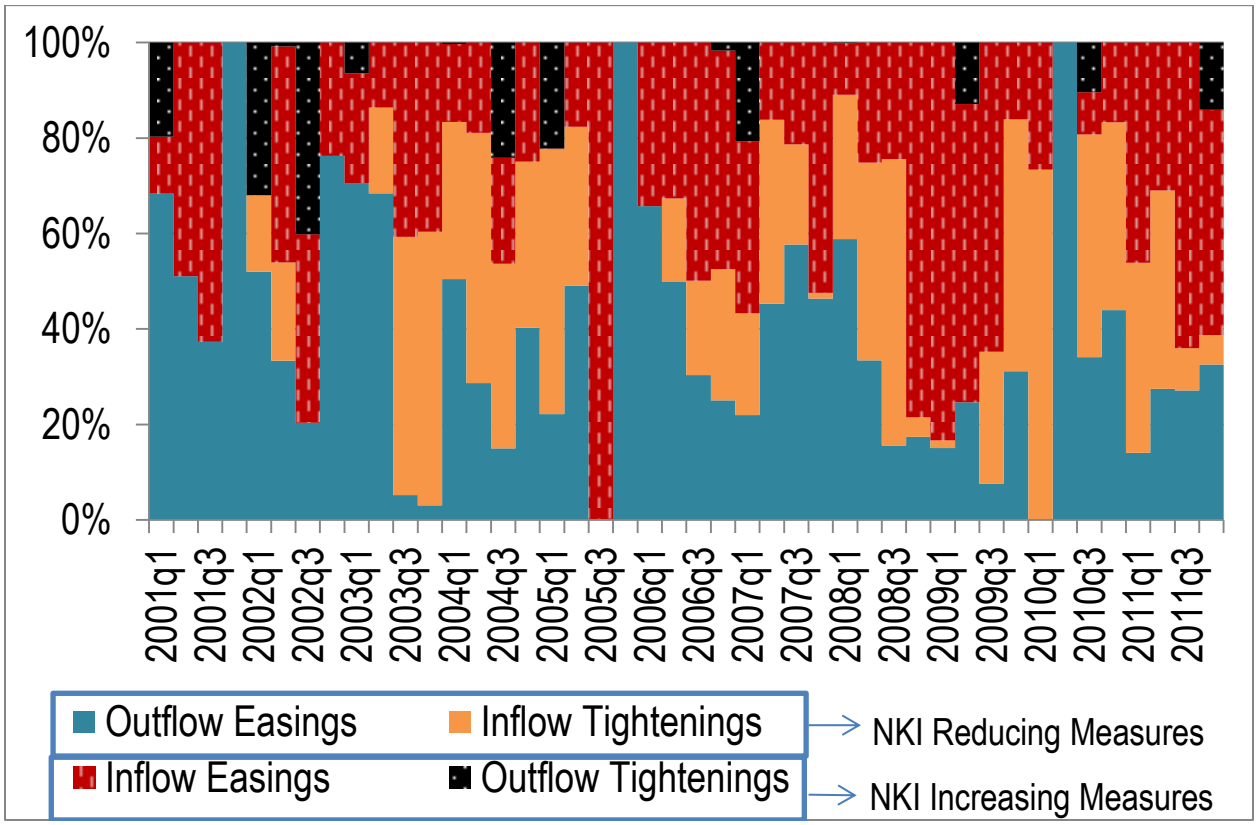


Note: Net private capital inflows exclude FDI flows and government and monetary authority transactions from "other" inflows and outflows. Net private capital inflows are therefore the sum of net portfolio inflows, net "private" other inflows and net derivative inflows, and are calculated on a quarterly basis. Net NKI restricting measures is the difference between NKI reducing capital control actions (inflow tightenings and outflow easings) and NKI increasing actions (inflow easings and outflow tightenings). We exclude CCAs related to FDI.

Although capital control actions have on balance been restrictive since the early 2000s, a breakdown of these measures shows that EMEs introduced all types of measures in each year (Figure 3). Policy changes were often of a conflicting nature from a point of view of managing NKI. For example, even in the years 2006-07, when emerging economies faced high NKI and

overheating pressures, the number of inflow easing measures taken was higher than the number of inflow tightening measures. This nuances the widespread view that policy-makers in EMEs tighten controls in the face of a surge in inflows to manage macroeconomic and financial stability risks, while they ease them in case of a sudden stop. Figure 3 suggests that more complex motivations may be at play, with policy-makers balancing exchange rate stability or other objectives with the need to fund their growing economies.

Figure 3: EMEs introduced NKI reducing and NKI increasing measures at the same time



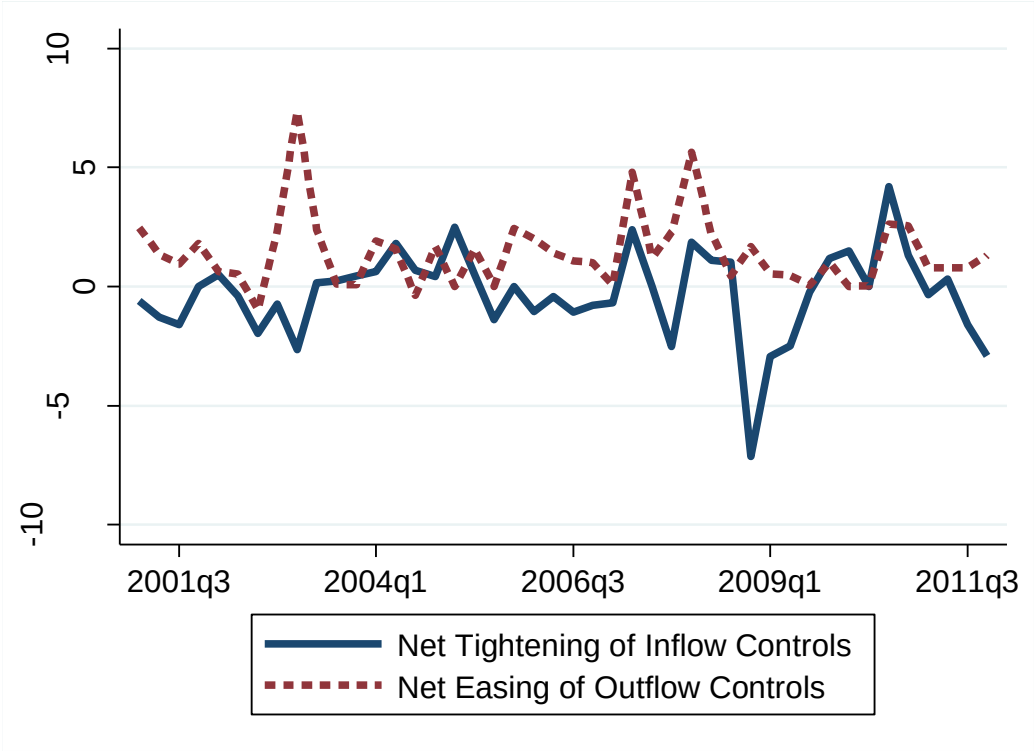
Note: NKI reducing measures is the sum of inflow tightening capital control actions (CCAs) and outflow easing CCAs. NKI increasing measures is the sum of inflow easing CCAs and outflow tightening CCAs. We exclude CCAs related to FDI. All measures are weighted measures.

Figure 3 also shows that the relative importance of inflow tightening as NKI reducing measures seems to have increased since the start of the global financial crisis (NKI reducing measures in the figure are the sum of the blue and yellow areas). During 2006-08, when net capital inflows to EMEs and the number of NKI reducing measures peaked, inflow tightening measures represented about 40% of all NKI reducing measures introduced by EMEs. This changed after the crisis, when inflow tightening measures amounted to more than half of all NKI

reducing measures on average, exceeding 60% in 2010. Policy-makers in EMEs thus seem to have become more open to inflow tightening measures, reflecting not only the higher volatility of capital inflows around the global financial crisis but possibly also an increased recognition of the validity of such measures in the international debate (IMF, 2011a).

A similar picture emerges when looking at the net inflow tightening measures and net outflow easing measures, our main policy variables in the VARs (Figure 4). Net outflow easing actions dominated the policy response to the pre-global financial crisis surge, whereas net inflow tightening actions dominated policy-makers' response to the 2010 surge in net capital inflows.

Figure 4: Net inflow tightening CCAs peaked in 2010



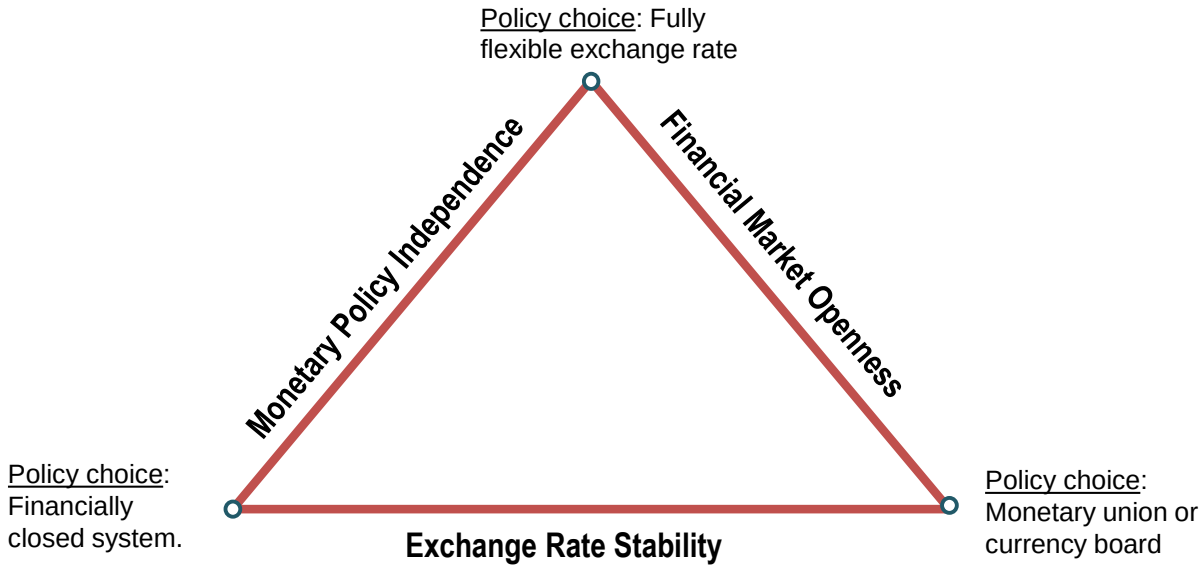
Note: Net easing of outflow controls is the difference between outflow easing CCAs and outflow tightening CCAs. Net tightening of inflow controls is analogously defined. We exclude measures related to FDI. All CCA measures in the figure are weighted measures.

5. Data and empirical strategy

Capital control policies may have an impact on a range of variables, as well as be driven by these variables. Therefore, we estimate a system of equations for capital control actions,

capital flows, a monetary policy autonomy index and exchange rates, treating all these variables as endogenous. These variables are interdependent according to the impossible trinity or monetary policy trilemma, which asserts that a country can only maintain two of three policy objectives: a fixed exchange rate, open capital markets and domestic monetary policy autonomy (Figure 5). Capital control actions measure the attempts to *de jure* close the capital account and reduce capital flows (which measure the *de facto* openness of the capital account). Attempts to close the capital account would reflect a policy preference for a more stable exchange rate, while retaining monetary policy autonomy.

Figure 5: The impossible trinity



Source: Aizenman, Chinn and Ito (2010).

5.1 Country selection and sample period

The countries in the database include the 21 EMEs that are in the MSCI Emerging Markets Index and Argentina. However, for the purpose of this paper, we drop the three central and eastern European countries, namely Czech Republic, Hungary and Poland, as their capital control actions since 2001 have been heavily influenced by their accession process to the EU, and Taiwan and Morocco due to data constraints. We therefore have 17 countries in our sample, for the period 2001Q1 to 2011Q4. For the empirical analysis, we drop observations for Argentina

and Turkey prior to 2004Q1 and for Russia prior to 2002Q1, to take into account their crisis periods.

5.2 Baseline model I: Effectiveness of domestic capital control changes

Our baseline model is a panel VAR in which all variables of interest are treated as endogenous, while controlling for a number of exogenous push factors. In the baseline model, we assume that the variables of interest are described by a system of equations, which can be written in reduced-form as:

$$y_{i,t} = a_0 + A_1 y_{i,t-1} + \ldots + A_p y_{i,t-p} + B_1 x_{i,t-1} + \ldots + B_q x_{i,t-q} + d_i + \varepsilon_{i,t} \quad (1)$$

where y_t is a ($k \times 1$) vector of endogenous variables for country i, x_t is a ($k \times 1$) vector of exogenous variables common to all countries, $\varepsilon_{i,t}$ is a ($k \times 1$) vector of reduced-form residuals, A_J ($J = 1, \ldots, p$) and B_l ($l = 1, \ldots, q$) are ($k \times k$) matrices of coefficients for the endogenous and exogenous variables, respectively, and d_i is a vector of country-specific intercepts. The inclusion of country dummies aims at controlling for omitted factors (e.g.: institutional quality) that may affect the dynamics of the system across countries but uniformly through time.

The baseline model includes the following **endogenous variables** at quarterly frequency: two variables of capital control actions (net inflow tightening and net outflow easing measures), the spot exchange rate vis-à-vis the US dollar, a measure of monetary policy autonomy and a capital flow variable.

More specifically, the capital control variables include both measures targeting inflows as well as measures targeting outflows as we want to assess their impact separately. The exchange rate is the quarterly change in the spot exchange rate of the local currency vis-à-vis the US dollar, with an increase implying a depreciation of the local currency. As a measure of monetary policy autonomy we use the Aizenman-Chinn-Ito index of Monetary Policy Autonomy, [20] which is computed as the reciprocal of the within-quarter correlation of the interest rates between the home country and the base country (i.e. the US), using daily data for money market interest rates (i.e. more monetary policy autonomy corresponds to a higher level of the index, which, by construction, can fluctuate between 0 and 1). We initially focus on net capital inflows, but we

[20] See Aizenman, Chinn and Ito (2010).

also look at gross inflows and outflows. All capital flow measures are "hot" or non-FDI private capital flows, i.e. they exclude FDI and transactions for monetary authority and general government in the "other investment" category.[21]

In addition, we include a set of **exogenous variables** to control for various push factors. These are global real GDP growth, the increase in the S&P 500 index, the US inflation rate and a dummy for quantitative easing in the U.S. These are selected from a list of several potential explanatory variables identified in the literature, including, for example, the VIX index, EMBI sovereign spreads and several other financial variables as well as business cycle indicators.[22] Finally, we include a dummy for the global financial crisis.[23, 24]

In our baseline model, the number of lags p of the endogenous variables is two, while the number of lags q of the exogenous variables is one in order to limit the number of parameters to estimate.[25] We estimate the baseline model using OLS. It is well known that the presence of lagged regressors in panels with fixed effects induces serial correlation between the residuals and future values of the regressors (Nickell, 1981; Arellano, 2003). This generates estimates that are inconsistent as the number of cross-sectional units (N) tends to infinity if the number of time periods (T) is kept fixed. Our panel uses quarterly data for the period 2001Q1 to 2011Q4 (T=44) and, therefore, we are confident that, if present, inconsistency issues are small.[26] However, following Benetrix and Lane (2013), we test the presence of small biases by conducting a mean

[21] The non-FDI private capital flows are therefore the sum of portfolio investment, other investment (excluding monetary authority and government flows) and derivative flows. For ease of exposition, we refer to these flows as NKI/net capital inflows or gross inflows and gross outflows. Strictly speaking our definition is broader than the one typically used for "hot" flows, as we also include long term bank loans (part of the "other investment" category) in the hot flow definition.

[22] We regress potential explanatory variables on our policy target variables (capital flows, monetary policy autonomy index, as well as changes in exchange rates and foreign reserves) by running panel regressions for each of these variables combining all variables in each category of potential determinants. All regressions are with fixed effects with robust standard errors, estimated for period 2000Q1 to 2012Q4 excluding the global financial crisis (2008Q1-2009Q3). All variables in these first stage regressions are normalized and outliers are removed (the results are available from the authors upon request). The chosen exogenous variables are significant in most regressions for most of the endogenous variables.

[23] As we are interested in the effectiveness of capital controls in "normal" times, we use a crisis dummy to account for the impact of crisis episodes on the variables in our model. This dummy takes the value one during the global financial crisis (the observations from 2008Q1 until and including 2009Q2) for all countries in the sample.

[24] See Appendix B for more details on the construction of the variables used and some descriptive statistics.

[25] We tested up to four lag lengths for endogenous variables and selected two based on standard lag length selection criteria (AIC, SBC/BIC and HQ).

[26] For other works with similar N and T in panel VARs see Beetsma et al. (2008), Beetsma and Giuliodori (2011) and Benetrix and Lane (2013).

group estimation of the baseline model (also removing the country fixed effects), finding no substantial differences with the results presented in the paper.[27]

In order to recover the structural shocks from the VAR innovations, we adopt the recursive Choleski decomposition identification proposed by Sims (1980). This decomposition provides a minimal set of assumptions that can be used to identify the structural shocks. Since the ordering of the endogenous variables plays a crucial role, alternative orderings are tested to check the robustness of the results (see Section 8). We compute and graph error bands for impulse response functions for the panel VAR using Monte Carlo simulation with 1000 draws (Doan, 2009). Our baseline ordering is as follows: 1) capital control measures (net inflow tightening and net outflow easing measures in the baseline); 2) capital flows; 3) the monetary policy autonomy index; and 4) the exchange rate. The identifying assumption is that the variables that come earlier in the ordering affect the following variables contemporaneously (as well as with a lag), while the variables that come later affect the previous variables only with a lag. This Choleski ordering is based on the assumption that policy-makers do not react to changes in the other variables within the same quarter as the decision-making process takes time. We therefore order them first, followed by the capital flow variables, which are more sluggish than the financial market variables (monetary policy autonomy index and exchange rate), which are ordered at the end. The variables that appear earlier are thus more exogenous and those that appear later are more endogenous. We test the robustness of our results to alternative model specifications and different samples. These robustness checks are described in Section 8.

Table 1 provides an overview of the expected signs in our baseline model for the domestic effects. In order for capital control actions to be considered effective, we expect that both inflow tightening and outflow easing measures affect net capital inflows and the exchange rate in the same direction, i.e. they lower net inflows and weaken the currency vis-à-vis the US dollar. Measures that tighten inflows will increase monetary policy autonomy (implying a higher monetary policy autonomy index), as those measures represent a more closed capital account. Conversely, measures that ease outflows represent a liberalization of the capital account and are expected to reduce monetary policy autonomy. Although we do not focus on the other shocks in

[27] Prior to estimating the model, each series was tested for stationarity using Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) tests with and without trends (four tests for each series) separately for each country, which is a stronger test than panel unit root tests. The exogenous variables (world GDP growth, US inflation and change in S&P index) are all stationary in all tests. The endogenous variables are also stationary by a majority of the four tests in almost all countries (at 10% level of significance).

the model, we expect a positive shock to net capital inflows to lead to more capital control actions as policymakers respond by introducing measures to discourage inflows or encourage outflows. Moreover, we expect monetary policy autonomy to decline and the exchange rate to strengthen. While we do not have priors on the impact of a shock to the monetary policy autonomy index, we expect a positive exchange rate shock (i.e. a depreciation of the currency) to lead to fewer inflow tightening and outflow easing CCAs. The impact of an exchange rate shock on the other variables in the model could be either positive or negative, depending on the circumstances.

Table 1: Expected sign of domestic responses (baseline model of domestic capital controls)

Shock to ⇨ / Impact on	Net Inflow Tightening	Net Outflow Easing	NKI	MPA	Exchange rate
Net Inflow Tightening		0	+	+/-	-
Net Outflow Easing	0		+	+/-	-
Net Capital Inflows (NKI)	-	-		+/-	+/-
Monetary Policy Autonomy Index (MPA)	+	-	-		+/-
Spot exchange rate	+	+	-	+/-	

Note: + indicates an expected positive impact, - an expected negative impact, 0 no expected impact, and +/- indicates the impact could be either positive or negative.

5.3 Baseline model II: Spillover effects of capital control changes

Our second purpose is to assess the strength of cross-country spillover effects, which we do in a modified version of the baseline model. We first construct a dummy variable that captures spillover effects. We assume that any spillovers of capital control actions are most likely to stem from the BRICS countries and have an impact on the other EMEs in the same region or on the other BRICS. More specifically, our hypothesis is that the most likely spillovers of CCAs in, for example, India are to the other Asian countries in the sample or to the other BRICS (i.e. other large emerging economies) as these represent closer substitutes to India than smaller countries in other regions (e.g. Argentina or Peru). We thus construct a count variable that, for each of the BRICS, is the sum of the number of policy changes in any of the other BRICS in a given quarter. For each of the other countries in the sample (i.e. the non-BRICS), the variable is the sum of the number of measures introduced by the regional BRICS country (i.e. Brazil for Latin America, China and India for Asia, Russia for emerging Europe (i.e. only

Turkey in our sample) and South Africa for Africa) in a given quarter. We add this spillover variable to our panel near-VARs.

We model the impact of spillovers of capital control actions using a near-VAR approach, which differs from the standard fully symmetric VAR in the sense that it constrains specific shocks to affect only some variables in the system.[28] This allows us to restrict the coefficients for changes in capital controls in other countries to zero, implying that the domestic variables in the system do not have an impact on capital control decisions by policy-makers in other countries. In other words, domestic variables are excluded from the equations of foreign capital controls, which are treated as block exogenous variables. At the same time, we are able to assess the impact of these latter variables on our domestic variables of interest (capital flows, etc.) via impulse response functions, as foreign capital control variables are allowed to have an impact on domestic variables (the endogenous block). As regards the endogenous block, structural shocks are identified using a Choleski decomposition identification, with the same ordering used for the panel VARs: 1) capital flows; 2) the monetary policy autonomy index; and 3) the exchange rate.

Since the explanatory variables in each equation of a near-VAR are not identical, the system of equations constitutes a Seemingly Unrelated Regressions (SUR) model, in which the error terms are assumed to be correlated across the equations.[29] To estimate the SUR model, we use a common variant of Markov Chain Monte Carlo methods, the Gibbs sampler, which is a standard tool for posterior simulation. The results are obtained from 25000 replications from the Gibbs sampler, with 5000 burn-in replications discarded and 20000 replications retained.[30]

Table 2 provides an overview of the expected signs in our baseline model for spillover effects. If spillover effects are present, then we expect that both inflow tightening and outflow easing measures in the BRICS increase net capital inflows elsewhere and lead to an appreciation of other countries' currencies. The impact of capital control measures on monetary policy autonomy in other countries is not a priori clear. On the one hand, by increasing net capital inflows in other emerging economies, inflow tightening and outflow easing measures in the BRICS may reduce monetary policy autonomy in those countries if net capital inflows are high

[28] Near-VAR models have been employed for example by Olson et al. (2012) and Agenor and Hoffmaister (1998) and panel near-VARs by Peersman (2004).
[29] The SUR model was first proposed by Zellner (1962).
[30] We choose standard uninformative priors. More specifically, we impose flat priors on the coefficients and standard Jeffrey's prior on the covariance matrix. For more details on the Gibbs sampler, see Koop (2003) and Doan (2009).

on those countries. On the other hand, if emerging economies are facing net capital outflows, those capital control actions in BRICS may strengthen the degree of monetary policy autonomy in those countries as they may bring in more capital flows. The sign of the impact of shocks to capital controls in BRICS may thus depend on whether net capital inflows in other emerging economies are positive or negative. We therefore do not interpret the results for the monetary policy autonomy index in our baseline model for spillover effects. Shocks to net capital inflows, the monetary policy autonomy index and the exchange rate do not have an impact on the capital control variables in the BRICS as the latter are by construction exogenous, while the impact on the other variables in the model could be either positive or negative.

Table 2: Expected sign of responses (baseline model of capital control spillovers)

Shock to ⟹ / Impact on	Foreign Net Inflow Tightening	Foreign Net Outflow Easing	NKI	MPA	Exchange rate
Foreign Net Inflow Tightening		0	0	0	0
Foreign Net Outflow Easing	0		0	0	0
NKI	+	+		+/-	+/-
Monetary Policy Autonomy Index (MPA)	+/-	+/-	+/-		+/-
Spot exchange rate	-	-	-	+/-	

Note: + indicates an expected positive impact, - an expected negative impact, 0 no expected impact, and +/- indicates the impact could be either way.

6. Results: Domestic effects of capital controls

Section 4 showed that many EMEs have pursued active capital control policies during the past decade. In this section, we investigate the effectiveness of those measures. The main conclusion is that we find little meaningful evidence of effectiveness of capital control measures as tools of macroeconomic management. In order to make the impulse responses comparable across different samples, the impulses are standardized to a one unit shock. The responses are expressed in the unit of each respective variable.

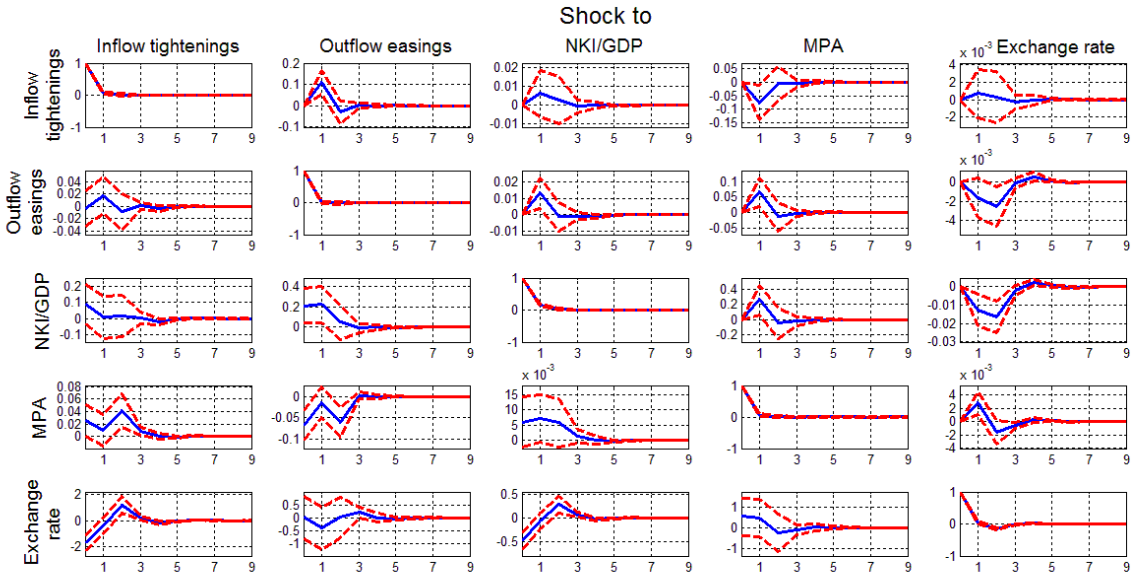
6.1 Results of the baseline model

Figure 6 shows impulse responses using our baseline model based on the full sample. For the full sample period, changes in (weighted) capital controls do not seem to have a significant expected impact on most of the variables in the model. Even where the effects are significant and as expected, the size of the impact is small. In particular, changes to capital controls do not have a significant expected impact on net capital inflows. This applies to both inflow tightening as well as outflow easing measures, although net outflow easing measures do have a short-lived upward impact on net capital inflows. This upward impact is counterintuitive and we investigate this in more detail below. Looking at the other variables of the model, a tightening of inflow controls tends to strengthen monetary policy autonomy and depreciate the exchange rate vis-à-vis the US dollar with some delay (after two quarters), but that impact is preceded by an initial appreciation. The size of this delayed impact is very small and not economically meaningful. Outflow easing measures, which are essentially liberalization steps, weaken monetary policy autonomy as expected, but they do not have an impact on the exchange rate.

Most of the impulse responses for the other variables that are significant in our baseline model look plausible, suggesting that our model seems to capture the dynamics in the system accurately.[31] For example, a positive shock to net capital inflows leads to an appreciation of the currency. The model also sheds light on policy-makers' behavior following changes in the economic environment. For example, policy-makers seem to respond to developments in net capital inflows and the exchange rate by easing outflow controls (in Figure 6 a shock to the exchange rate, i.e. a depreciation of the local currency, reduces the number of net outflow easing measures). This suggests that policy-makers in EMEs in the 2000s responded by liberalizing outflows to limit net capital inflows and curb upward pressure on the currency. These results are consistent with the results in Figure 3, which shows that the broad majority of NKI reducing measures were outflow easing measures, except in 2004 and 2010, i.e. outflow liberalization was the instrument of choice for EMEs in responding to economic pressures.

[31] This is confirmed by the robustness of the results to different orderings of the endogenous variables.

Figure 6: Inflow and outflow measures (weighted) – Own effects: Impulse responses in the baseline model



Note: The blue line denotes the median impulse response to a positive shock to the variable at the top of each column. The dotted red lines represent the 16 and 84 percentiles. The impulse responses are normalized to a one unit shock and are expressed in the unit of each respective variable. NKI/GDP stands for net capital inflows as a share of GDP. MPA is the monetary policy autonomy index. An increase in the exchange rate chart is a depreciation of the local currency against the USD.

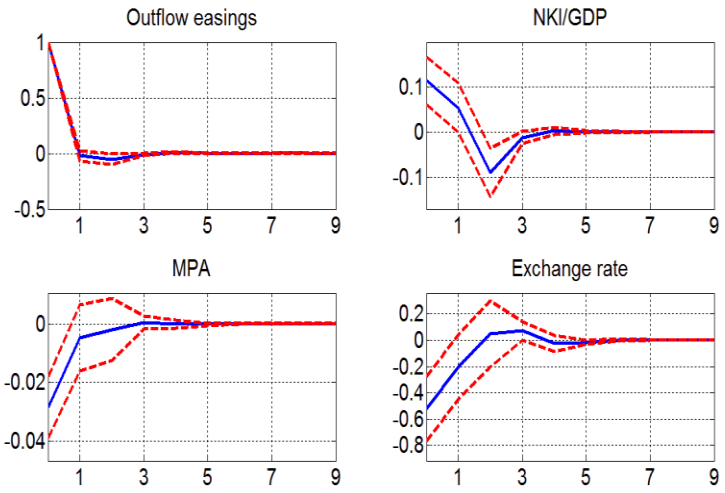
The results of the baseline model are in line with the findings of "mixed evidence" in the literature. But what does mixed evidence mean exactly? And why do outflow easing measures seem to lead to a counterintuitive increase in net capital inflows? In the remainder of this section, we examine these questions further. More specifically, we investigate why we do not find much of an impact of changes in capital controls on the variables in our model. We also explore the impact of capital control policies at a more disaggregated level: e.g. do they have an effect on specific components on capital flows?

6.2 The counterintuitive impact of outflow easing measures: is it data-related?

The weights we use to aggregate changes in capital controls are based on historical flows. Liberalizing a flow that had been restricted or prohibited until then can have a large impact on that flow, but if the weight of that component is small the impact will not be very visible in total net capital inflows. Unweighted changes may thus provide a more accurate picture of the impact of capital control changes if the asset positions to which the flows pertain are small. This is in

particular the case for easing of certain outflows (i.e. resident assets abroad), which are still small but have increased in size in recent years as EME residents expanded their cross-border investment activities as EMEs grew relatively strongly and their financial sectors developed further (IMF, 2013 and appendix A). Using unweighted capital control changes provides a more nuanced picture of the impact of outflow easings. In that case, we find that net outflow easing measures had a small downward impact on net capital inflows (with a delay), in contrast to the baseline results using weighted data (Figure 7). Nevertheless, the size of the downward impact is not large and is preceded by an upward impact, similar to the model with weighted data. This is different for inflow tightening, for which the results based on unweigthed data are similar to those using unweighted data (not shown here). Inflow tightenings targeted inflows where accumulated asset positions resulting from past foreign inflows were larger, explaining why the results based on weighted and unweighted capital control changes are more similar.

Figure 7: Outflow measures (unweighted) – Own effects: Impulse responses



Note: The blue line denotes the median impulse response to a positive shock to outflow easing measures. The dotted red lines represent the 16 and 84 percentiles. An increase in the exchange rate chart is a depreciation of the local currency against the USD.

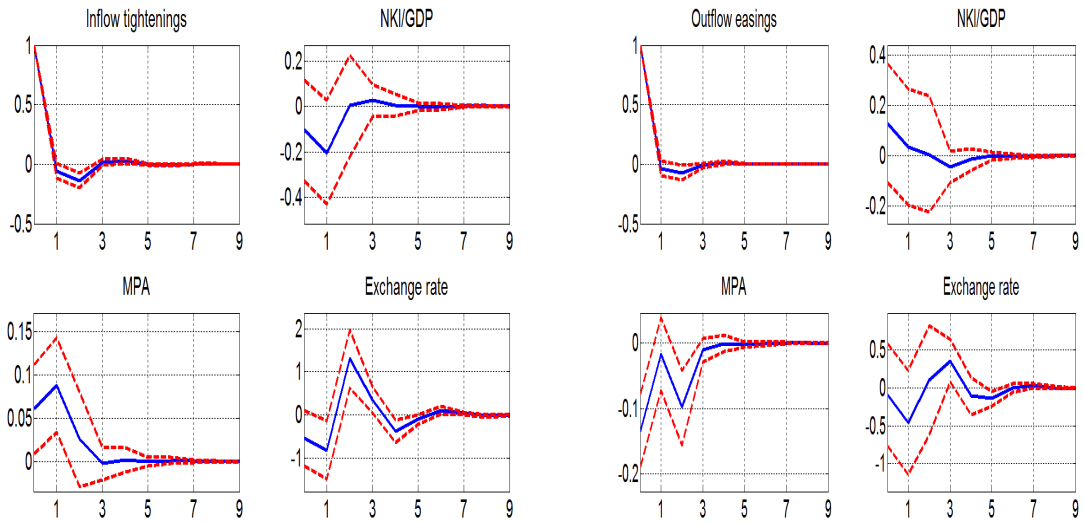
6.3 Have the effects changed over time? Pre- vs. post–global financial crisis

A potential explanation for the mixed results we find using the full sample may stem from the possibility that the effects of capital control policies may have changed over time. As economic and financial developments during the 2000s were heavily influenced by the global

financial crisis, a logical approach is to divide up the sample into a pre- and a post-crisis period. More specifically, we split the sample into the following two parts: the five years before the global financial crisis (2003Q1-2007Q4) and the four years covering the crisis and its aftermath (2008Q1-2011Q1). Comparing the results for the pre-crisis period with those for afterwards suggests that the domestic effects of changes in capital controls seem to have weakened in the post-global financial crisis period. While before the crisis, net inflow tightening measures were to some extent effective in achieving a more favorable trilemma configuration, this was not anymore the case afterwards.

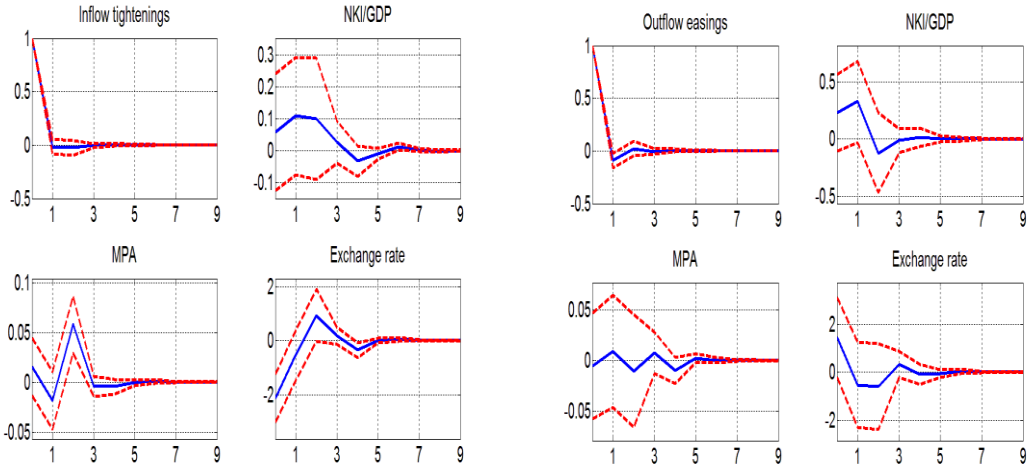
In the pre-crisis period, net inflow tightening measures had a downward impact on net capital flows (although it was not significant) and led to greater monetary policy autonomy (Figure 8). While the exchange rate initially appreciated, that impact was only just significant and it was followed by a subsequent depreciation (after two quarters). This suggests that pre-crisis, EMEs were able to achieve both more depreciated exchange rate and more monetary policy autonomy, although the effects are very small and not long lasting. Net easing outflow measures did not have significant impacts on the above variables before the crisis, with our results only suggesting that they reduced monetary policy autonomy. In the post-crisis period, by contrast, policy-makers in emerging markets did not manage anymore to reduce net capital inflows via net inflow tightening measures (Figure 9). Although these measures temporarily led to greater monetary policy autonomy, that impact came at the expense of a more appreciated exchange rate.

Figure 8: Inflow and outflow measures – Own effects before the crisis (2003Q1-2007Q4)



Note: The blue line denotes the median impulse response to a positive shock to capital control variable shown in each panel. The dotted red lines represent the 16 and 84 percentiles. The impulse responses are normalized to a one unit shock and are expressed in the unit of each respective variable. An increase in the exchange rate chart is a depreciation of the local currency against the USD.

Figure 9: Inflow and outflow measures – Own effects after the crisis (2008Q1-2011Q4)



Note: The blue line denotes the median impulse response to a positive shock to the capital control variable shown in each panel. The dotted red lines represent the 16 and 84 percentiles. The impulse responses are normalized to a one unit shock and are expressed in the unit of each respective variable. An increase in the exchange rate chart is a depreciation of the local currency against the USD.

6.4 Looking at gross flows before and after the crisis

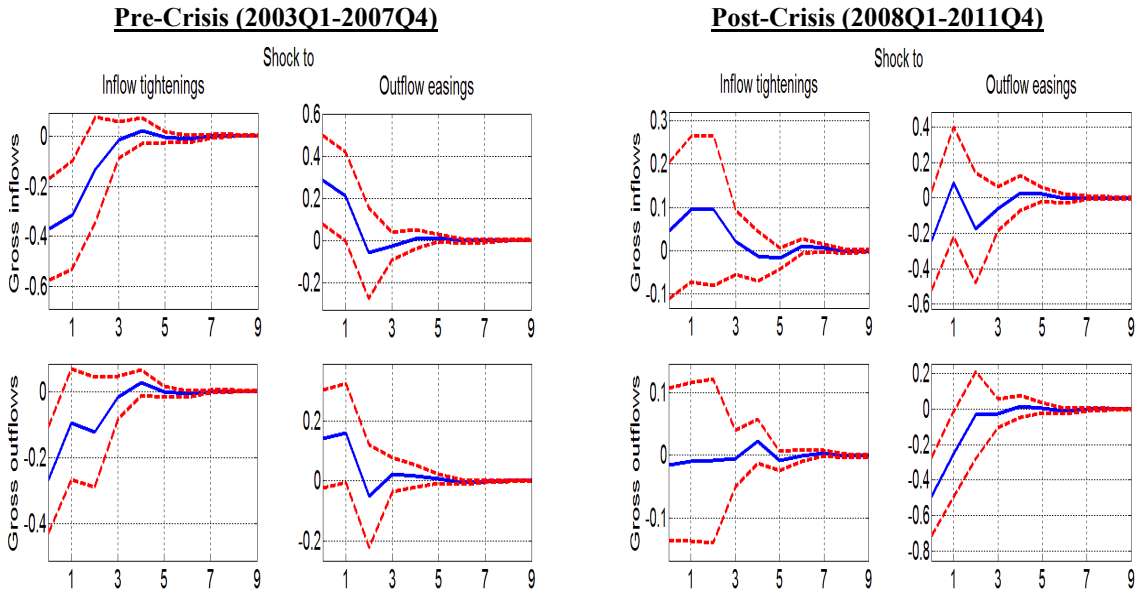
As EMEs become increasingly important players in the global economy, their share in global capital flows is also rising. It is therefore increasingly relevant to differentiate between changes in non-resident and resident behavior when analyzing the impact of capital controls. Whereas the former flows would typically dominate developments in net capital inflows to EMEs in the past, capital outflows by domestic investors in EMEs have become increasingly important and cannot be ignored anymore (Forbes and Warnock, 2012). We therefore decompose the results for the pre-and post-crisis periods into gross inflows and outflows.

Figure 10 shows the results for capital flows of our baseline model with gross inflows and outflows for the pre-crisis period (left-hand side) and the post-crisis period (right-hand side). In the pre-crisis period, net inflow tightening measures significantly reduced gross inflows, but they reduced residents' outflows as well, thus resulting in a non-significant impact on net capital inflows. In the post-crisis period, neither gross inflows nor outflows fell in response to these tightening measures, perhaps due to abundant global liquidity and the lower profitability of external investment opportunities.

The results of this model with gross flows also shed further light on why outflow easing measures seem to increase net capital inflows. This counterintuitive impact of net outflow easing measures on net capital inflows stems from the fact that these measures have a significant upward effect on gross capital inflows, while they do not have an impact on outflows (in Figure 10 this is only the case for the pre-crisis period, but the results using the full sample confirm this, see Appendix C, Figure C2). The positive impact on gross inflows may be due to the signaling effect of the country becoming more open on the capital account, which may enhance confidence of international investors. This is consistent with Fratzscher and Bussiere (2004), who find that the acceleration of growth immediately after liberalization seems to be often driven by an investment boom and a surge in portfolio and debt inflows. A stylized fact from the literature is indeed that capital account liberalization has historically generated large gross capital in- and outflows, but the direction of net flows has depended on many factors (Bayoumi and Ohnsorge, 2013). These factors may include the (relative) business cycle, growth expectations and whether outflow easings are embedded in a broader reform package that strengthens the investment climate. That may also explain why an easing of outflow controls led to a decline in gross

outflows during the post-crisis period, when EMEs grew relatively strongly and there were ample domestic investment opportunities.

Figure 10: Gross inflows and outflows – Before and after the crisis



Note: The blue line denotes the median impulse response to a positive shock to the capital control variable shown in each panel. The dotted red lines represent the 16 and 84 percentiles. The impulse responses are normalized to a one unit shock and are expressed in the unit of each respective variable. The left-hand panel shows results for the pre-crisis period and the right-hand panel for the post-crisis period.

While much of the existing literature emphasizes the opportunities for evasion of marginal inflow controls as overall capital account openness increases, our results suggest that the impact of controls (and related macroeconomic policies) on residents' outflows is another channel through which emerging economies may see their efforts to manage net capital inflow frustrated. Given that emerging economies have become more open over time, residents' incentives to invest abroad have become an important determinant of the net capital flows, underlining the importance of looking at gross capital inflows and outflows. Vice versa, steps to liberalize outflows can have a positive impact on gross inflows as they may enhance international investor confidence. More generally, this implies that capital control changes may not only have an impact on capital flows they target, but also on other flows. In addition, capital control changes may have different effects in different circumstances, thus rendering their impact not always straightforward to predict.

6.5 Impact of controls on the composition of capital flows

The absence of strong effects of capital control policies in our baseline model may also be related to the possibility that the capital flow variables included in our model may disguise significant effects at a more disaggregated level. Indeed, earlier studies have found that capital controls may have an impact on the composition of flows (Magud et al., 2011). In order to explore the question of whether capital control actions can have an impact on the composition of capital flows, we look at their impact on other investment flows (which comprise mostly banking flows and trade credit), portfolio flows and FDI. We find that inflow tightening measures reduce gross inflows of other investment (i.e. mainly resident borrowing from foreign banks), although the effect is small. We also find that inflow tightening measures increase net FDI inflows, which is driven by a decline in gross FDI outflows.

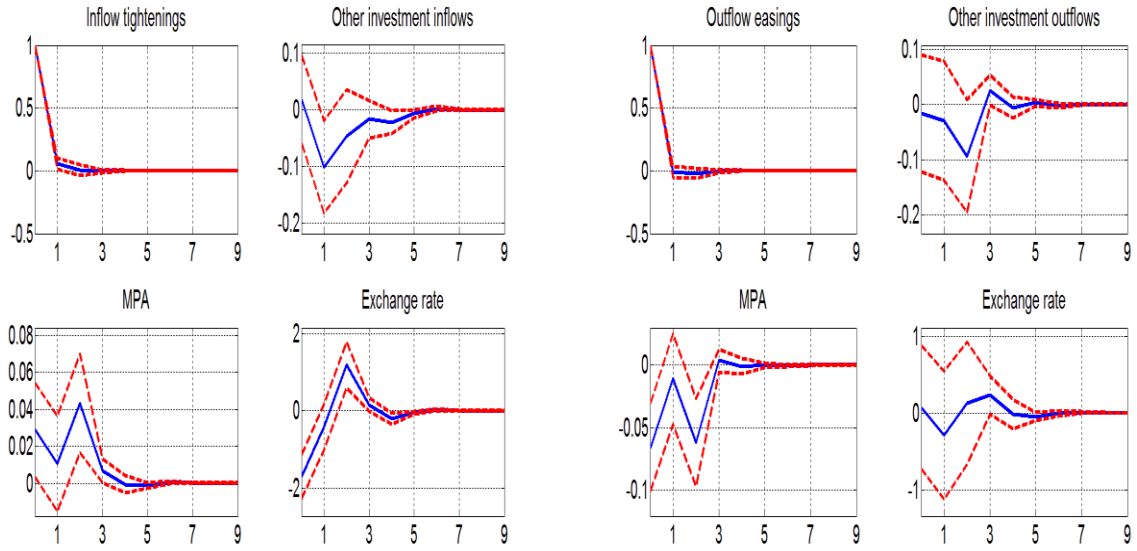
Figure 11 shows the main results of our model if we substitute our net capital inflows variable with gross flows of one of its key components (i.e. gross inflows and outflows of other investment).[32] Inflow tightening measures seem to be able to reduce other investment inflows after one quarter, although the impact is not very strong. While a tightening of inflow controls thus seems to be effective in reducing other investment inflows and increases monetary policy autonomy, it also leads to upward pressure on the exchange rate (in line with the results of the baseline model presented above). Measures that ease outflow restrictions do not have an expected significant impact on other investment outflows.

Finally, our results for FDI confirm the key role of resident flows in explaining net capital inflows and their reaction to changes in capital controls (not shown here). Measures that tighten controls on (hot) inflows have an upward impact on net FDI inflows. This increase is due to a decline in gross FDI outflows, whereas the impact on gross FDI inflows is not significant. In other words, whenever inflow restrictions are tightened, companies in EMEs during the 2000s decided to invest less abroad, perhaps investing more in their own economies as access to foreign funding for domestic investment projects became scarcer. Similar to our findings for total gross outflows post-crisis, an easing of outflow restrictions led to a decline in gross FDI outflows while the impact on gross FDI inflows is not significant. Capital account liberalization in EMEs during the 2000s thus made local companies less inclined to invest abroad. This may in particular

[32] We do the same for portfolio flows, but do not find significant results and therefore those results are not shown here.

be the case if capital account liberalization is accompanied by structural reforms that strengthen the business/investment climate. In addition, it should be borne in mind that most of our sample period coincides with a period of strong growth and ample investment opportunities in EMEs (certainly relative to advanced economies).

Figure 11: Inflow and outflow measures – Own effects on gross other investment flows



Note: The blue line denotes the median impulse response to a positive shock to the capital control variable shown in each panel. The dotted red lines represent the 16 and 84 percentiles. The impulse responses are normalized to a one unit shock and are expressed in the unit of each respective variable.

6.6 Domestic effects: Key findings, caveats and implications

To sum up, we find limited evidence of effectiveness of capital control measures in generating desired policy outcomes or configurations in the trilemma. If they have a desired impact on net capital inflows, monetary policy autonomy or the exchange rate, the size of that impact is generally small. Net inflow tightening measures allow more monetary policy autonomy, but they do not reduce net capital inflows or, on balance, weaken the exchange rate, suggesting that they fail to effectively close the capital account. The lack of effectiveness on net capital inflows seems to come from the behavior of gross outflows, which tend to decline as a result of a tightening of inflow restrictions as domestic investors in EMEs seek more investment opportunities in their own countries. The trend towards capital account liberalization has made it easier for residents in EMEs to adjust their investment activities abroad in response to changes in

capital controls. As capital flows to EMEs increased after the start of the global financial crisis, the domestic effects of changes to capital controls seem to have become weaker compared with the pre-crisis period. Capital control changes do seem to be able to influence the composition of capital inflows to some extent as policy-makers managed to reduce inflows of other investment by tightening inflow controls, although the size of the impact is small.

The results in this section are broadly in line with the mixed evidence of the effectiveness of capital controls typically found in the literature. Our results also confirm earlier findings that capital flow measures seem to have an impact on interest rate differentials (or monetary policy autonomy in our case), but they do not seem to have much of an effect on capital flows or the exchange rate (Hutchison et al. 2014, Pandey et al., 2015).

However, some caveats need to be borne in mind. First, the above analysis only sheds light on the average relationships between the variables in our model and the impact of specific capital control changes may deviate from this average. Second, the effectiveness of capital controls also depends on the governance institutions in countries imposing these controls and we do not control for these. Looking at EMEs during the period 1995-2010, Saborowski et al. (2014), for example, find that restrictions on outflows are more effective if they are supported by good institutions (as well as strong macroeconomic fundamentals). Finally, we do not take into account the de facto financial flows via trade mis-invoicing, which are not captured by official capital flow statistics. In so far as these flows take place to evade capital controls, including these flows in our analysis may only bolster our conclusions of ineffectiveness of controls.

Our finding that the average policy action is ineffective in influencing domestic macroeconomic aggregates also reflects the ambiguity in the policies themselves. Emerging markets use both inflow easing and tightening measures in times of inflow surges (while also changing outflow controls in both directions at the same time as well). The textbook prescription of tightening controls on inflows during a gross inflow surge (and vice versa) is not seen in the data – and this is the reason we use "net changes in controls" in our empirical analysis. In our dataset, of the ten countries that introduced inflow easing or inflow tightening measures during 2007, a year of surging gross inflows to EMEs, only half took more inflow tightening measures

than inflow easing measures.[33] Some of the easing measures may have had the effect of mitigating the impact of the tightening measures, something we are not able to fully control for. The ambiguity in the overall stance of capital control policies within a country may also be explained by its institutional structures. For example, the responsibility for controls on different types of flows (such as FDI, bonds, equities and derivatives flows) may rest with different government agencies. This suggests that future research on capital controls would benefit from focusing on the costs and benefits of specific instruments, rather than on capital controls in general (Pandey et al., 2015).

7. Results: Spillover effects

Capital flow measures in EMEs could spill over to other economies by increasing or decreasing flows to countries with similar characteristics or in the same region, or have an impact on the other variables of the trilemma in those countries. Understanding the multilateral implications of capital control policies is relevant for several reasons. First, capital control actions by some capital-receiving countries may deflect capital towards other recipient countries that do not impose such controls and exacerbate their overheating pressures or domestic financial imbalances. Second, capital controls may have the effect of hampering or postponing external adjustment, for example when inflow controls are used to sustain an undervalued currency.

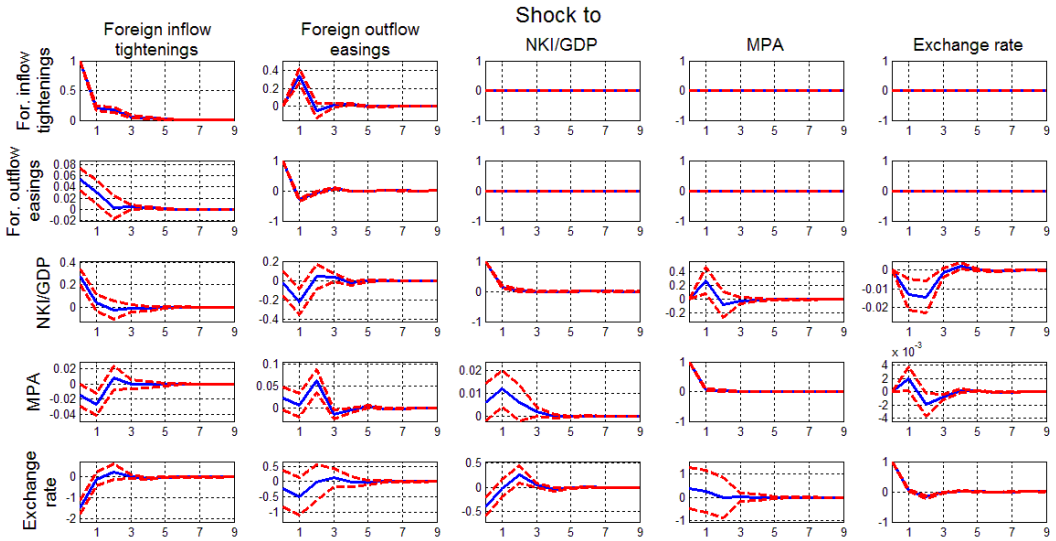
A recent event study analysis by Forbes et al. (2013) suggests that capital flow measures in Brazil spilled over to other countries. However, more general empirical evidence of such spillovers remains scant. In this section, we use a near-VAR model to analyze these externalities for CCAs in all BRICS, treating all variables as endogenous except for capital flow policies in other countries (see Section 4 for more details). We first look at the evidence for the full sample in a panel near-VAR and then we analyze interactions between specific countries in country-by-country near-VARs.

[33] For more discussion of the direction of policies, including analysis by regions, see Pasricha (2012). Fernández et al. (2013) use a different dataset on levels of capital controls for a larger sample of countries and also find that capital controls are a-cyclical.

7.1 Results of the baseline model

Figure 12 shows impulse responses using our model with spillover effects for net inflow tightening and net outflow easing measures based on the full sample. In this model, these effects are defined as spillovers from any of the BRICS countries to the other BRICS or from any of the BRICS to the other countries in the same region (see Section 4). On average, changes in capital controls in other countries create significant, temporary spillovers to all variables of the trilemma. These spillovers stem from measures that tighten inflow controls, whereas net outflow easing measures do not generate such spillovers. In more detail, net inflow tightening measures in BRICS spill over to other countries by increasing their net capital inflows and by placing upward pressure on the currencies of those countries. These other countries also seem to lose monetary policy autonomy, although that impact is not as significant as the effects on the other variables. Somewhat counterintuitively, net outflow easing measures in BRICS seem to reduce net capital inflows to other countries. This is consistent with our finding that these measures increase net capital inflows in the countries that undertake them, as residents in EMEs adjust their investment activity abroad in response to changes in inflow controls (see Section 6). Looking at components of capital flows, it seems that spillovers mainly occur via other investment flows (although the impact on portfolio flows is also significant, but much smaller; not shown here). Spillover effects occur relatively quickly in the sense that they are already significant within the quarter in which the capital control change is implemented. The impact of net outflow easing measures occurs somewhat more slowly.

Figure 12: Inflow and outflow measures – Spillover effects: Impulse responses in the baseline model



Note: The blue line denotes the median impulse response to a positive shock to the variable at the top of each column. The capital control measures refer to net inflow/outflow measures taken in other countries (as defined in the text).The dotted red lines represent the 16 and 84 percentiles. The impulse responses are normalized to a one unit shock and are expressed in the unit of each respective variable. An increase in the exchange rate chart is a depreciation of the local currency against the USD. The flat lines in the panels in the two upper rows mean that capital flows, monetary policy autonomy and the exchange rate do not have an impact on capital control decisions in other countries as the latter are treated as exogenous.

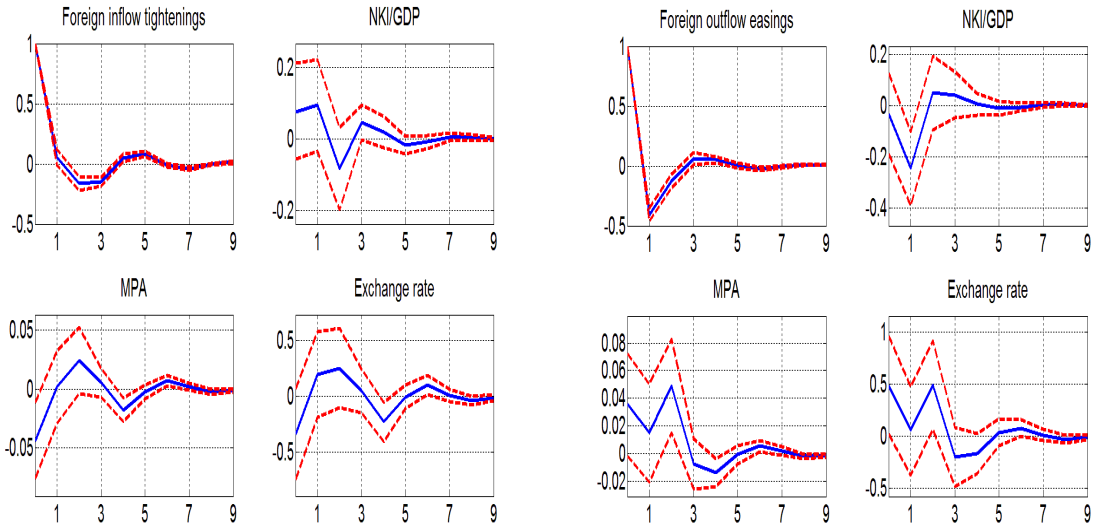
7.2 Have spillovers changed over time? Pre- vs. post–global financial crisis

Given the increased size and volatility of capital flows to EMEs (IMF, 2011b), the question comes up whether the importance of spillover effects has increased over time. As for domestic effects, we split the sample into two parts: the five years before the global financial crisis (2003Q1-2007Q4) and the four years covering the crisis and its aftermath (2008Q1-2011Q1). Figure 13, which reports the results for the pre-crisis period, shows more mixed results for the significance of spillover effects than Figure 14, which covers the post-crisis period.

The results in Figure 13 show that, before the crisis, net inflow tightening measures in BRICS had a small upward impact on net capital inflows elsewhere and drove up other countries' currencies, but those effects were not very significant. Outflow easing measures did not have significant negative spillover effects (the downward impact of outflow easing on net capital inflows in other EMEs is consistent with our findings for the domestic effects of these measures). During the post-crisis period (Figure 14), however, spillovers from capital control

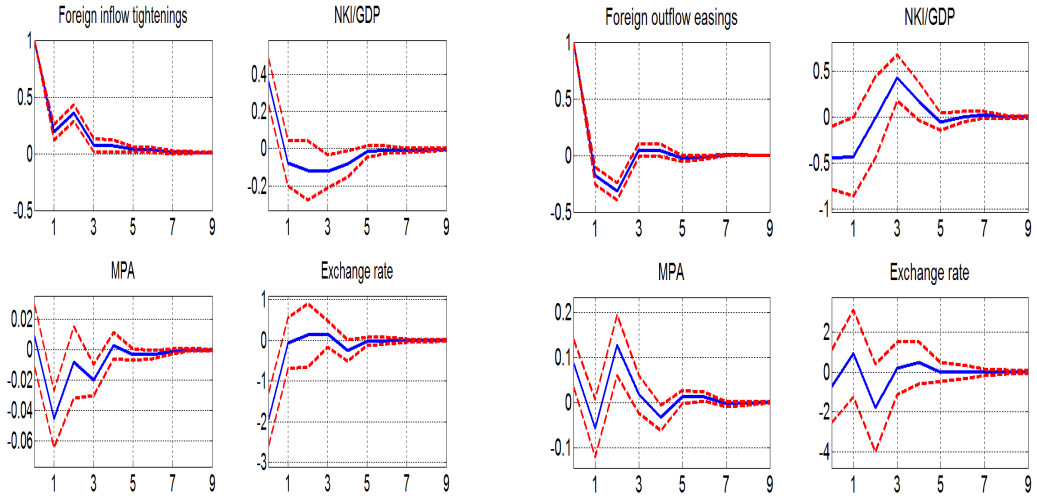
changes in BRICS seem to have become larger and more significant than before the crisis. Moreover, during the post-crisis period outflow easing measures in BRICS also created clearer spillovers to other emerging economies by increasing net capital inflows into those economies.

Figure 13: Inflow and outflow measures– Spillover effects before the crisis (2003Q1-2007Q4)



Note: The blue line denotes the median impulse response to a positive shock to capital control variable shown in each panel. The dotted red lines represent the 16 and 84 percentiles. The impulse responses are normalized to a one unit shock and are expressed in the unit of each respective variable. An increase in the exchange rate chart is a depreciation of the local currency against the USD.

Figure 14: Inflow and outflow measures – Spillover effects after the crisis (2008Q1-2011Q4)

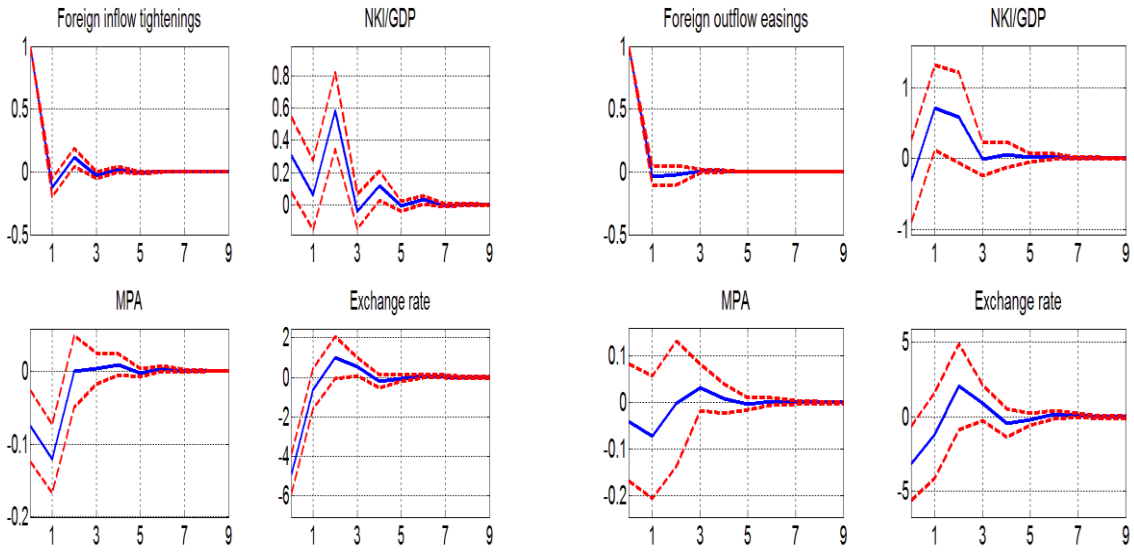


Note: The blue line denotes the median impulse response to a positive shock to capital control variable shown in each panel. The dotted red lines represent the 16 and 84 percentiles. The impulse responses are normalized to a one unit shock and are expressed in the unit of each respective variable. An increase in the exchange rate chart is a depreciation of the local currency against the USD.

7.3 Are there regional differences?

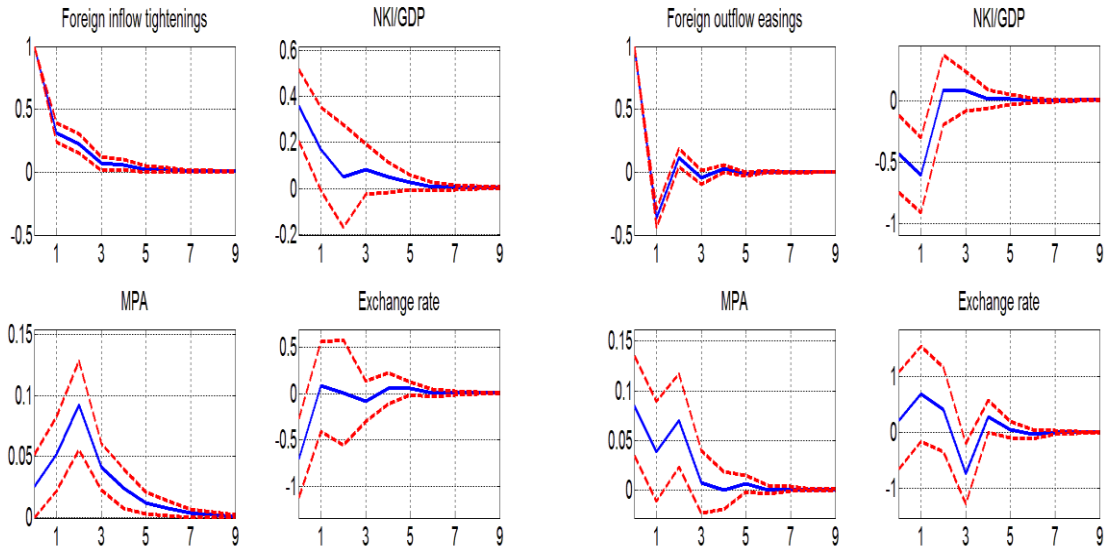
Spillovers from changes in capital controls seem to be more prevalent in Latin America than in Asia. Figure 15 shows that both inflow tightening measures and outflow easing measures in Brazil have a significant impact on net capital inflows and the exchange rate in other Latin American countries. In Asia, by contrast, we only find evidence of spillovers for inflow tightening measures in China/India on the other Asian countries (both via net capital inflows and exchange rates), but not for outflow easing measures (Figure 16). In addition, the impact of Brazilian inflow tightening measures on net capital inflows and exchange rates of other Latin American EMEs is significantly larger (5% average quarter-on-quarter appreciation in the same quarter) than the impact of inflow tightening measures in India and China on other Asian EMEs (1% average appreciation in the same quarter). This may reflect the relatively closed capital accounts of China and India as well as other Asian EMEs in the sample relative to Brazil and the other Latin American EMEs. In addition, the greater role of cross-border banking in Latin America (Committee on the Global Financial System, 2014) may also play a role as the main transmission channel for these spillovers for capital flows is foreign borrowing by EME residents (see below).

Figure 15: Inflow and outflow measures – Spillover effects: Latin America



Note: The blue line denotes the median impulse response to a positive shock to the capital control variable in Brazil shown in each panel. The dotted red lines represent the 16 and 84 percentiles. The impulse responses are normalized to a one unit shock and are expressed in the unit of each respective variable. An increase in the exchange rate chart is a depreciation of the local currency against the USD.

Figure 16: Inflow and outflow measures – Spillover effects: Asia



Note: The blue line denotes the median impulse response to a positive shock to the capital control variable in China and India shown in each panel. The dotted red lines represent the 16 and 84 percentiles. The impulse responses are normalized to a one unit shock and are expressed in the unit of each respective variable. An increase in the exchange rate chart is a depreciation of the local currency against the USD.

Table 3, based on Figures C4 to C19 in Appendix C, summarizes our results for the individual countries using country-specific near-VARs. The following points are noteworthy.

First, our analysis for individual countries confirms that capital flow policies have more significant cross-border spillovers in Latin America than in Asia. In fact, India, Korea, Malaysia, Thailand and South Africa stand out as the most insulated countries with only spillovers via exchange rates stemming from inflow tightening measures in BRICS. On the other side of the spectrum, Mexico and Turkey stand out as the most integrated (or vulnerable) countries with significant spillovers from BRICS' capital control actions. This is consistent with our finding that capital control policies seem to be somewhat more effective in Asia than in Latin America, suggesting that Asian countries are less exposed to spillovers than economies in Latin America. When we compare these results with the classification of countries into "walls", i.e. countries with extensive and long-standing capital controls and "gates", i.e. countries with less extensive controls (Klein and Shambaugh, 2013), it seems that more open countries are also subject to more spillovers while more closed countries are less affected.

Second, inflow tightening measures generate substantially more spillovers than outflow easing measures. Looking at the components of net capital flows (portfolio and other

investment), the main capital flow channel through which inflow tightening measures spill over to other economies is via other investment. In other words, a key transmission channel for these spillovers is essentially borrowing by EME residents from abroad. In line with our findings for domestic effects, this confirms the importance of resident flows in understanding the impact of capital control changes.

Third, the most common channel for spillovers runs via exchange rates rather than net capital flows. The latter is in particular the case for inflow tightening measures. In fact, for all countries shown in Table 3, inflow tightening measures taken in BRICS generate significant spillovers via the exchange rate. The key role of exchange rates as a transmission channel for these shocks suggests that, to the extent that they are not accompanied by movements in net capital flows, capital control changes in the BRICS may have an impact on exchange rate expectations in other EMEs.

Table 3: Spillover effects of BRICS capital control changes on countries below

	NKI/GDP		Exchange rate		Wall or gate?
	Net inflow tightening	Net outflow easing	Net inflow tightening	Net outflow easing	
ARG	N	N	Y	Y	G
BRA	(N)	N	Y	Y	G
CHL	Y	N	Y	N	G
CHN	Y	N	Y	N	W
COL	N	(Y)	Y	N	G
IDN	Y	N	(Y)	N	G
IND	N	(N)	Y	(N)	W
KOR	N	(N)	Y	N	G
MEX	(Y)	(Y)	Y	Y	G
MYS	N	N	(Y)	(N)	W
PER	N	N	Y	Y	G
PHL	Y	(N)	Y	N	W
RUS	Y	N	Y	N	G
THA	N	N	Y	N	W
TUR	N	Y	(Y)	Y	G
ZAF	(N)	N	Y	N	W

This table summarizes the results of Appendix C, Figures C4-C19, showing the significance of spillover effects on the countries in the first column. Y = significant impact with expected sign; (Y) = significant impact with expected sign with delay; N = no significant impact; (N) = significant impact with unexpected sign. W = "wall", i.e. a country with extensive and long-standing capital controls; G = "gate", i.e. a country with less extensive controls or practically no controls. This classification is based on Klein and Shambaugh (2013).

To conclude, our evidence suggests that spillover effects of capital flow policies may have been more important than generally thought. We find evidence that during the 2000s capital flow policies in large EMEs – in particular tightening of inflow controls – had significant implications for other countries. These policies generated upward pressure on the currencies of other EMEs, while in a more limited number of cases they also fuelled net capital inflows in other countries. These spillovers were a general phenomenon in EMEs but more prevalent in the more open Latin American economies than in emerging Asia.

8. Robustness checks

We test the robustness of our results to several alternative model specifications and different samples. The robustness checks include alternative capital control variables, different sub-samples (countries and time periods), an alternative indicator for monetary policy autonomy using the covered short-term interest rate differential between the home and the base country (the US), other Choleski orderings (capital control measures reversed, alternative orderings of the other endogenous variables), a different number of lags for the endogenous variables (i.e. one instead of two quarters), the inclusion of other variables (e.g. reserve accumulation as an additional variable, the expected exchange rate instead of the actual exchange rate, a single variable for capital flow measures instead of two, i.e. net restricting measures instead of net inflow tightening and net outflow easing measures together and the inclusion of domestic real GDP growth) and other modifications listed in Table 4.

As capital control policies in EMEs during the 2000s were often focused on reducing the pressure of net capital inflows, we also look at the impact of our second classification of capital control measures, i.e. breaking them down into measures aimed at reducing or increasing net capital inflows (irrespective of whether they relate to inflows or outflows). NKI reducing or NKI increasing measures do not have a significant impact on monetary policy autonomy (see Appendix C, Figure C3). This is intuitive as the impact of these measures on the capital account (i.e. whether they lead to a more closed or more open capital account is ambiguous as it depends on the specific measure). Other results for this model broadly confirm the above findings for net inflow tightening and net outflow easing measures.

In order to further interpret our results for domestic effects, we also run our baseline for various sub-groups of countries. Klein and Shambaugh (2013) find that with pegged exchange rates, capital controls provide greater monetary autonomy only when they are long standing and extensive.[34] We therefore investigate whether there is a difference between countries with extensive and long-standing capital controls and countries with less extensive controls. In contrast to Klein and Shambaugh (2013), we do not find a clear difference between these two groups (results available upon request from the authors). In both groups of countries, changes in capital controls do not have on average expected significant effects on the variables in our baseline model. In addition, we estimate our baseline model for domestic effects for BRICS only in order to be able to compare the results for domestic effects with those for spillover effects for the same group. We find that the results for BRICS are very similar to those for the full sample.

Recent literature has argued that reserves are a fourth dimension in the trilemma, allowing countries to maintain a middle configuration (Aizenman et al., 2010). The inclusion of reserves as an additional variable into our model does not change the results (Appendix C, Figure C1). Our results show that a net tightening of inflow restrictions is followed by a stronger accumulation of reserves, while a net easing of outflows does not have a significant impact on a country's reserve position. The upward impact on reserve accumulation of a net tightening of inflow controls is consistent with the upward effect that these measures have on net capital inflows. By tightening inflow restrictions, policy-makers in emerging economies can thus accumulate reserves and gain monetary policy autonomy, although that comes at the expense of upward pressure on the exchange rate.

Our results may underestimate the impact of capital controls if policy-makers are forward-looking when they decide on capital controls. If this is the case, the identification of the structural shock can be improved by controlling for the expected depreciation of the exchange rate in addition to the actual rate. We do this by creating a new variable for capital control changes (for both net tightening inflow measures and net easing outflow measures) that captures the change in capital controls that does not reflect anticipated changes in the exchange rate. More precisely, we use the expected exchange rate (based on Consensus Forecasts) to predict changes in capital controls and we use the component of the capital control change that cannot be

[34] We follow the classification of countries in walls and gates in Klein and Shambaugh (2013), i.e. countries with extensive and long-standing capital controls ("walls") are China, India, Malaysia, the Philippines, Thailand and South Africa and the countries with less extensive controls ("gates") are the remaining countries in our sample.

explained by this expected exchange rate (i.e. the residual of our equation) as the capital control measure in our baseline model. The results are very similar to those of the baseline model presented above, which suggests that the potential forward-looking nature of capital control policies does not bias our results.

We also test the sensitivity of the results for different exogenous variables, including, for example, the VIX index, EMBI sovereign spreads and several other financial variables as well as business cycle indicators. We also include other proxies for global monetary policy conditions, such as global liquidity growth and the change in the size of the FED's balance sheet. These modifications to the exogenous variables do not have a significant impact on the impulse responses.

As the expected impact of capital control actions on monetary policy autonomy is ambiguous for spillover effects (see Section 7), we also estimate a range of models using a two-regime threshold-panel VAR (TPVAR and near-TPVAR), in which we define high and low net capital inflow regimes based on whether NKI is positive or negative during the preceding quarters or based on whether the covered interest rate differential is positive or negative. However, we find that the outcomes are somewhat sensitive to the definition of the regimes (whether NKI is positive/negative in the two, three or four preceding quarters). In addition, we do not find a clear difference between the outcomes for the high and low NKI regimes, suggesting that single-regime models as presented in this paper capture sufficiently well the dynamics of the process that we are interested in.

Moreover, as regards spillover effects, the main results do not change if we add domestic capital control variables to the model, if we use gross capital inflows instead of net capital inflows or if we use NKI reducing and NKI increasing measures as capital control variables in the BRICS countries (instead of net tightening inflow and net easing outflow measures).

To sum up, for both domestic and spillover effects, the results are stable across various model configurations: in all specifications there is limited or no evidence of effectiveness of domestic CCAs, while there is clear evidence of spillover effects.

Table 4: List of Robustness Checks

Domestic effects		**Spillover effects**	
Model	Specification	Model	Specification
PVAR	Net restricting NKI measures, NKI, MPA, exchange rate	Near-PVAR	Foreign NKI reducing and foreign NKI increasing measures, NKI, MPA, exchange rate
PVAR	NKI reducing and NKI Increasing measures, NKI, MPA, exchange rate	Near-PVAR	Foreign net tightening in and foreign net easing out measures, gross inflows, MPA, exchange rate
PVAR	BRICS only	Near-PVAR	Foreign Net restricting, domestic net restricting, NKI, MPA, exchange rate
PVAR	CID instead of MPA	Near-PVAR	CID instead of MPA
PVAR	Drop MPA	Near-PVAR	Drop MPA
PVAR	1-qtr lags instead of 2-qtr lags	Near-PVAR	1-qtr lags instead of 2-qtr lags
PVAR	Add GDP growth/business cycle	Near-PVAR	Add GDP growth/business cycle
PVAR	Reverse order MPA and exchange rate	Near-PVAR	Reverse MPA and exchange rate
PVAR	Reverse order capital control variables	Near-PVAR	Reverse order capital control variables
PVAR	Exclude India and Peru (most changes)	Near-PVAR	Demeaning of endogenous variables, except capital controls
PVAR	Unweighted instead of weighted capital control measures		
PVAR	Demeaning of endogenous variables, except capital controls		
TPVAR	High NKI regime - net tightening in and hot net easing out measures, NKI, MPA, exchange rate	Near-TPVAR	High NKI regime - Foreign net tightening in and foreign hot net easing out measures, NKI, MPA, exchange rate
TPVAR	Low NKI regime - net tightening in and hot net easing out measures, NKI, MPA, exchange rate	Near-TPVAR	Low NKI regime - Foreign net tightening in and foreign hot net easing out measures, NKI, MPA, exchange rate
TPVAR	High NKI regime - With Gross Inflows and gross outflows	Near-TPVAR	High NKI regime - With Gross Inflows instead of NKI
TPVAR	Low NKI regime - With Gross Inflows and gross outflows	Near-TPVAR	Low NKI regime - With Gross Inflows instead of NKI
TPVAR	High NKI regime - NKI reducing and hot NKI increasing measures, NKI, MPA, exchange rate	Near-TPVAR	High NKI regime - Foreign NKI reducing and foreign NKI increasing measures, NKI, MPA, exchange rate
TPVAR	Low NKI regime - NKI reducing and hot NKI increasing measures, NKI, MPA, exchange rate	Near-TPVAR	Low NKI regime - Foreign NKI reducing and foreign NKI increasing measures, NKI, MPA, exchange rate
		Near-TPVAR	High CID regime - Foreign net tightening in and foreign net easing out measures, NKI, MPA, exchange rate
		Near-TPVAR	Low CID regime - Foreign net tightening in and foreign net easing out measures, NKI, MPA, exchange rate

Note: NKI: Net capital inflows (excluding FDI), MPA: Monetary Policy Autonomy Index (see Aizenman et al., 2010), absolute CID: absolute value of the covered interest rate differential. The results are available from the authors upon request.

8. Conclusions

This paper evaluates the effectiveness of capital controls in emerging market economies since 2000. One important, but little-studied, aspect of the growing prominence of EMEs is outward investment flows from these economies. These outflows, while still relatively modest, have increased at a rapid rate. Our results suggest that these flows warrant attention when analyzing the impact of capital controls. We investigate the effectiveness of different types of controls by using a new, detailed dataset on capital control changes. We take a multi-dimensional approach to this question by recognizing that the size of capital flows are jointly determined with other macroeconomic outcomes, including exchange rates, an indicator of monetary policy autonomy based on the co-movement of interest rates and the changes in controls themselves. We estimate the impact of changes in capital controls on these outcomes using impulse response functions based on panel VARs. We also provide empirical evidence on a nascent topic in this area, i.e. whether changes in capital controls in BRICS have spillover effects on other emerging economies.

Our main conclusion for the domestic effects of capital flow measures is that there is limited evidence of effectiveness of capital control measures in generating desired policy outcomes or configurations in the trilemma. If they have a desired impact on net capital inflows, monetary policy autonomy or the exchange rate, the size of that impact is generally small. Net inflow tightening measures allow more monetary policy autonomy, but they do not reduce net capital inflows or weaken the exchange rate, suggesting that they fail to effectively close the capital account. Before the global financial crisis, that lack of effectiveness depended on the behavior of gross outflows, which offset the impact of inflow tightening measures on gross inflows. In the aftermath of the crisis, abundant global liquidity and the reduced profitability of external investment opportunities seem to have played a role. Our results are consistent with evidence in the literature that, in the past decade, EMEs have become more important as a source of capital in addition to being a recipient of capital, implying that the behavior of net capital flows depends more than in the past on resident flows. Capital control changes do seem to be able to influence the composition of capital inflows to some extent as we find that EMEs

managed to reduce gross inflows of resident borrowing from foreign banks (i.e. other investment flows) by tightening inflow controls.

Looking at spillovers, our main finding is that these cross-border effects of capital flow policies have been more important than generally thought. We find clear evidence that during the 2000s capital flow policies in large EMEs – net inflow tightening measures, but not outflow easing measures – had significant implications for other countries. Capital flow policies seem to have an impact on other countries in particular via exchange rates, but also via net capital flows. Spillovers mainly occur via cross-border bank lending (i.e. other investment flows). Spillovers of capital flow policies seem to have become more important over time, as cross-border effects have been more significant in the aftermath of the global financial crisis than before the crisis. Finally, they seem to be more prevalent in Latin America than in emerging Asia, reflecting the greater role of cross-border banking and the more open capital accounts in the former countries.

Our analysis tests the effectiveness of the average capital control policy action (irrespective of its objective) on the ability of countries to limit aggregate inflows and influence the exchange rate while retaining monetary policy independence. It does not address the question of whether capital controls or currency-based measures were effective in mitigating the build-up of systemic risk when used as part of macro-prudential policy. The next steps in the capital controls literature would be to categorize and tabulate each of the vast array of instruments that fall under the category "capital controls" and to assess the relative costs and benefits of each of these in achieving their macroeconomic and macro-prudential objectives.

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Appendix A: Construction of the Dataset on Capital Control Actions

The dataset covers 17 EMEs (listed in Table A1 below) and the years 2001-2011. It contains information on capital controls (regulations that discriminate based on residency of transactor) and currency-based measures (measures that discriminate based on currency of transaction). The two groups of measures together can be referred to as "capital flow measures", as both can influence cross-border transactions in assets (capital flows). For the initial data on CCAs, we follow Pasricha (2012) and supplement information in the IMF AREAER with regulators' press releases/notifications, news sources and other research papers. We follow Pasricha (2012) and count changes separately by asset class and price, quantitative or monitoring type. The final categories are as follows:

The IMF AREAER breaks down the broad category, capital transactions, into the following categories:

1. Controls on capital and money market instruments
2. Controls on derivatives and other instruments
3. Controls on credit operations
4. Controls on direct investment
5. Controls on liquidation of direct investment
6. Controls on real estate transactions
7. Controls on personal capital transactions
8. Provisions specific to the financial sector

For the unweighted data, we use the above categories and split each change (where necessary) as a change in one of the above categories, and further as a quantitative, price-based or monitoring change. This gives us 24 potential categories, over which the unweighted data is classified. This unweighted data is then further classified into inflow or outflow controls, and into capital controls or currency-based measures. We then drop the "small changes" in the dataset. We define small changes as follows:

- Limits on capital flows when targeted at specific countries and/or related to sanctions for political reasons (such as restrictions on transactions with Libya or Iran).
- Regulations resulting from specific trade disputes or issues related to one specific industry (for example, FDI in manufacturing of cigarettes and cigars).

- Minor changes in procedural requirements (for example, for reporting of transactions).
- Minor changes affecting non-residents living or travelling abroad or residents travelling abroad (for example, repatriation of assets by emigrants, payments for education or medical expenses abroad, or access to foreign currency for travel) or small value transactions between relatives and friends.

In addition to small changes, we drop changes that cover one-off guarantees as these are not included in the BOP statistics (for example, authorization requirement for guarantees by non-financial juridical persons in credit operations for their foreign subsidiaries).

The dataset has both announcement and effective dates of change. We use effective dates, where the two differ. This affects 16% of the changes in the unweighted dataset (after dropping minor changes).

To construct the weighted CCA dataset, we weigh the changes by the share of the country's total international assets or liabilities that the measure is designed to influence. For example, a tax on portfolio equity inflows is weighted by the (lagged) share of portfolio equity liabilities in the total international liabilities of the country imposing the tax. A restriction on the foreign direct investment by domestic residents (FDI outflows) is weighted by the share of FDI assets in total international assets of the country. A change that influences all asset classes of inflows (or outflows) has the highest weight equal to 1.

In order to weigh the changes by the share of foreign asset/liabilities that they affect, we need to make the above AREAER classification consistent with the international assets/liabilities data. For example, liquidation of direct investment and real estate transactions are included in direct investment data in the balance of payments. Further, international investment position data allows us to break down controls on capital and money market instruments into portfolio equity, portfolio debt and financial derivatives categories. We use data on the international investment position (IIP) from Lane and Milesi-Ferretti (2007, LMF henceforth). The IIP categories and the possible AREAER categories that may contain CCAs related to the IIP categories are in the table below. The matching is not automatic. Each CCA in the dataset is manually classified as belonging to one or more IIP categories below:

Code	IIP Category	AREAER Categories
D	Foreign Direct Investment	Controls on direct investment; Controls on liquidation of direct investment; Controls on real estate transactions; Provisions specific to the financial sector
O	Other Investment	Controls on credit operations; Controls on personal capital transactions; Provisions specific to the financial sector
P	Portfolio Investment, of which:	Controls on capital and money market instruments; Provisions specific to the financial sector
PD	Portfolio Debt	Controls on capital and money market instruments; Provisions specific to the financial sector
PE	Portfolio Equity	Controls on capital and money market instruments; Provisions specific to the financial sector
PDF	Financial Derivatives	Controls on derivatives and other instruments; Provisions specific to the financial sector

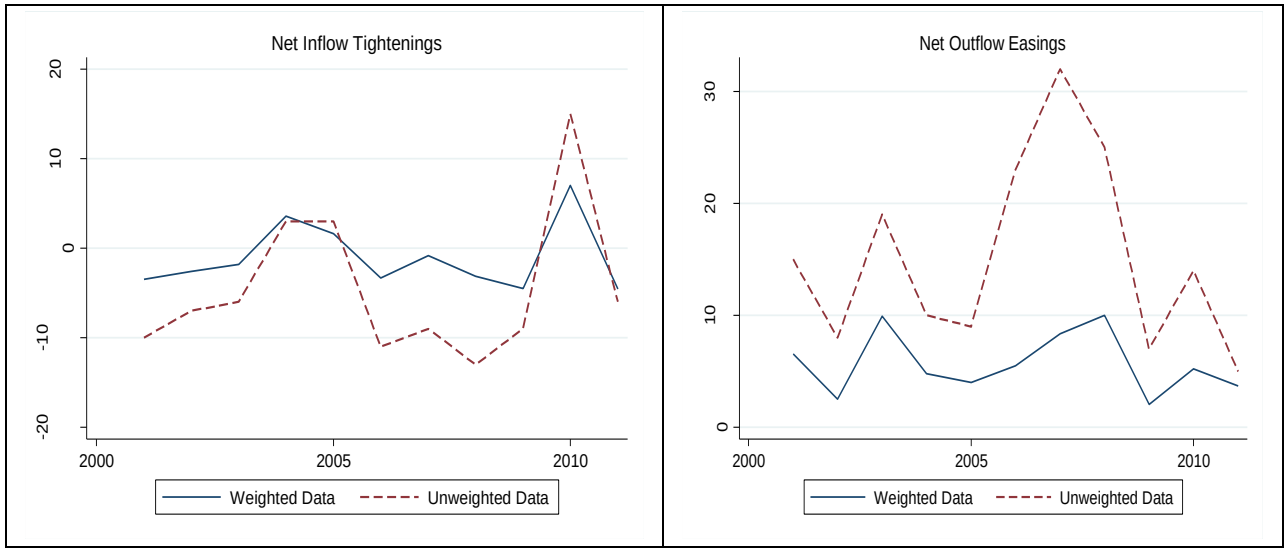
For countries for which the LMF data starts after 2001, the first data point is used for all prior years. If the LMF series is missing for a country, the average value of that series for all EMEs in each year is used. If a change affects more than one category, we add up the weights across the relevant IIP categories.

The weights for inflow controls are constructed as the share of the assets in the relevant category in the total international assets of the country for the year. International investment position data is available at an annual frequency. Our dataset on CCAs is daily, which we aggregate it into a quarterly dataset. In order to control for endogeneity, the weights are lagged by one year, i.e. CCAs on each day in a calendar year are weighted by the IIP positions as at the end of the previous calendar year.

By design, the weighting scheme puts a low weight on changes related to transactions that are not important for the country's external balance sheet. This scheme works better for inflow controls than for outflow controls. When inflows are surging, countries try to limit transactions that have been important in the past, and therefore, the series for total weighted and unweighted number of inflow control changes are relatively close together, in number and shape (Figure A1). However, for outflow controls, if countries try to open up categories of transactions that residents had not been allow to conduct before) to counter the pressure of net capital inflows), then the accumulated assets in these categories would be low, and so would be the weights on these changes. This turns out to be the case in our dataset as well. For this reason, when assessing the domestic effects, we put more weight on domestic effects of outflow easings

with unweighted data, than with weighted data. For net inflow tightenings, our results are robust to the weighting scheme.

Figure A1: Impact of the weighting scheme on net inflow tightenings vs. net outflow easings



Note: Net easing of outflow controls is the difference between outflow easing CCAs and outflow tightening CCAs. Net tightening of inflow controls is analogously defined. We exclude measures related to FDI.

Table A1. Countries in the sample

Argentina	Egypt	Mexico	Thailand
Brazil	India	Peru	Turkey
Chile	Indonesia	Philippines	
China	Korea	Russia	
Colombia	Malaysia	South Africa	

Appendix B: Description and summary statistics of variables used

Table B1: Variables used in the baseline model

Variable	Description/Source
NKI	NKI are private net capital inflows excluding FDI, computed as the sum of portfolio investment, other investment (excluding monetary authority and government flows) and derivative flows. Source: IMF-BOP.
Gross inflows	Gross inflows are gross private capital inflows excluding FDI, computed as the sum of portfolio investment, other investment (excluding monetary authority and government flows) and derivative inflows. These measure the net accumulation of claims on residents by non-residents. Source: IMF-BOP.
Gross outflows	Gross outflows are gross private capital outflows excluding FDI, computed as the sum of portfolio investment, other investment (excluding monetary authority and government flows) and derivative outflows. These measure the net accumulation of claims on non-residents by residents. Source: IMF-BOP.
Monetary Policy Autonomy Index	Following Aizenman, Chinn and Ito (2010), the monetary autonomy index is measured as $1 - \frac{corr(i,i*)-(-1)}{1-(-1)}$ where i is the domestic three-month interest rate expressed as a percentage per annum, and i^* is the foreign interest rate (of the same maturity as the domestic interest rate, namely three months). The correlation coefficient (*corr*) is calculated for each quarter using daily data for interest rates. By construction, the index can fluctuate between 0 and 1. A higher (i.e. more positive) correlation between the home and the foreign interest rate corresponds to a lower value of the index and a lower degree of monetary policy autonomy. The interest rates used are interbank interest rates for EMEs, except Colombia and Chile, where 90-day CD rates are used. The foreign interest rate is the three-month USD LIBOR. Sources: Bloomberg, Datastream and Haver Analytics.
Spot exchange rate vs the USD	The spot exchange rate is expressed as the number of units of the local currency per US dollar, with an increase implying a depreciation of the local currency. Source: Bloomberg.
World GDP	Global real GDP in USD. Source: IMF-IFS.
US inflation	US CPI. Source: Datastream.
SP index	Standard and Poor's 500 Composite Index. Source: Bloomberg.

Table B2: Summary statistics of global variables

	Mean	Standard Deviation	Maximum	Minimum
World GDP growth	3.27	1.95	5.32	-2.69
US inflation	2.47	1.33	5.25	-1.61
S&P500 index growth	1.23	20.19	42.89	-40.24

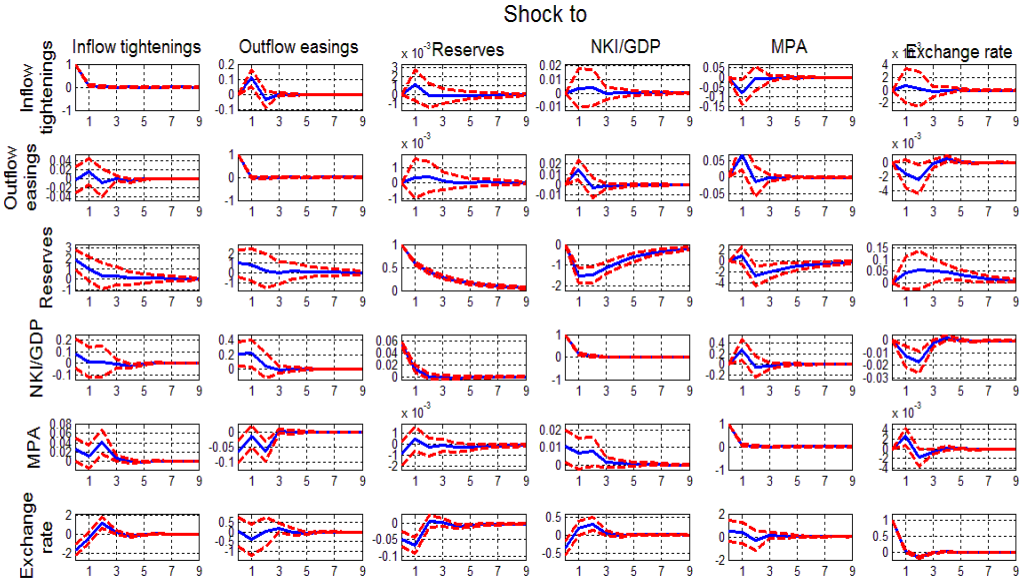
Table B3: Summary statistics of country-specific variables

	Hot NKI/GDP				Hot gross inflows/GDP				Hot gross outflows/GDP				Exchange rate vs USD				MPA			
	mean	sd	max	min	mean	sd	max	min	mean	sd	max	min	mean	sd	max	min	mean	sd	max	min
ARG	-0.60	1.35	2.28	-4.07	0.01	1.26	2.63	-3.28	0.61	0.70	1.95	-1.17	1.28	2.50	7.44	-5.03	0.47	0.29	0.96	0.05
BRA	0.15	0.85	1.77	-1.97	0.41	1.00	2.57	-2.85	0.27	0.42	1.21	-1.20	0.42	11.44	43.97	-14.47	0.47	0.32	0.97	0.02
CHL	-0.75	1.76	3.75	-4.99	0.93	1.28	3.22	-3.65	1.67	1.52	5.30	-1.67	-0.02	7.14	31.12	-10.02	0.51	0.25	0.94	0.05
CHN	0.08	0.39	0.67	-1.16	0.48	0.38	1.34	-0.07	0.40	0.44	1.39	-0.11	-0.58	0.92	0.08	-3.63	0.49	0.15	0.86	0.16
COL	0.13	0.67	2.14	-1.22	0.39	0.74	2.14	-1.23	0.26	0.66	1.97	-0.96	-0.05	7.21	33.22	-15.16	0.56	0.26	0.96	0.07
EGY	-0.84	0.76	0.24	-1.51	-1.12	0.91	-0.49	-2.47	-0.28	0.66	0.36	-0.96	1.16	4.77	27.65	-6.23	0.52	0.31	0.96	0.06
IDN	0.01	0.62	1.25	-1.51	0.29	0.61	1.46	-1.18	0.32	0.47	1.83	-0.62	0.16	6.29	27.13	-14.02	0.51	0.30	0.99	0.04
IND	0.68	0.67	2.77	-0.60	0.62	0.58	2.06	-0.82	-0.06	0.27	0.59	-0.71	0.26	4.34	18.37	-5.78	0.45	0.28	0.92	0.03
KOR	0.28	1.32	3.00	-6.72	0.79	1.64	3.57	-8.19	0.51	0.67	2.01	-1.47	-0.10	7.24	38.98	-10.19	0.53	0.30	0.95	0.03
MEX	0.10	0.71	1.28	-1.28	0.35	0.78	1.91	-1.27	0.24	0.84	2.42	-2.18	0.98	6.53	34.09	-5.80	0.47	0.28	0.98	0.01
MYS	-0.84	2.84	5.50	-9.55	0.52	2.86	5.91	-9.21	1.35	1.28	4.55	-1.38	-0.39	2.58	10.31	-6.03	0.47	0.27	0.98	0.06
PER	0.30	1.26	4.14	-1.65	0.64	1.13	3.89	-1.78	0.34	0.61	1.81	-1.25	-0.55	2.41	8.70	-5.41	0.49	0.21	0.91	0.09
PHL	0.03	1.32	2.38	-3.22	0.44	1.42	3.83	-2.37	0.41	0.94	2.62	-1.71	-0.21	3.47	10.80	-6.51	0.53	0.22	0.94	0.11
RUS	-0.22	2.06	4.83	-9.80	1.10	1.37	4.75	-3.24	1.32	1.27	6.56	-1.32	0.26	5.58	23.02	-7.36	0.53	0.29	0.94	0.09
THA	-0.44	1.53	3.55	-2.85	-0.01	1.70	4.09	-3.06	0.43	1.45	3.96	-4.91	-0.73	3.41	6.43	-7.15	0.38	0.27	0.85	0.02
TUR	1.14	1.00	2.92	-1.61	1.29	1.10	3.02	-2.37	0.15	0.69	1.61	-1.25	1.04	9.20	37.89	-9.91	0.54	0.27	0.95	0.11
ZAF	0.30	1.84	2.87	-8.97	0.78	1.45	3.98	-3.70	0.48	1.15	5.27	-1.24	0.66	10.90	47.34	-14.49	0.48	0.28	0.95	0.02

Note: sd= standard deviation, max = maximum, min = minimum.

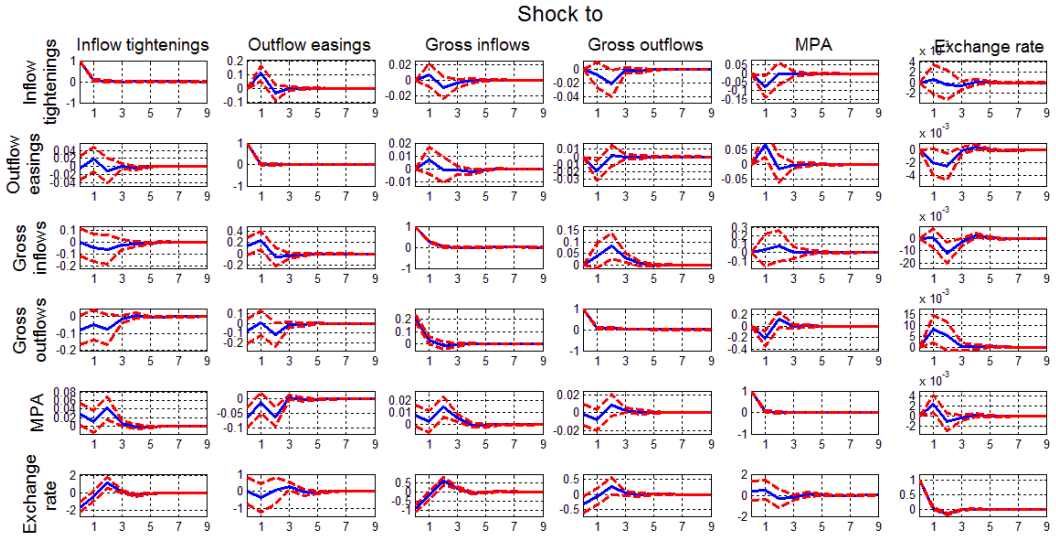
Appendix C: More detailed results

Figure C1: Baseline model with reserves – Impulse responses to a shock in capital controls



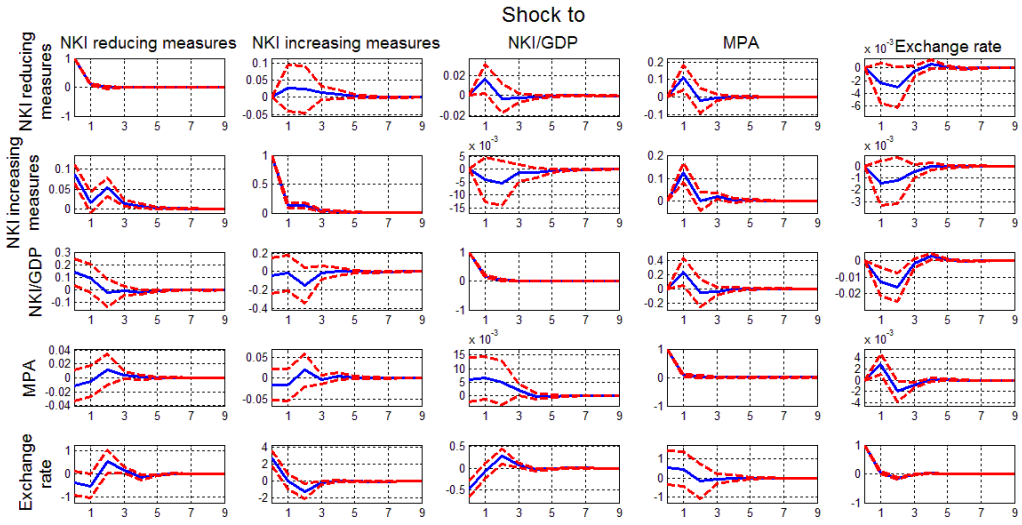
Note: The blue line denotes the median impulse response to a positive shock to the capital control variable shown in each panel. The dotted red lines represent the 16 and 84 percentiles. The impulse responses are normalized to a one unit shock and are expressed in the unit of each respective variable. An increase in the exchange rate chart is a depreciation of the local currency against the USD.

Figure C2: Gross inflows and outflows – Impulse responses to a shock in capital controls



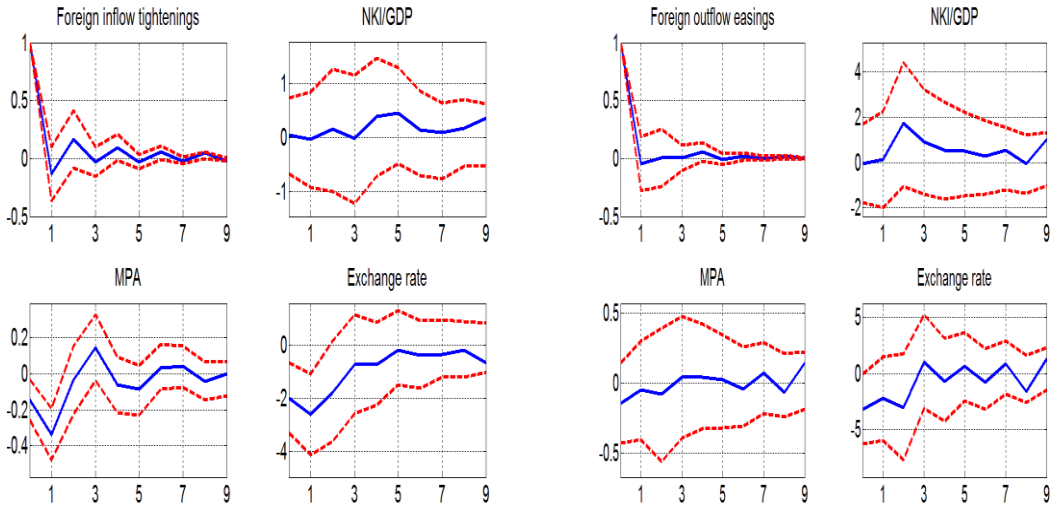
Note: See C1.

Figure C3: NKI reducing and increasing measures – Impulse responses to a shock in capital controls



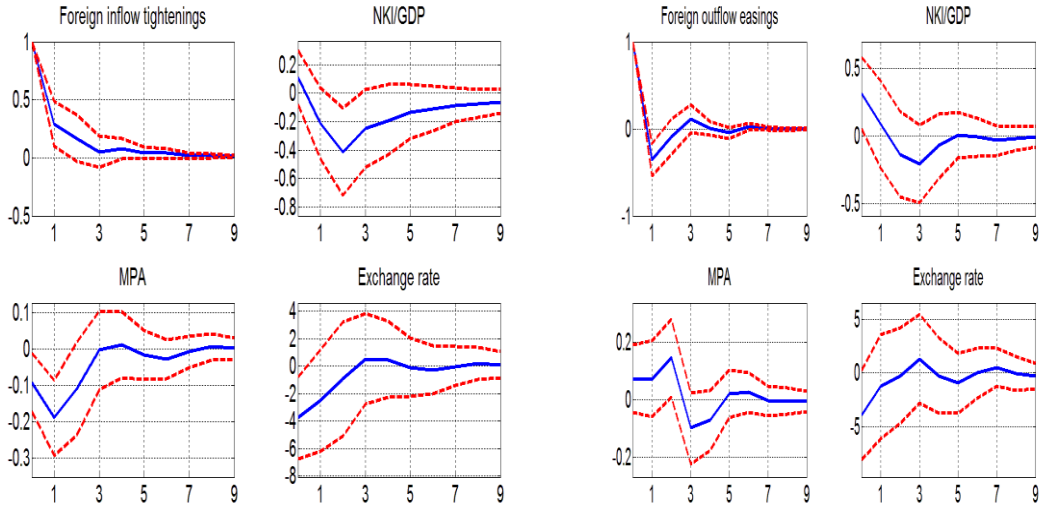
Note: See C1.

Figure C4: Spillover effects on Argentina (from Brazil)



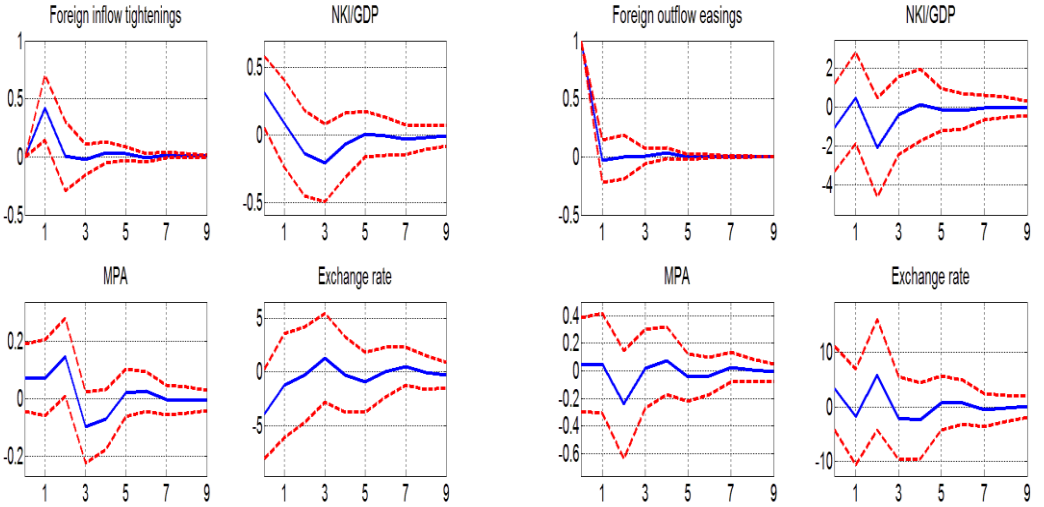
Note: See C1.

Figure C5: Spillover effects on Brazil (from other BRICS)



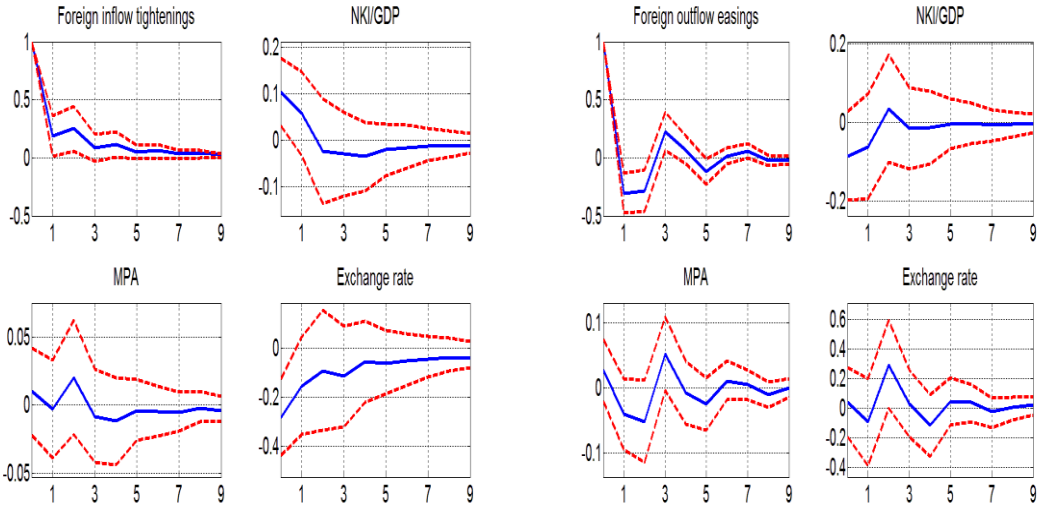
Note: See C1.

Figure C6: Spillover effects on Chile (from Brazil)



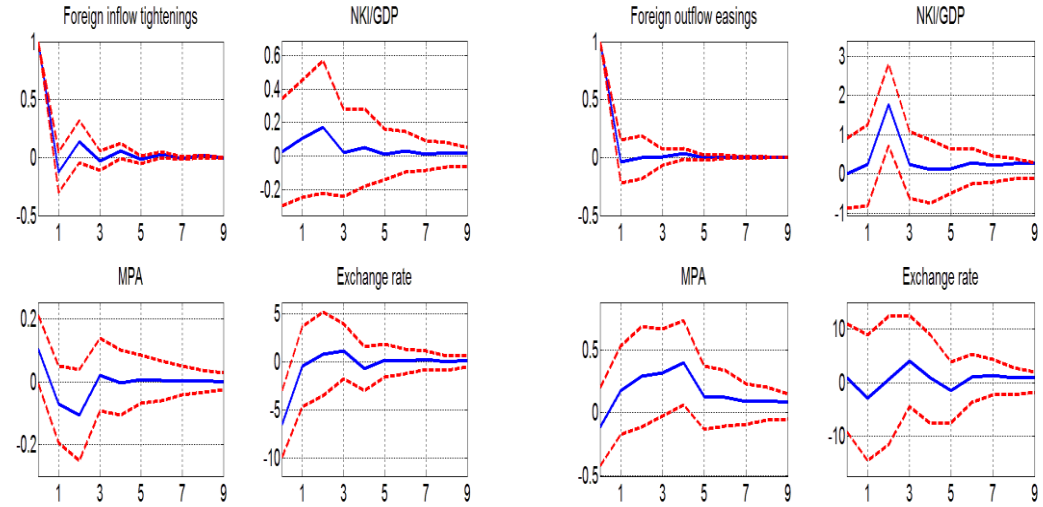
Note: See C1.

Figure C7: Spillover effects on China (from other BRICS)



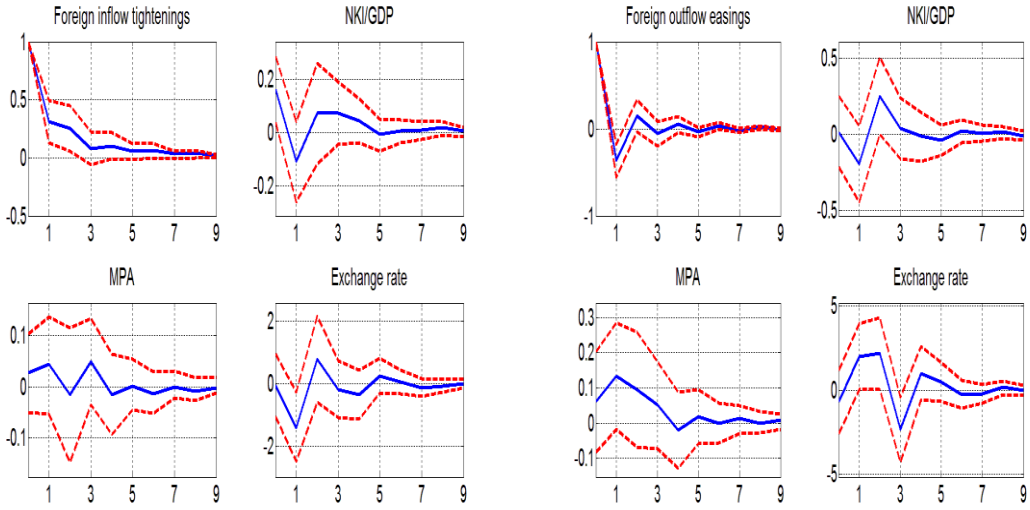
Note: See C1.

Figure C8: Spillover effects on Colombia (from Brazil)



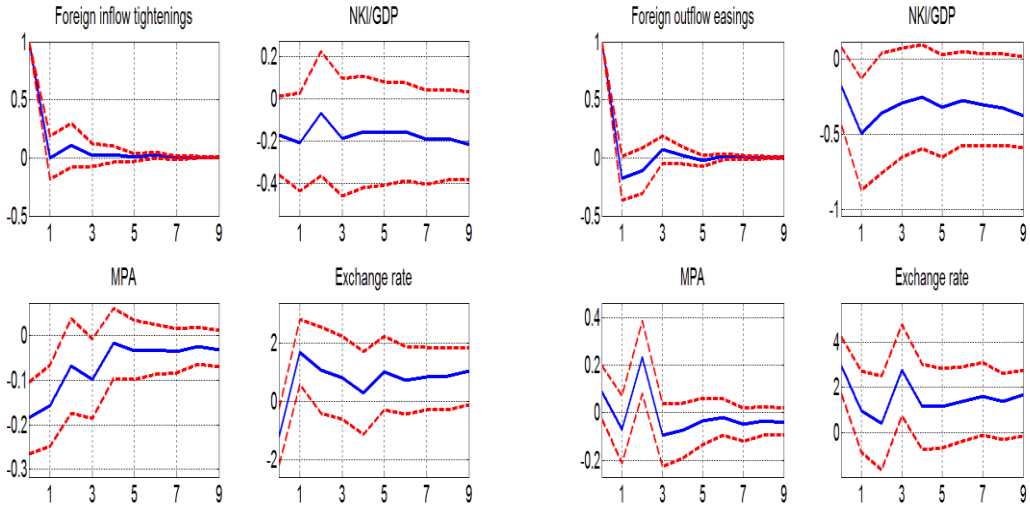
Note: See C1.

Figure C9: Spillover effects on Indonesia (from China/India)



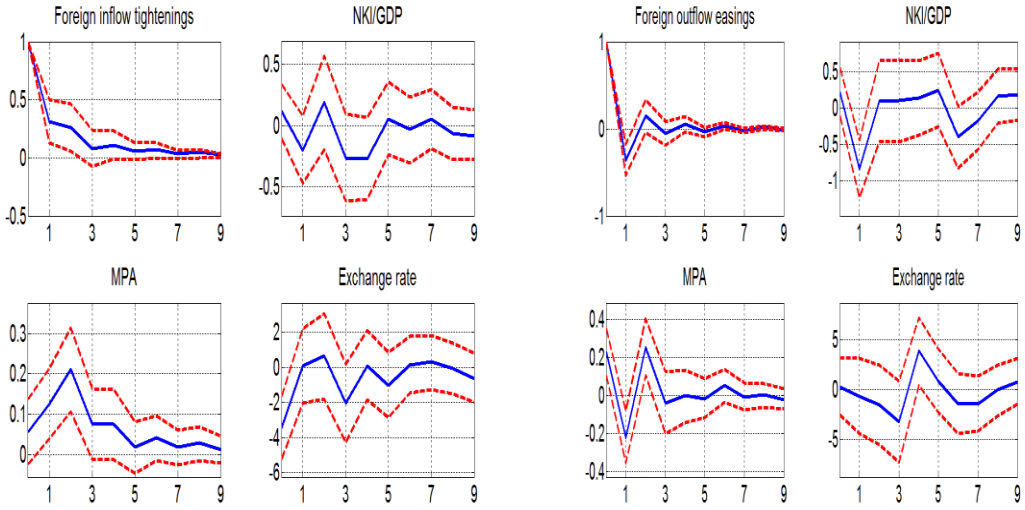
Note: See C1.

Figure C10: Spillover effects on India (from other BRICS)



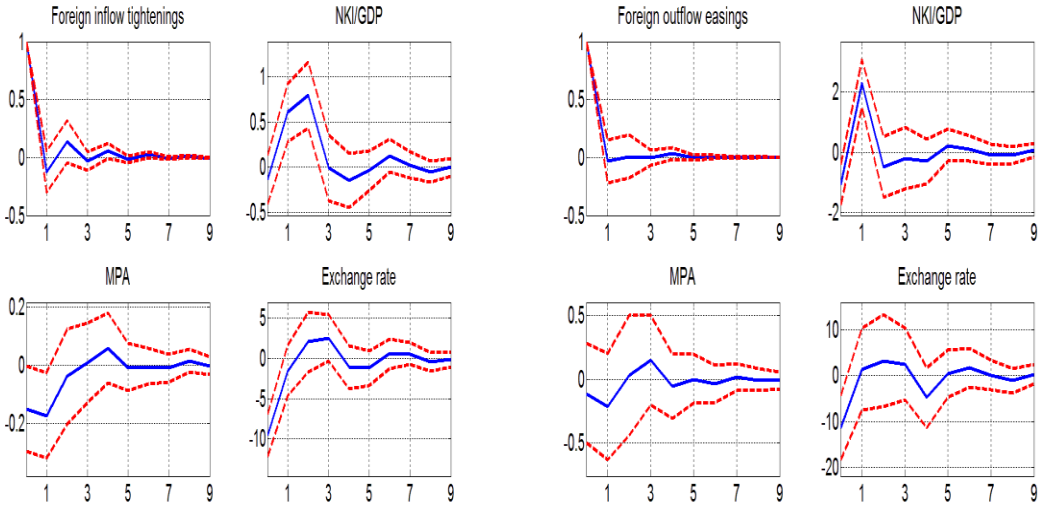
Note: See C1.

Figure C11: Spillover effects on Korea (from China/India)



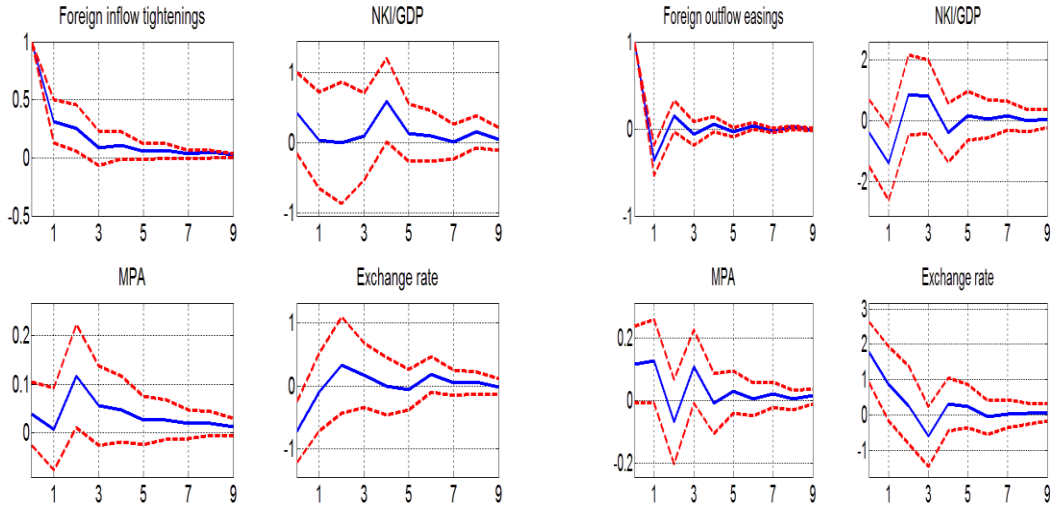
Note: See C1.

Figure C12: Spillover effects on Mexico (from Brazil)



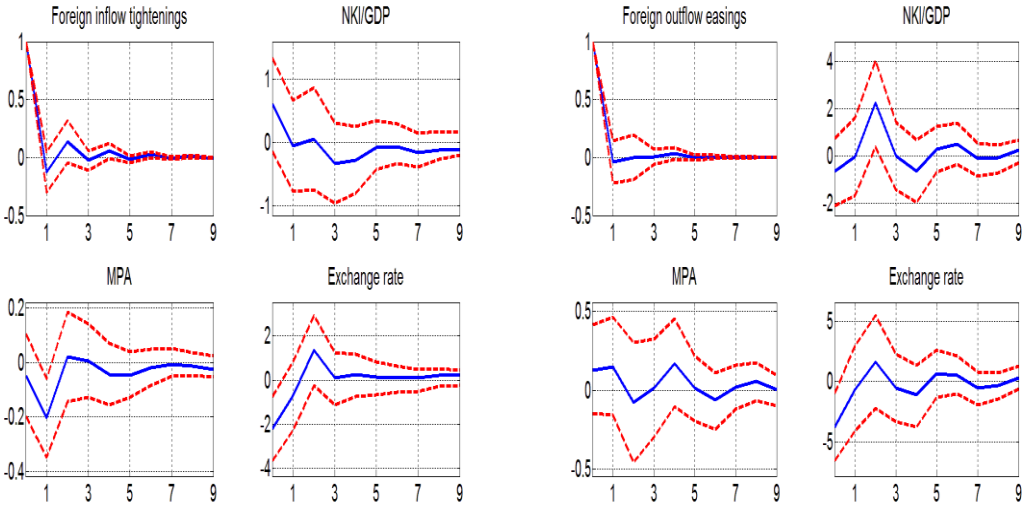
Note: See C1.

Figure C13: Spillover effects on Malaysia (from China/India)



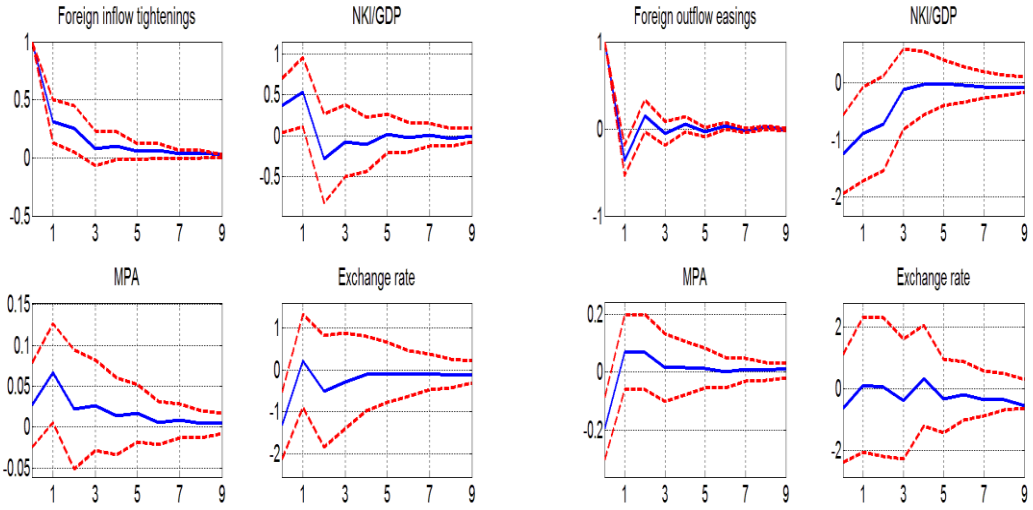
Note: See C1.

Figure C14: Spillover effects on Peru (from Brazil)



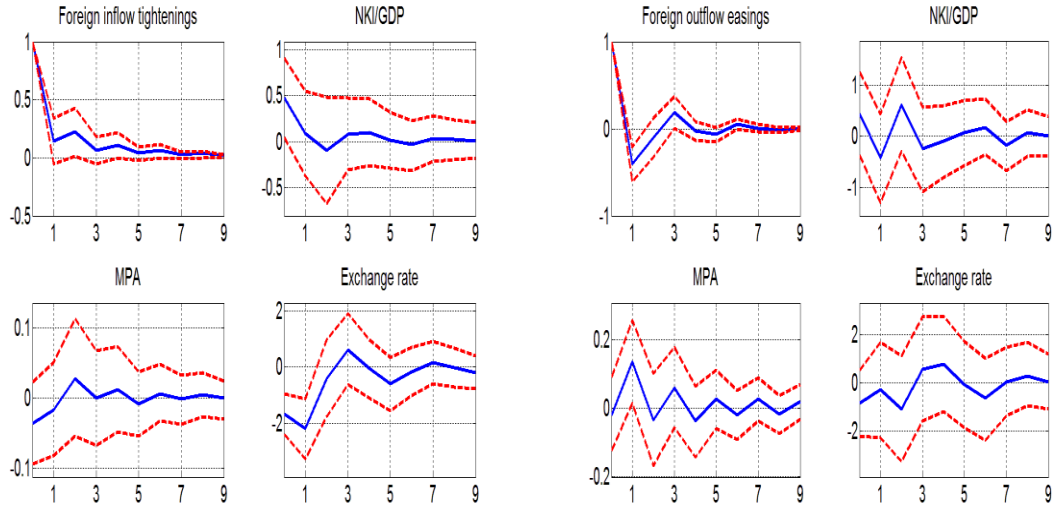
Note: See C1.

Figure C15: Spillover effects on the Philippines (from China/India)



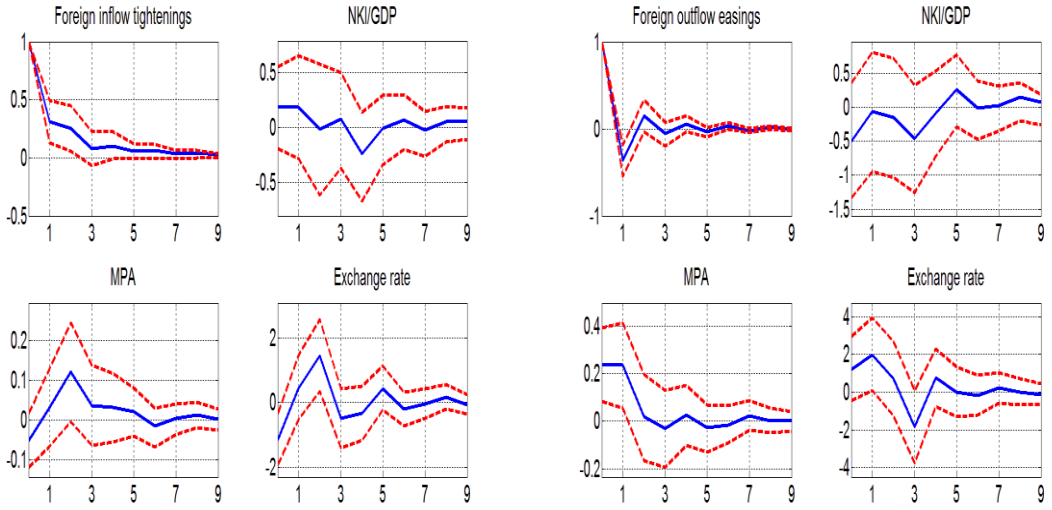
Note: See C1.

Figure C16: Spillover effects on Russia (from other BRICS)



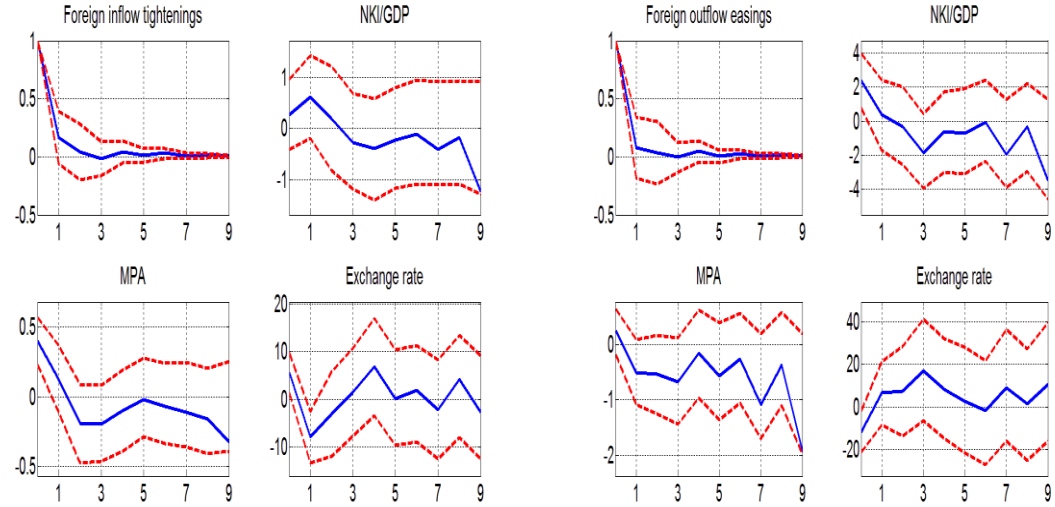
Note: See C1.

Figure C17: Spillover effects on Thailand (from China/India)



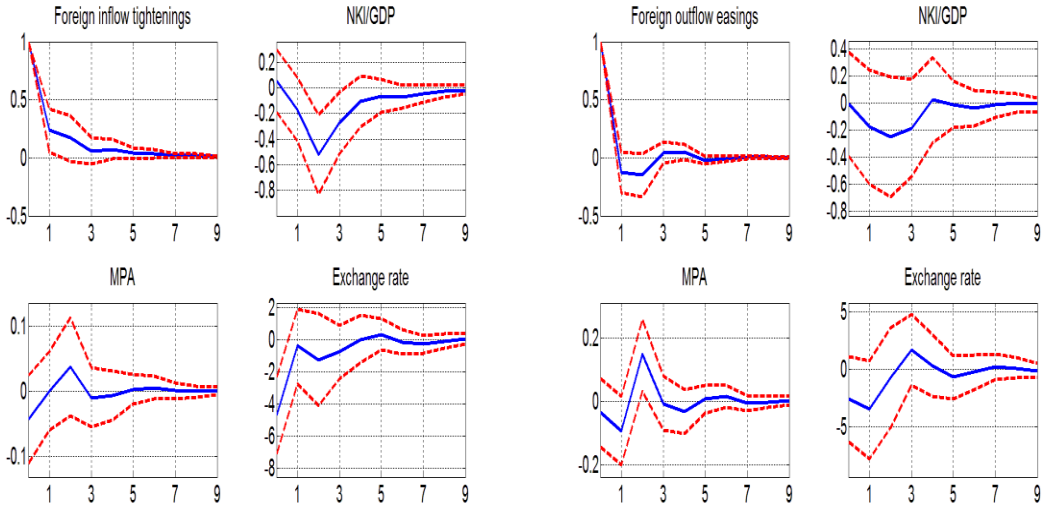
Note: See C1.

Figure C18: Spillover effects on Turkey (from Russia)



Note: See C1.

Figure C19: Spillover effects on South Africa (from other BRICS)



Note: See C1.