NBER WORKING PAPER SERIES

DOMESTIC AND MULTILATERAL EFFECTS OF CAPITAL CONTROLS IN EMERGING MARKETS

Gurnain Pasricha
Matteo Falagiarda
Martin Bijsterbosch
Joshua Aizenman

Working Paper 20822
http://www.nber.org/papers/w20822

NATIONAL BUREAU OF ECONOMIC RESEARCH
1050 Massachusetts Avenue
Cambridge, MA 02138
January 2015

We would like to thank Thomas Dallaire, Gagandeep Pabla, Bryce Shelton and Derrick Shroeter for excellent research assistance. We would also like to thank Rose Cunningham and Alison Arnot for helpful comments and suggestions. The views expressed in this paper are those of the authors. No responsibility for them should be attributed to the National Bureau of Economic Research, the Bank of Canada or the European Central Bank.

Domestic and Multilateral Effects of Capital Controls in Emerging Markets
Gurnain Pasricha, Matteo Falagiarda, Martin Bijsterbosch, and Joshua Aizenman
NBER Working Paper No. 20822
January 2015
JEL No. F32,F41,F42

ABSTRACT

This paper assesses the effects of capital controls in emerging market economies (EMEs) during 2001-2011, focusing on cross-country spillovers of changes in these controls. We use a novel dataset on weighted changes in capital controls (and currency-based measures) in 18 major EMEs. We first use panel VARs to test for effectiveness of own capital controls which take into account the endogeneity of such controls. Next, using near-VARs, we provide new evidence of multilateral effects of capital controls of the BRICS. Our results suggest a limited domestic impact of capital controls. Outflow easing measures do not have a significant impact on any of the variables in the model. Inflow tightening measures increase monetary policy autonomy (measured by the covered interest differential), but at the cost of a more appreciated exchange rate. These measures are therefore not effective in allowing EMEs to choose a trilemma configuration with a de-facto closed capital account, larger monetary policy autonomy and a weaker exchange rate. We do not find a clear difference between countries with extensive and long-standing capital controls (India and China) and other countries. Capital control actions in BRICS (Brazil, Russia, India, China and South Africa) had significant spillovers to other EMEs during the 2000s in particular via exchange rates. Multilateral effects were more important among the BRICS than between the BRICS and other, smaller EMEs, particularly in the pre-global financial crisis period. They were more significant in the aftermath of the global financial crisis than before the crisis. This change stems in particular from the fact that spillovers from capital flow policies in BRICS countries to non-BRICS became more significant in the post-global financial crisis period. These results are robust to various specifications of our models.

Gurnain Pasricha
Bank of Canada
234 Wellington Street
Ottawa, ON K1A 0G9
Canada
gpasricha@bankofcanada.ca

Matteo Falagiarda
European Central Bank
Frankfurt
Germany
matteo.falagiarda@ecb.europa.eu

Martin Bijsterbosch
European Central Bank
Frankfurt
Germany
martin.bijsterbosch@ecb.europa.eu

Joshua Aizenman
Economics and SIR
USC
University Park
Los Angeles, CA 90089-0043
and NBER
aizenman@usc.edu

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. The use and effectiveness of capital controls as a tool to manage such flows have been key elements in this debate. Notably, the IMF has softened its longstanding opposition to capital controls, and has suggested that such controls may be a valid tool of macroeconomic and macro-prudential management under certain circumstances (IMF, 2011a).

Although there is a large body of empirical literature assessing the effectiveness of capital controls, there are several aspects that remain neglected. Our paper aims at filling some of those gaps in the literature. First, most existing cross-country studies that assess the efficacy of capital controls use crude measures of the level of controls, which do not capture the intensive margin of changes in controls. Our database uses information on all policy changes or capital control actions (CCAs), along with information about the precise dates that the changes were made effective, allowing us to more precisely measure the policy whose impact we are trying to gauge. We extend the Pasricha (2012) database from January 2001 to December 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, which allows us to obtain more precise estimates of their impact.

Second, many panel empirical studies on the effectiveness of capital controls take a partial view by focusing on their impact on capital flows only. However, the level of capital flows is determined jointly with other outcomes, such as the interest rate differential vis-à-vis the rest of the world, currency movements and change in reserves. Adequately assessing the impact of controls thus requires a multi-dimensional approach, which 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 vector auto-regressions (PVARs) for capital control actions,

capital flows, covered interest rate differentials 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 cross-country setting (and, to our knowledge, the first to do this for multilateral effects of capital controls).[1]

A third contribution of this paper is that it provides evidence on multilateral effects of capital controls, an issue that has generated much policy interest in recent years. The policy debate, particularly since the global financial crisis, has increasingly focused on the role of policy spillovers from other economies. Such policy spillovers may arise from extraordinary monetary policies in advanced economies, but also from changes in capital controls in emerging-market economies (EMEs), 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 stimulative monetary policy in advanced economies may result in higher capital flows to emerging economies. The empirical evidence of multilateral 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) 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 all capital control actions of the effects of BRICS (Brazil, Russia, India, China and South Africa) capital controls on each other and on non-BRICS emerging economies.

A fourth area where we make a contribution is in assessing the impact of capital control actions in the 2000s, comparing the impact of these actions in the pre-global financial crisis period with the post-crisis period. There is scant empirical evidence of the effectiveness of capital controls in the 2000s, in particular since the start of the global financial crisis. Magud et al. (2011), for example, provide an overview of a significant part of the literature, but the empirical studies it covers mainly deal with the experiences of the 1990s. Since then, many EMEs have opened up their capital accounts and have significantly developed their financial sector, which may have had an impact on the effectiveness of capital controls. The most recent

[1] Saborovski et al. (2014) use PVARs 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).

studies on capital control effectiveness (Forbes et al. 2013, etc.) either evaluate only their effectiveness during the post-crisis period or their impact on individual countries. This paper looks at a panel of large EMEs over a longer horizon, of a decade, which encompasses the pre-crisis period, the global financial crisis of 2007-09 and the post-crisis periods. The longer sample period allows us to assess the domestic and multilateral effects of capital controls under different economic circumstances: the pre-crisis period of robust global growth and the post-crisis period of uneven and relatively low global growth.

Our results show limited or no evidence of the effectiveness of own capital control actions. Inflow tightening measures seem to allow countries to achieve a more depreciated exchange rate only at the cost of a loss in monetary policy autonomy (and vice versa). These measures therefore do not seem to allow countries to choose at the margin a trilemma configuration of a more closed capital account, more monetary policy autonomy and a preferred exchange rate. Net outflow easing measures do not have a significant expected impact on any of the variables in the model. However, we do find strong evidence of multilateral effects of capital flow policies. During the 2000s, changes in capital controls in large EMEs had significant implications for other countries via several channels, in particular via exchange rates, but also through other channels (interest rates and capital flows). Multilateral effects seem to have been more important among the BRICS countries themselves than between the BRICS and other, smaller EMEs. The spillovers have also become more important over time, especially for the non-BRICS, as they have been more significant in the aftermath of the global financial crisis than before the crisis. These results are robust to various specifications of our models.

The paper is organized as follows: in the next section, we provide an overview of the relevant literature, focusing in particular on the most recent studies. Section 3 explains how we measure changes in capital flow policies (i.e. capital control actions or CCAs) and Section 4 discusses our dataset and empirical methodology. Section 5 describes recent trends in measures to manage capital flows. Section 6 presents the results for domestic effects of capital controls, while Section 7 deals with multilateral effects. Section 8 presents robustness checks and Section 9 concludes.

2. What does the literature tell us?

While the empirical literature on the effectiveness of capital flow measures has grown strongly during the past decade, the effectiveness of these measures remains subject to debate and the circumstances under which they may have an impact are still not fully understood. One oft-stated policy objective for taking capital control actions is to stabilize net capital flows or to shift the composition of foreign inflows towards longer maturity flows. 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 also 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).

Capital flow measures can not only be used to influence the volume or composition of capital flows, but they may also be aimed at limiting exchange rate movements or preventing the loss of monetary policy autonomy associated with large capital flows. In this regard as well, the empirical evidence on the effectiveness of capital controls is mixed, with Klein and Shambaugh (2013) finding that with pegged exchange rates, capital controls provide greater monetary autonomy only when they are long standing and extensive, while Miniane and Rogers (2007) finding 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., forthcoming; Jinjarak et al., 2013), with perhaps the exception of Chile in the 1990s (Edwards and Rigobon, 2009).

The reasons for these mixed results are likely to be associated with a number of challenges facing the literature in estimating impact of controls, which we briefly mentioned in the introduction. One of these challenges is data-related. Most existing cross-country studies use

crude measures of the level of de-jure restrictions which do not capture well the policy actions or their timing. Measuring the effectiveness is also complicated by the fact that capital controls may be part of a broader package of policies and it may therefore be difficult to disentangle the impact of these measures from the effects of other policies. In addition, most cross-country studies take a partial approach and focus on analyzing the impact on capital flows or one of the other policy targets (such as the exchange rate or the interest differential vis-à-vis other countries), while neglecting the potential interrelationships between these targets via the monetary policy trilemma (an exception is Klein and Shambaugh, 2013). Moreover, the effects of capital control policies may differ across countries and over time, depending on global and country-specific economic circumstances. Differences in effectiveness across countries will depend on policy implementation, which, in turn, are likely to be associated with institutional quality. Finally, attempts to measure effectiveness suffer from an endogeneity problem as capital control policies may respond to changes in the target variables they are aimed at. Aizenman and Pasricha (2013), for example, find that policymakers in EMEs in the 2000s adjusted capital controls in response to changes in net capital inflows. As discussed in the previous section, our paper addresses several of these issues.

To isolate the macroeconomic impact of changes in capital controls, we first need to understand the main drivers of capital flows in order to control for these variables in the regressions. The literature on capital flows usually distinguishes between push (common or global) factors and pull (country-specific) factors. Both types of factors will need to be included in any model explaining capital flows, but there is evidence that during the 2000s global factors played an increasingly important role relative to country-specific factors (Broto et al., 2011). Fratzscher (2012) confirms this finding for portfolio flows during the crisis, while country-specific determinants seem to have become dominant in 2009 and 2010.

The recent policy debate has increasingly focused on the role of policy spillovers from other economies, although the empirical evidence is still relatively limited. Externalities may arise from monetary policies in advanced economies in recent years, which may have added to the size of capital flows in EMEs. Fratzscher et al. (2013) find that Fed policies functioned in a pro-cyclical manner for capital flows to EMEs, triggering a portfolio rebalancing across countries out of EMEs into US equity and bond funds under QE1 and in the opposite direction under QE2. In addition, the IMF (2011b) finds that economies with a direct financial exposure to

the US experience an additional decline in their net capital inflows following a US monetary tightening, illustrating the importance of accounting for the impact of monetary policy conditions in advanced economies when explaining capital flows in the 2000s. Our regressions therefore include a wide range of potential determinants of capital flows, including indicators that capture monetary policy conditions in the US.

Policy spillovers may also arise from EME policies. Policy spillovers from EME capital control actions are often referred to as multilateral effects of capital controls. Looking at the case of Brazil in the period 2006-2011, Forbes et al. (2012) find that when Brazil tightens its capital controls, investors increase their portfolio allocations to other countries. Bernie and Friedrich (2014) find that spillovers of capital controls and other measures applied through the financial sector have some international spillovers for banking flows, but the economic size of these spillovers is small for most countries. The literature on multilateral effects is scant and our paper adds to the debate by providing evidence of policy spillovers from the policies of the 5 largest EMEs, to each other and to other emerging economies, both before and after the global financial crisis.

In addition to capital controls, countries have used prudential tools to address capital inflow surges. Prudential tools are applied to the financial sector and are typically used by micro-prudential regulators to mitigate risk in individual banks' balance sheets.[2] There is evidence that foreign currency-based prudential tools may be effective in restraining the riskiness of credit booms. Looking at EMEs during the period 1995-2008, Qureshi et al. (2011) find that foreign currency-related measures are associated with a lower proportion of foreign currency lending in total domestic bank credit and a lower proportion of portfolio debt in total external liabilities. Forbes et al. (2013) confirm that prudential tools can significantly reduce some measures of financial fragility, although they do not seem to affect other key target variables (such as capital flows, exchange rates, etc.).

[2] A distinction needs to be made here between macro-prudential measures and prudential tools. Macro-prudential measures refer to all measures taken to mitigate systemic risk and the pro-cyclicality of finance (BIS-FSB-IMF, 2011). Prudential tools, for example loan-to-value ratios, when applied counter-cyclically, form part of the macro-prudential regulators' toolkit.

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, tax on non-residents' investments in domestic securities that does not apply to residents' investments in the same securities is a capital control. In addition to these, emerging market economies often also have 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.[3,4] 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 have 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 measure 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.[5] 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.

[3] 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.

[4] 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.

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

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. forthcoming). 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 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. Different papers have used different approaches, of varying sophistication, 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. (forthcoming), in increasing degrees of refinement, and necessarily involves using judgment. 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.[6] 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.[7]

Pandey et al. (forthcoming) go further in this direction by counting separately every regulatory tool 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 does not easily permit comparing changes across different countries with different regulatory structures and regimes, nor to 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).[8] A limitation of this approach, however, is that the effective tax rate can only be computed for certain kinds of policy actions (e.g.

[6] In this paper, we also exclude "minor changes". For further details on the data, including a full list of the asset classes, please see Appendix A.

[7] Price-based changes are those that seek to restrict or influence the price of transactions, 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.

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

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 the database, while the price-based measures 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 38% of all the measures in Latin America 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. 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. Weighing the changes thus allows us to control for how important each change was.

The international investment position data are 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. We then sum the weighted CCAs in each quarter for each country, based on the economic classifications discussed in the next two sub-sections.

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.[9] We focus on controls on capital transactions only, that is, we exclude 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 18 major EMEs between January 2001 and December 2011. It contains 748 CCAs at a daily frequency, which after weighing, sum to 186 CCAs.[10] 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.[11]

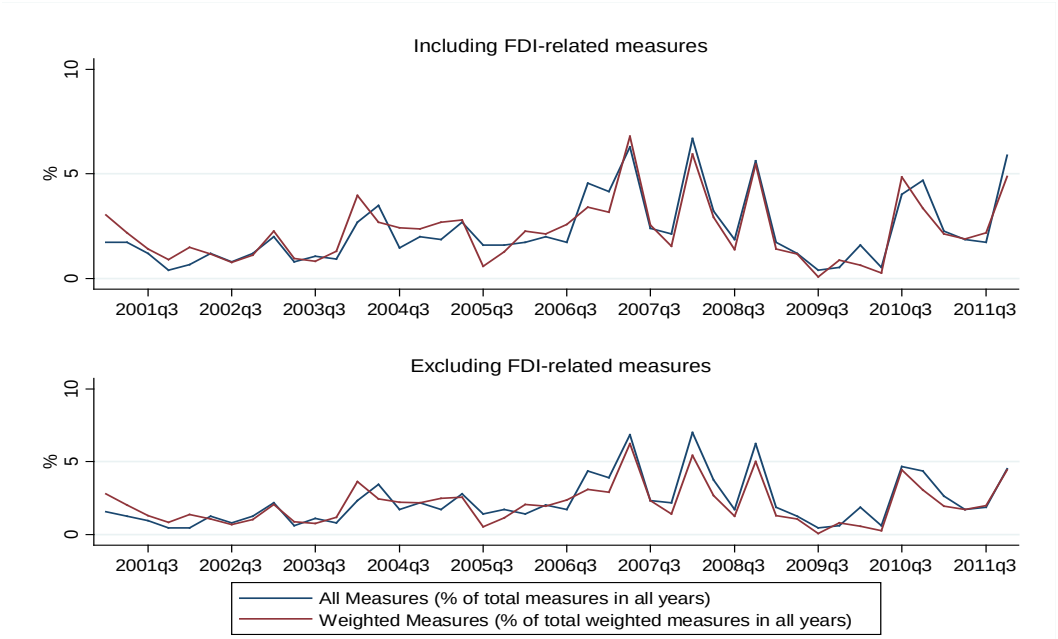
[9] Roughly 25% of the CCAs in the final dataset are from non-AREAER sources (the proportion in the initial dataset – i.e. before dropping small changes and other revisions – was higher). Even for the CCAs that were in AREAER, several corrections were made to the AREAER dates and other information by cross-verifying information from regulators' websites. Further information on the dataset is provided in Appendix A.

[10] These numbers exclude the observations for Argentina and Turkey prior to 2004Q1 and for Russia prior to 2002Q1. We drop these country-quarter pairs to account for their crises, during which several major changes were introduced along with other crisis-related measures, particularly in Argentina.

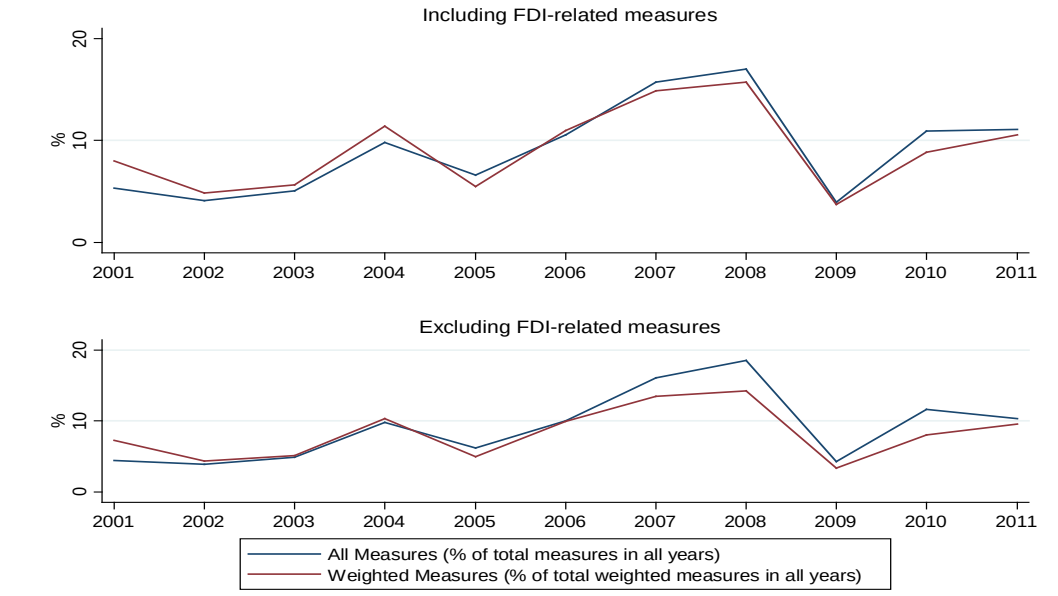
[11] Note that some of the measures in the database are partial or full reversals of earlier measures. Brazil's tax on inflows, for example, was tightened and eased several times in the time period covered in our database.

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

(a) Quarterly Frequency



(b) Annual Frequency



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

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 inflow and outflow controls. Central bank circulars/notifications do not provide this classification. 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 (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.[12] 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. These are often, but not always, 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.[13] 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 residents nor those in domestic currency between non-residents.[14] Therefore,

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

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

[14] Foreign currency transactions are only included in the balance of payments statistics when they involve one resident and one non-resident entity. See IMF (2009) Sixth Edition of the IMF's Balance of Payments and International Investment Position Manual (BPM6).

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 748 un–weighted changes, 105 are currency-based measures out of which 60 were classified as purely inflow- or outflow-related (as above). Another 65 measures are classified as capital controls, but are not specific to inflow or outflows (most of these relate to domestic trading of currency derivatives). This left 110 policy changes that could not be classified as either pertaining to inflows or to outflows and are therefore not included in our analysis.[15]

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.[16] 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.

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

[15] All results in this paper are robust to including these measures. As the inflow/outflow categorization of these measures is not clear, in robustness checks, we include them on both the inflow and the outflow side.
[16] The effective date differs from the announcement date for 16% of the CCAs.

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 in VARs:

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 longer term considerations about the openness of the economy rather than shorter 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. Data and empirical strategy

Capital control policies may have an impact on a range of variables, as well as be driven by these variables, so we estimate a system of equations for capital control actions, capital flows, (covered) interest rate differentials and exchange rates, treatingall these variables as endogenous. These variables are interdependent according tothe 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. 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 fixing the exchange rate while retaining monetary policy

autonomy (measured by ability to sustain a covered interest differential with the rest of the world).

4.1 Country selection and sample period

The countries in the database include the 21 emerging markets 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, 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 due to data constraints related to data on capital control changes. We therefore have 18 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.

4.2 Baseline model I: Effectiveness of domestic capital control changes

Our baseline model is a panel VAR (PVAR) in which all variables of interest are treated as endogenous, while controlling for a number of exogenous push factors.[17] 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, the absolute value of the covered short-term (three-month) interbank interest rate differential and a capital flow variable. We use the absolute

[17] For more details on the PVAR methodology, see Canova and Ciccarelli (2013).

value of the interest rate differential, as the extent to which the domestic interest rate deviates from the foreign interest rate (irrespective of its direction) can be considered as an indicator of monetary policy autonomy. In a fully open and efficient market, the covered interest differential would be zero. The ability to maintain a differential serves as a proxy for the ability to maintain a difference between desired and actual capital flows and therefore to set domestic interest rate independent of the foreign rate (with positive differentials indicating domestic interest rate higher than foreign rate, and vice versa). In addition, we include a set of exogenous variables to control for various push factors (explained below). 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.[18] We estimate the baseline model using OLS, which provides consistent estimates in a transformed panel model with homogenous dynamics (Canova, 2007).[19]

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. The absolute value of the covered short-term interest rate differential is in percentage points and the capital flow variables are expressed as a percentage of GDP. We initially focus on net capital inflows, but we 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.[20]

[18] 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).

[19] 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 are all stationary in all tests as defined (world GDP growth, US inflation and change in S&P index). The endogenous variables are also stationary by a majority of the four tests in almost all countries (at 15% level of significance). The exception is the (absolute) covered interest differential series for which unit roots cannot be rejected in four countries (China, Korea, Malaysia and Turkey) by a majority of the tests even at 15% level of significance. However, in the presence of capital controls and/or transaction costs, covered interest rate differentials may follow a SETAR process (Pasricha, 2010) and the ADF tests have been shown to have low power to distinguish a unit root from a non-linear process (Perna and Sibillo, 2014).

[20] 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.

The **exogenous variables** we include in our baseline model 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.[21] As a robustness check, we also include other proxies for global monetary policy conditions, such as global liquidity growth (measured as the percentage change in global M2/GDP) and the change in the size of the FED's balance sheet, but those changes do not significantly affect the results (see Section 8 on robustness checks). Finally, we include a dummy for the global financial crisis.[22, 23]

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 PVAR 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 covered interest rate differential; 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 (covered interest differential and exchange rate) which are ordered at the end.

[21] We regress potential explanatory variables on our policy target variables (capital flows, covered interest differentials, 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 were normalized and outliers were removed (results are available from the authors upon request). The chosen exogenous variables were significant in most regressions for most of the endogenous variables.

[22] 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.

[23] Appendix B reports descriptive statistics of our endogenous and exogenous variables.

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 own effects. In order for capital control actions to be considered effective, we expect that measures that tighten inflows will increase monetary policy autonomy, i.e. implying an increase in the absolute value of the covered interest rate differential, 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. Both inflow tightening and outflow easing measures are likely to affect net capital inflows and the exchange rate in the same direction, i.e. they would lower net inflows and weaken the exchange rate. Although we do not focus in our results on the other shocks in 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 absolute covered interest rate differential, 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 own country responses (baseline model of domestic capital controls)

Shock to ⇨ / Impact on	Net Inflow Tightening	Net Outflow Easing	NKI	Absolute CID	Exchange rate
Net Inflow Tightening		0	+	+/-	-
Net Outflow Easing	0		+	+/-	-
Net Capital Inflows (NKI)	-	-		+/-	+/-
Absolute Covered Interest differential (CID)	+	-	-		+/-
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.

4.3 Baseline model II: Multilateral effects of capital control changes

Our second purpose is to assess the strength of multilateral effects, which we do in a modified version of the baseline model. We first construct a dummy variable that captures multilateral 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 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 multilateral variable to our panel near-VAR for the full sample and in country-specific near-VARs.

We model the impact of multilateral effects 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.[24] 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 in the PVAR: 1) capital flows; 2) the (absolute) covered interest rate differential; 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

[24] Near-VAR models have been employed for example by Agenor et al. (1997) and Agenor and Hoffmaister (1998).

error terms are assumed to be correlated across the equations.[25] 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.[26]

Table 2 provides an overview of the expected signs in our baseline model for multilateral effects. If multilateral effects are present, then we expect that both inflow tightening and outflow easing measures in the BRICS would increase net capital inflows elsewhere and lead to an appreciation of other countries' currencies. The impact of capital control measures on the absolute value of the covered interest rate differential depends on whether the initial differential is positive or negative. The covered interest rate differential can be expressed as $(1 + i) - \frac{F}{S}(1 + i^*)$, where i is the domestic interest rate, F and S are forward and spot exchange rates expressed in domestic currency units per unit of the foreign currency and $i^*$the foreign interest rate (of the same maturity as the forward rate). More capital inflows to the home country through covered arbitrage would lead to a decline in S (appreciation of the domestic currency) and an increase in F (expected depreciation of the currency), as the domestic currency is bought spot and sold forward. Over time, increased capital inflows would also lead to a decline in i. These movements together would lower the covered interest rate differential. If the initial differential is positive, this would imply a smaller absolute differential. However, if the initial differential is negative, higher capital inflows would increase the absolute size of the differential. A priori, the impact on the interest differential is thus unclear and we do not interpret the results for the interest rate differential in our models for multilateral effects.[27] Shocks to net capital inflows, the covered interest rate differential 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.

[25] The SUR model was first proposed by Zellner (1962).
[26] For more details on the Gibbs sampler, see Koop (2003) and Doan (2009).
[27] This ambiguity in the impact on the interest rate differential could be addressed by using a regime-switching model. We used a threshold-panel VAR, in which we define high and low net capital inflow regimes based on whether NKI is positive or negative during the preceding quarters (we used the past two, three and four quarters), but we did not find robust results.

Table 2: Expected sign of responses (baseline model of multilateral capital controls)

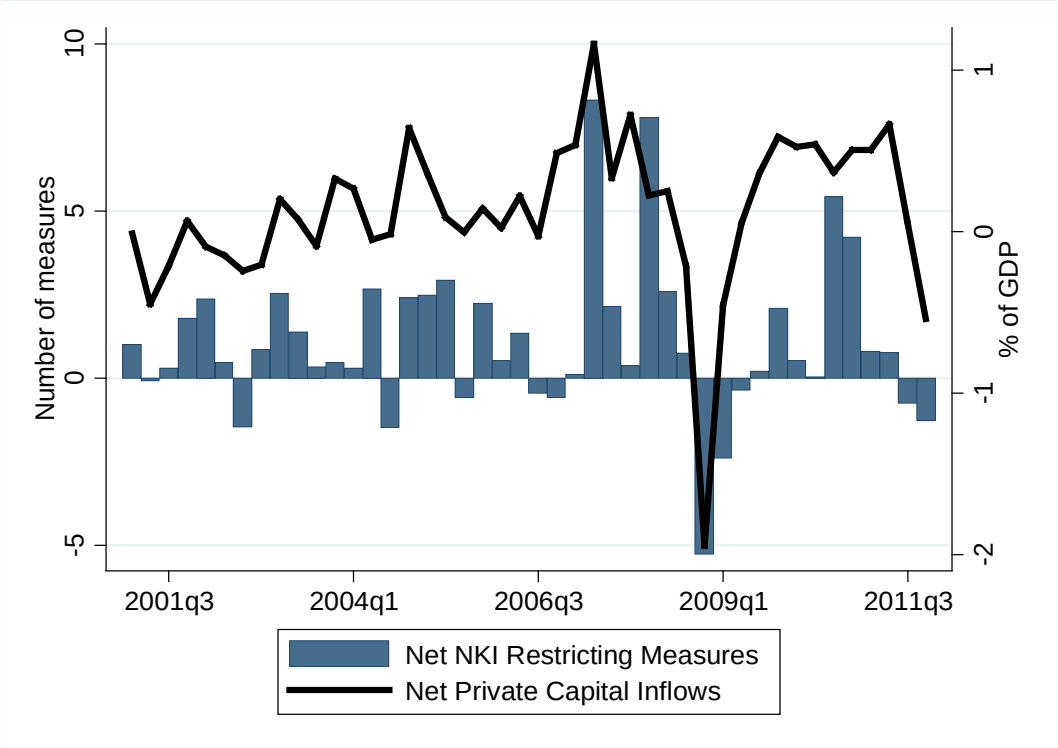
Shock to ⇨ / Impact on	Foreign Net Inflow Tightening	Foreign Net Outflow Easing	NKI	Absolute CID	Exchange rate
Foreign Net Inflow Tightening		0	0	0	0
Foreign Net Outflow Easing	0		0	0	0
NKI	+	+		+/-	+/-
Absolute CID	+/-	+/-	+/-		+/-
Spot exchange rate	-	-	-	+/-	

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

5. 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. Some of the graphs are at annual frequency as the trends can be more easily seen in annual data. Capital control policies 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, reflecting a divergence in economic growth between EMEs and advanced economies.

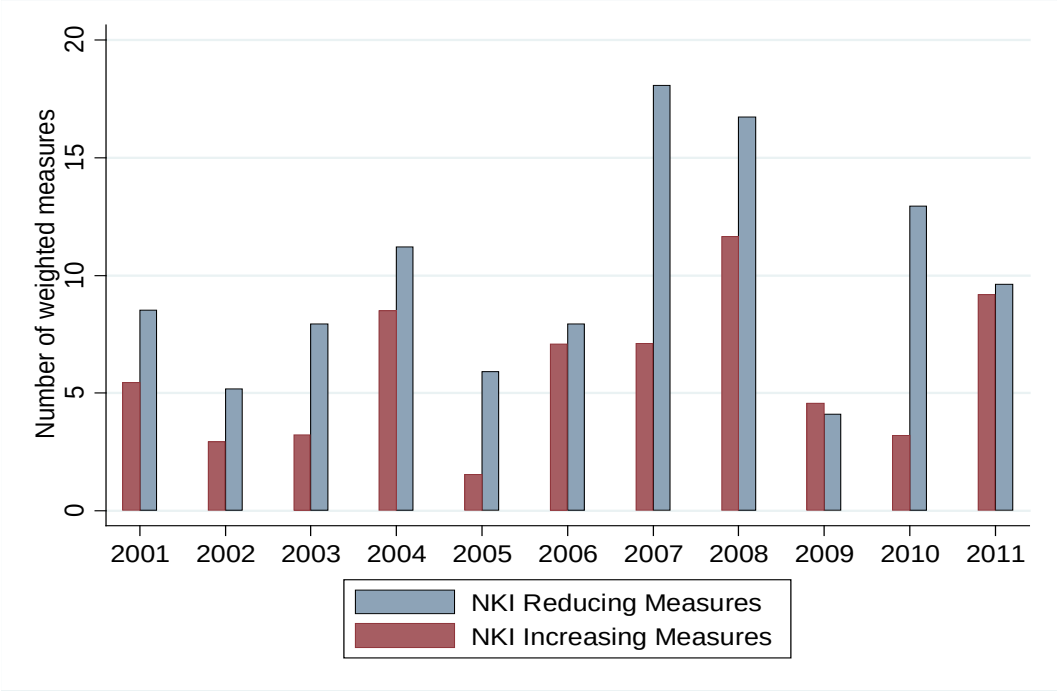
Figure 2: Net NKI Restriction Measures Peaked in 2007 and 2010



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 both NKI reducing and NKI increasing measures in each year (Figure 3). Both the period from 2007Q1 to 2008Q2 as well as 2010 were episodes of net capital inflow surges to EMEs. A key difference between these two periods was that in 2010, contrary to 2007–08, the rise in NKI reducing measures was not accompanied by a resumption of NKI increasing measures. During the 2007–08 increase in capital inflows to EMEs, these countries liberalized their capital accounts whereas they also took measures to restrict certain types of inflows and outflows at the same time. In 2010, however, EMEs seemed to be becoming more closed on the capital account on the whole as capital inflows into their economies picked up strongly. This changed again in 2011, when capital control policies in EMEs became more focused on attracting capital flows as inflows declined and outflows picked up further.

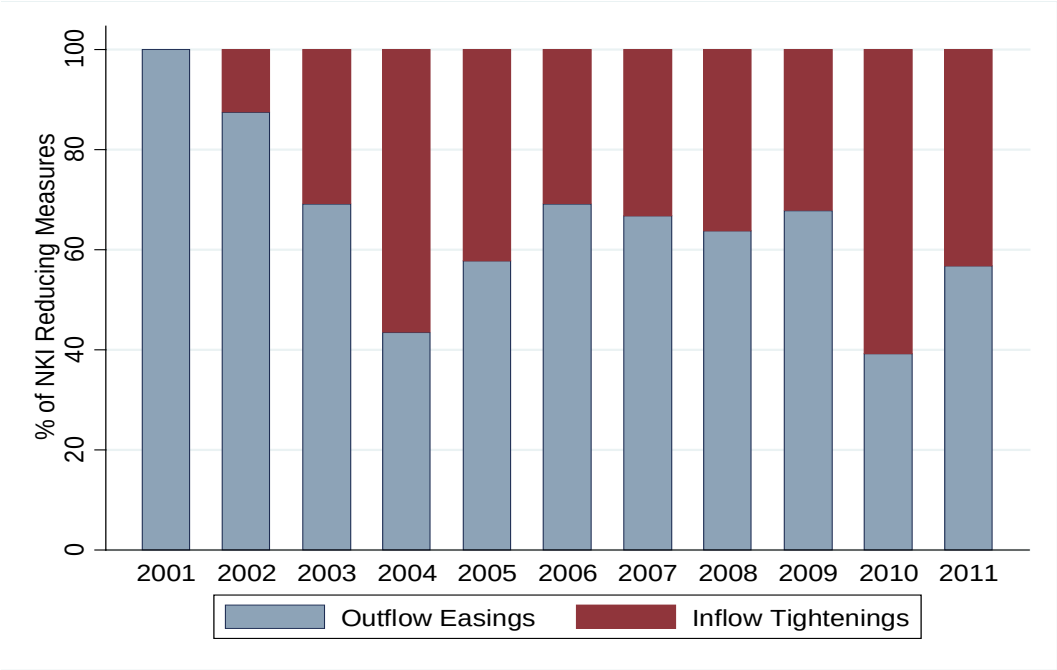
Figure 3: EMEs introduce both NKI reducing and NKI increase measures in each year



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.

Looking at the composition of NKI reducing measures, the relative importance of inflow tightening measures seems to have increased since the start of the global financial crisis (Figure 4). Before the crisis, the number of outflow easing measures consistently exceeded the number of inflow tightening measures, but this pattern has been reversed during the past years. Even during 2007-08, when net capital inflows to EMEs and the number of NKI reducing measures peaked, inflow tightening measures represented less than 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 benefits of such measures by the IMF (IMF, 2011a).

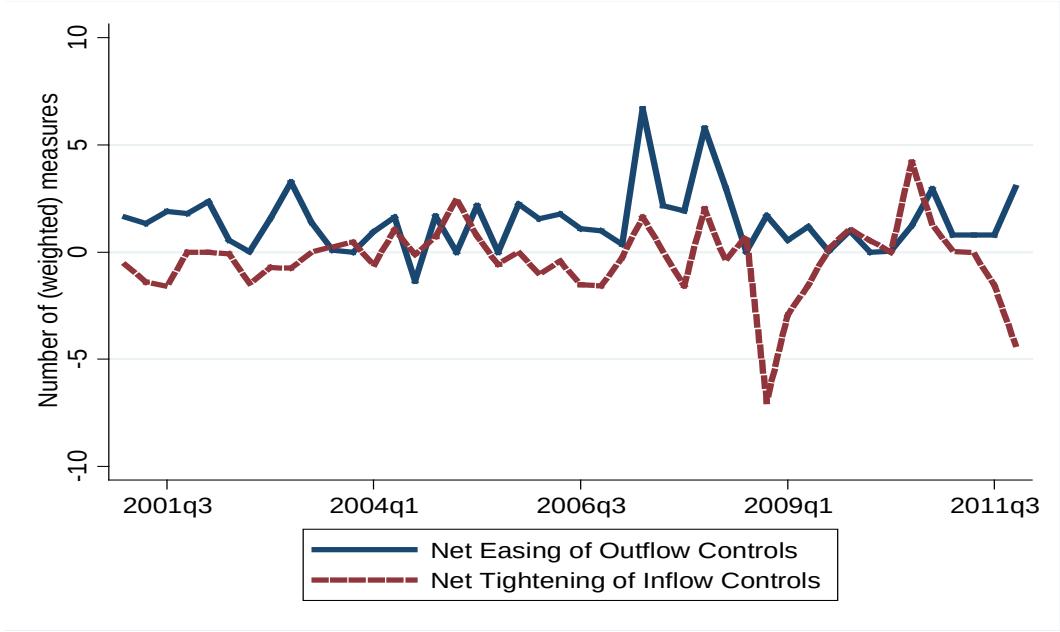
Figure 4: Prior to 2009, NKI reducing measures consisted primarily of outflow easings. Since 2009, inflow tightening measures have become relatively more important.



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

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 5). 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 5: 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.

6. Results: Effectiveness of capital controls

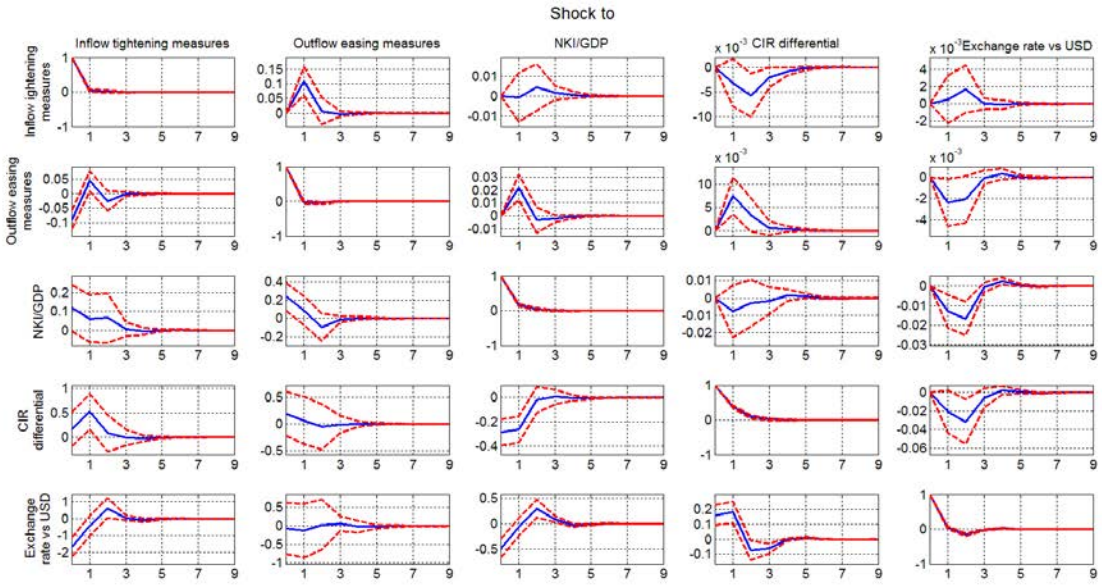
The previous section showed that many EMEs have pursued active capital control policies during the past decade. In this section we investigate the effectiveness of those measures. The main conclusion is that we find no meaningful evidence of effectiveness of capital control measures. Figure 6 shows impulse responses using our baseline model for net capital inflows (NKI) based on the full sample. 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 (i.e. the change in the ratio of capital flows to GDP, percentage points for the interest rate differential and quarter-on-quarter changes in percent for the exchange rate).

On average, changes in capital controls do not seem to have a significant expected impact on most of the variables in the model. Net inflow tightening measures have a significant upward impact on the (absolute) covered interest rate differential after one quarter, suggesting greater monetary policy autonomy, but also have a significant negative impact on the exchange rate (i.e.

an appreciation of the domestic currency). We also examine whether capital control actions have an impact on the composition of flows by investigating whether they affect the share of non-FDI flows in total net capital inflows, but we do not find any evidence that this is the case. Together, these results suggest that net inflow tightening measures are not effective in allowing EMEs to choose a de-facto closed capital account and achieve both higher monetary policy autonomy and a weaker exchange rate. This conclusion is confirmed when looking separately at the periods before and after the global financial crisis (Figures 7 and 8). In the post-crisis period, net inflow tightening measures temporarily led to greater monetary policy autonomy but at the cost of a more appreciated exchange rate. In the pre- crisis period, there was a significant impact on the exchange rate in the desired direction (i.e. a depreciation of the domestic currency), but with lower monetary policy autonomy. All these impacts were temporary and did not last beyond two quarters at most. Inflow tightening measures therefore do not seem to allow countries to choose at the margin a trilemma configuration of a more closed capital account, more monetary policy autonomy and a preferred exchange rate. Net outflow easing measures do not have a significant expected impact on any of the variables in the model, either in the full sample or the pre-or post-crisis periods.

In contrast to Klein and Shambaugh (2013), we do not find a clear difference between countries with walls of capital controls (India and China) than for countries with gates (all others). Looking in more detail at the countries with extensive controls, we find that changes in capital controls in China and India either do not have a significant impact on net capital inflows (China) or the impact is not in the desired direction (India). Although for China there is some evidence that net inflow tightening measures tend to be effective in weakening the exchange rate, they reduce China's monetary policy autonomy at the same time (Figure 9). For India, we find that net inflow tightening measures increase monetary policy autonomy, but at the expense of a stronger exchange rate, while the impact of CCAs on the other variables in our model is insignificant (Figure 10).

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



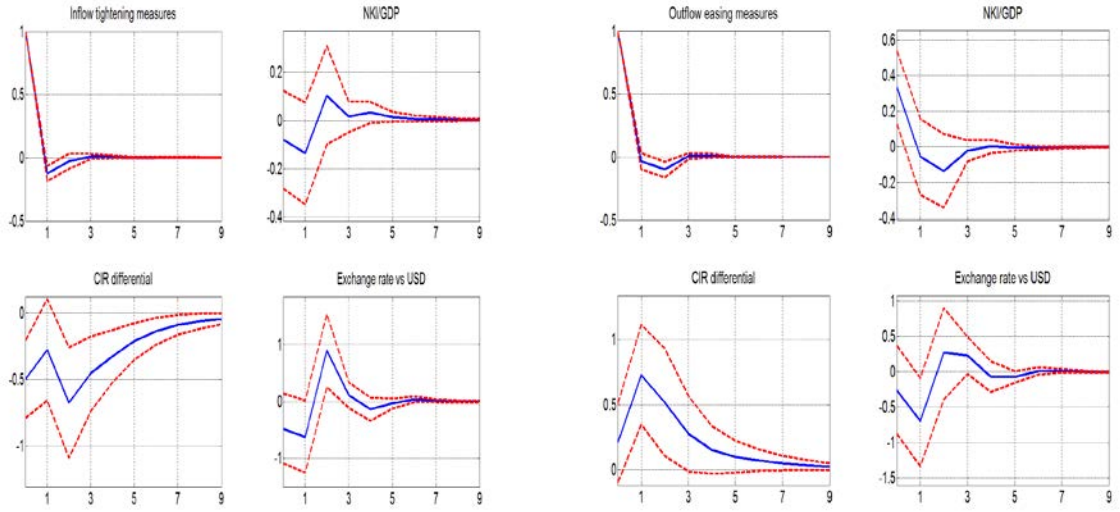
Note: The blue line denotes the median impulse response to a positive shock to the variable at the top of each column. The dotted red lines represent the 16 and 84 percentiles. The impulse responses are normalized to a one unit shock and are expressed in the unit of each respective variable. NKI stands for net capital inflows. The CIR differential is the absolute value of the covered interest rate differential. An increase in the exchange rate chart is a depreciation of the local currency against the USD.

Most of the impulse responses for the other variables that are significant in our baseline model look plausible (Figure 6), suggesting that our model seems to capture the dynamics in the system accurately.[28] For example, a positive shock to net capital inflows has a significant downward impact on the absolute interest rate differential (i.e. it reduces monetary policy autonomy) and it leads to an appreciation of the currency. In the same vein, a positive shock to the exchange rate (i.e. a depreciation of the currency) reduces net capital inflows and the interest rate differential. The model also sheds light on policy-makers' behavior following changes in the economic environment. More specifically, policy-makers seem to respond to developments in net capital inflows and the exchange rate when they decide on net outflow easing measures, but not for net inflow tightening measures. This suggests that policy-makers in EMEs in the 2000s responded by liberalizing outflows to reduce net capital inflows and to curb upward pressure on the currency. The response of inflow tightening measures to an increase in hot NKI is in the expected direction, but is not significant. These results seem consistent with the results in Figure

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

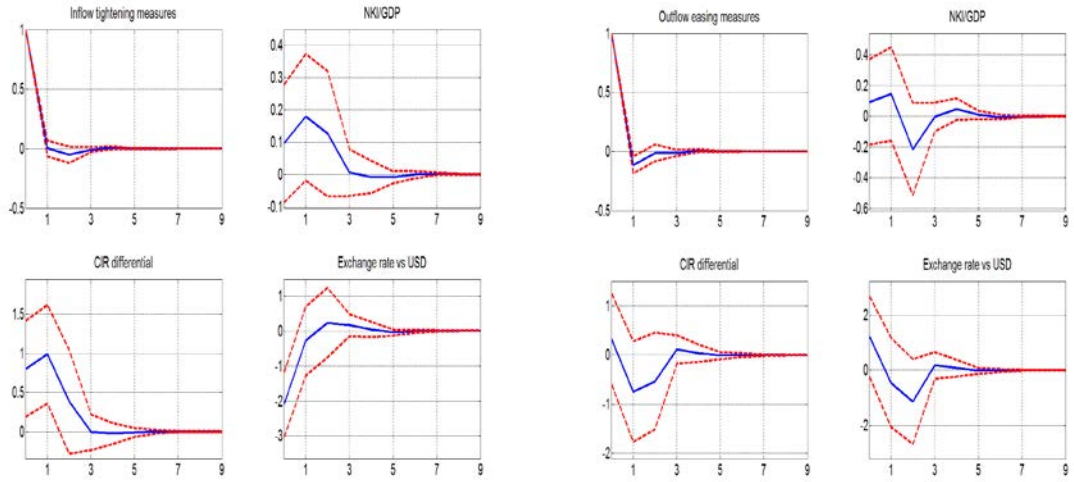
4 in the previous section, which shows that the broad majority of NKI reducing measures were outflow easing measures, except in 2004 and 2010, i.e. outflow liberalization was the instrument of choice for EMEs in responding to NKI pressures.

Figure 7: 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. The CIR differential is the absolute value of the covered interest rate differential. An increase in the exchange rate chart is a depreciation of the local currency against the USD.

Figure 8: 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. NKI stands for net capital inflows. The CIR differential is the absolute value of the covered interest rate differential. An increase in the exchange rate chart is a depreciation of the local currency against the USD.

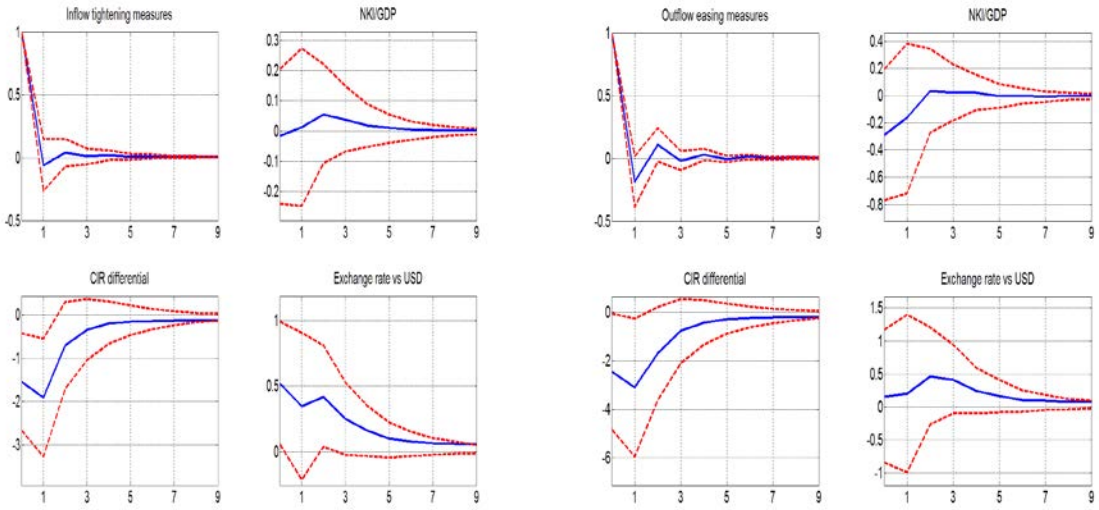
Capital flow measures may have a different impact on inflows and outflows and it is therefore important to analyze their impact on gross flows separately. In addition, whereas net flows are relevant for exchange rate developments, gross flows are important from a financial stability perspective (De Gregorio, 2013). To save space, we present the full results only for the first specification and show these results in the Appendix. For the other models we only show the impact of the shocks to the capital control variables. Figure C1 (in Appendix C) shows impulse responses using our baseline model, now with both gross capital inflows and gross outflows instead of net capital inflows. The findings confirm those for net capital inflows. Tightening inflow measures tend to temporarily increase monetary policy autonomy as the absolute interest rate differential rises, but without stemming the appreciation of exchange rate. Net outflow easing measures do not have a significant impact on gross outflows, the interest rate differential or the exchange rate.

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 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). These results confirm the

above findings for net inflow tightening and net outflow easing measures. Figure C2 (in Appendix C) suggests that NKI reducing measures increase monetary policy autonomy, but they do not have an impact on the exchange rate and do not seem to have the desired impact on the other variables. The latter also applies to NKI increasing measures, which generally have a less significant impact than NKI reducing measures.

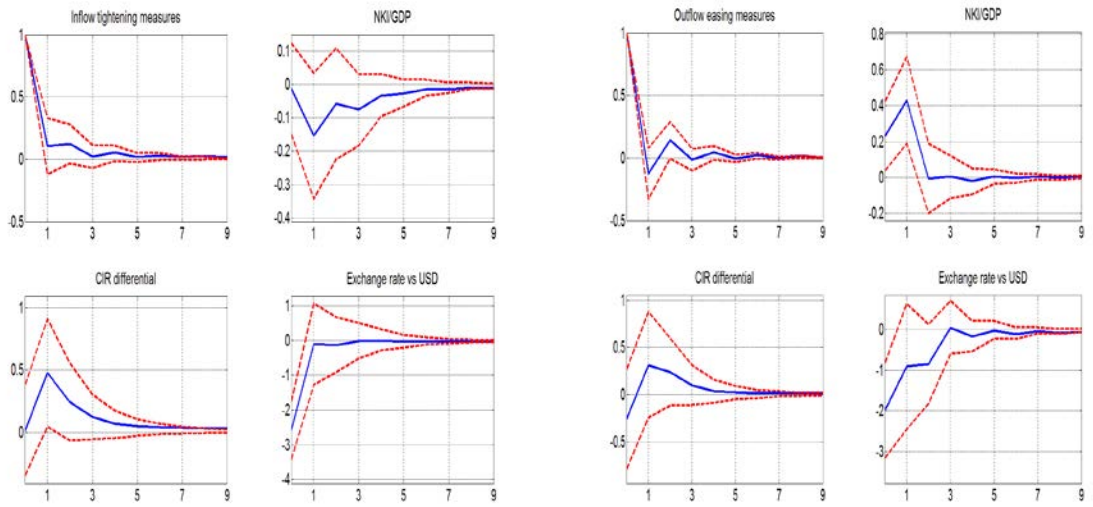
To sum up, we find no meaningful evidence of effectiveness of capital control measures in generating desired policy outcomes or configurations in the trilemma. At the same time, net outflow easing measures, which constituted the majority of NKI reducing measures over this period do not seem to have had a significant impact on average. Net inflow easing measures allow more monetary policy autonomy or a desired movement in the exchange rate but not both, suggesting that they fail to effectively close the capital account.

Figure 9: China – Impulse responses to a shock in capital controls



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. The CIR differential is the absolute value of the covered interest rate differential. An increase in the exchange rate chart is a depreciation of the local currency against the USD. Given the more limited number of observations in these country-specific regressions, these results are based on a VAR model using one lag instead of two.

Figure 10: India – 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. NKI stands for net capital inflows. The CIR differential is the absolute value of the covered interest rate differential. An increase in the exchange rate chart is a depreciation of the local currency against the USD. Given the more limited number of observations in these country-specific regressions, these results are based on a VAR model using one lag instead of two.

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, 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., forthcoming). Further, 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.

However, some caveats surrounding the interpretation of our results 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).

These results should not be interpreted to suggest that specific macro-prudential measures – when they discriminate based on residency (capital controls) or currency (currency-based measures) – would not be effective in mitigating systemic risk. Macro-prudential measures refer to all measures imposed with the objective of limiting systemic risk and mitigating the pro-cyclicality of finance (BIS et al., 2011). Capital controls, on the other hand, are restrictions on international trade in assets and encompass a wide range of measures – including those on firms, households and financial sector. They are not defined with reference to an objective. Capital controls may be used not only with macro-prudential objective but also with exchange rate management, macroeconomic management or fiscal management objectives.

It is difficult to assess the effectiveness of capital controls as macro-prudential tools without adding further information on the objective with which the capital control actions in the dataset were taken. However, some statistics suggest that the many, if not the majority, of measures were used for objectives other than macro-prudential: a majority of NKI reducing measures during the boom periods of 2006Q1 to 2008Q2 were outflow easing measures (that do not address systemic risks from high gross inflows) rather than inflow tightening measures. Further, only about 40% of the measures in our database applied directly to the financial sector and only about 15% of the measures are currency-based. Another factor that limits the interpretation of our analysis as evaluating macro-prudential policy is that we exclude several measures that are often used by micro-prudential regulators and may have been varied in a countercyclically manner (for example, changes in limits on net open positions in foreign currencies), as these measures could not directly be classified as targeting either inflows or outflows. 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, influence the exchange rate while retaining monetary policy independence. It does not ask 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.

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) are 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 took 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.[29] 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 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) could rest with different agencies of the government. This suggests that future research on capital controls would benefit from focussing on the costs and benefits of specific instruments, rather than on capital controls in general (Pandey et al., forthcoming).

7. Results: Multilateral effects

Capital flow measures in EMEs could spill over multilaterally 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 (Ostry et al., 2012). 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.

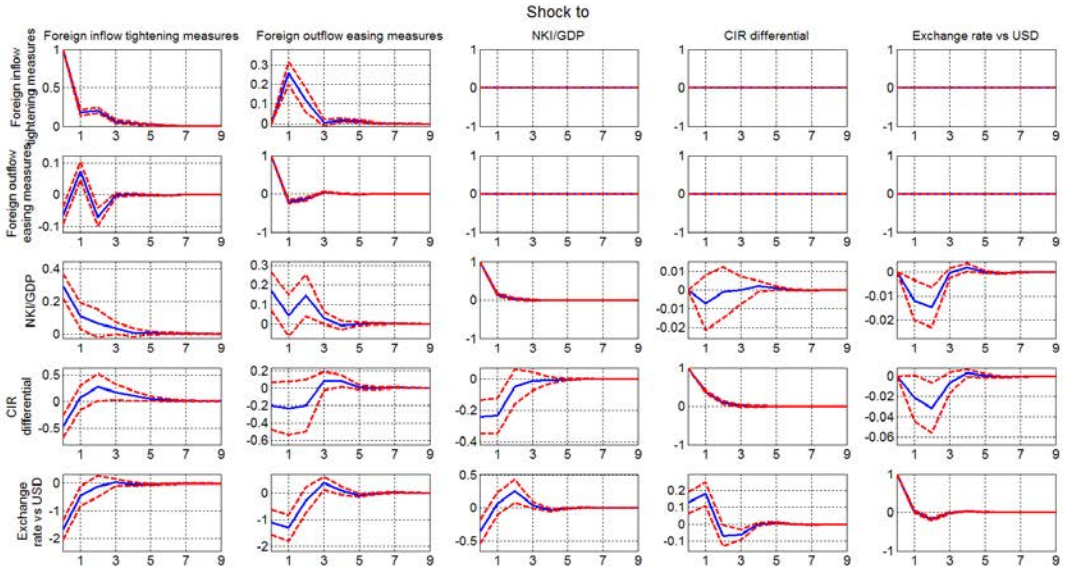
A recent event study analysis by Forbes et al. (2013) suggests that capital flow measures in Brazil spilled over to other countries, but more general empirical evidence of such spillovers remains scant. In this section, we use a near-VAR model to analyze these externalities for CCAs in all BRICS, treating all variables as endogenous except for capital flow policies in other

[29] For more discussion of the direction of policies, including analysis by regions, see Pasricha (2012). Fernandez 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.

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.

Figure 11 shows impulse responses using our model with multilateral effects for net inflow tightening and net outflow easing measures based on the full sample. In this model, multilateral 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. In more detail, net inflow tightening measures in BRICS spill over to other countries by increasing their net capital inflows, reducing their monetary policy autonomy and strengthening the currencies of those countries. Net outflow easing measures in BRICS have the same impact on these variables in other countries, as expected, but there is no spillover via interest rate differentials. Multilateral effects seem to 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 seems to occur somewhat more slowly. While there is an immediate spillover of those measures on net capital flows, there is a significant impact on flows after two quarters and spillovers via the exchange rate tend to peak after one quarter.

Figure 11: Inflow and outflow measures – Multilateral 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, the interest rate differential and the exchange rate do not have an impact on capital control decisions in other countries as the latter are treated as exogenous.

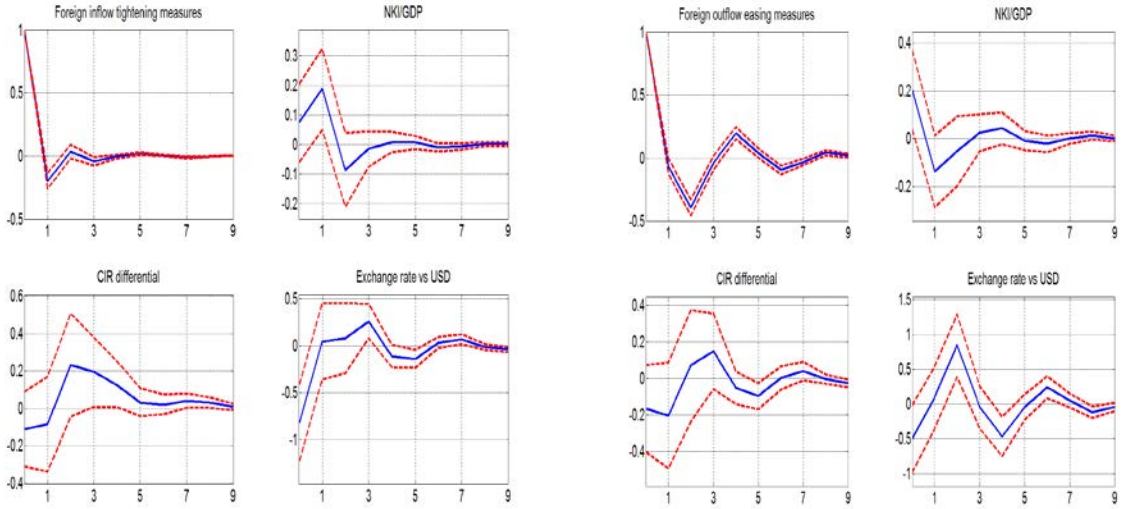
7.1 Pre- vs. post–global financial crisis

Given the increased size and volatility of capital flows to EMEs (IMF, 2011b), the question comes up whether the importance of multilateral effects has increased over time. In order to investigate this, 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 12, which shows the results for the pre-crisis period, shows more mixed results for the significance of multilateral effects than Figure 13, which covers the post-crisis period.

The results in Figure 12 show that, before the crisis, net inflow tightening measures in BRICS had an upward impact on net capital inflows elsewhere and drove up other countries' currencies. Outflow easing measures also had spillover effects, but their significance was less clear and their main impact seems to have been to generate volatility in the different variables.

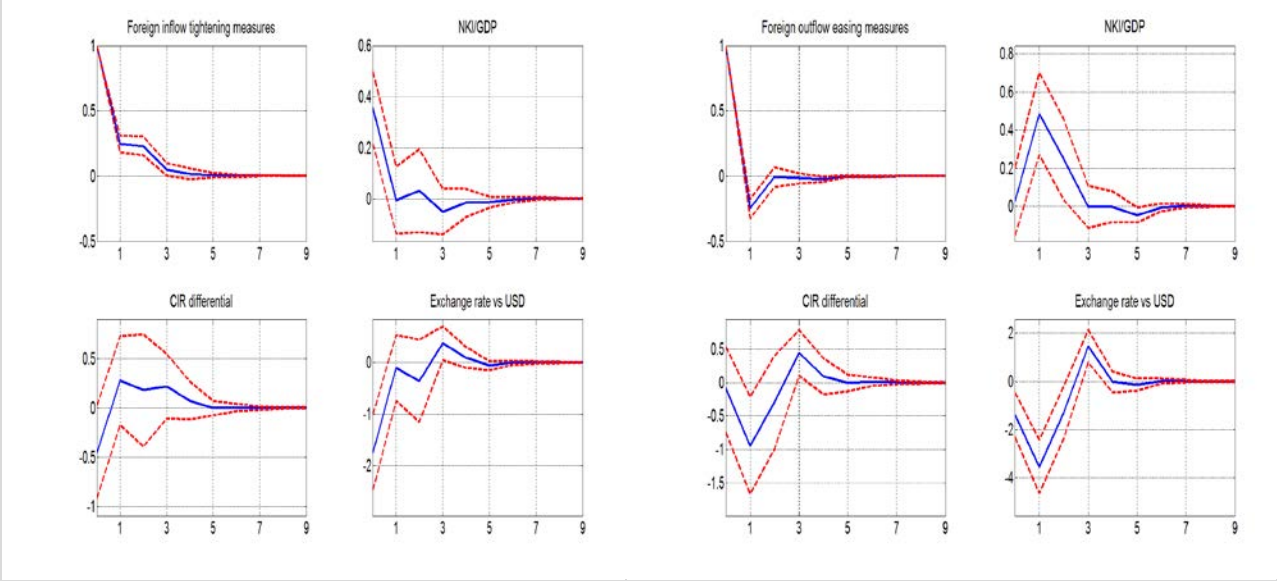
During the post-crisis period (Figure 13), however, spillovers from capital control changes in BRICS seem to have become clearer and stronger as, particularly for exchange rates, the size of the impact of the capital control shock was larger than before the crisis. Moreover, during the post-crisis period outflow easing measures in BRICS also created clearer spillovers to other emerging economies in addition to inflow tightening measures, which were the main source of spillovers before the crisis.

Figure 12: Inflow and outflow measures– Multilateral 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 13: Inflow and outflow measures – Multilateral 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.

7.2 BRICS vs. non–BRICS

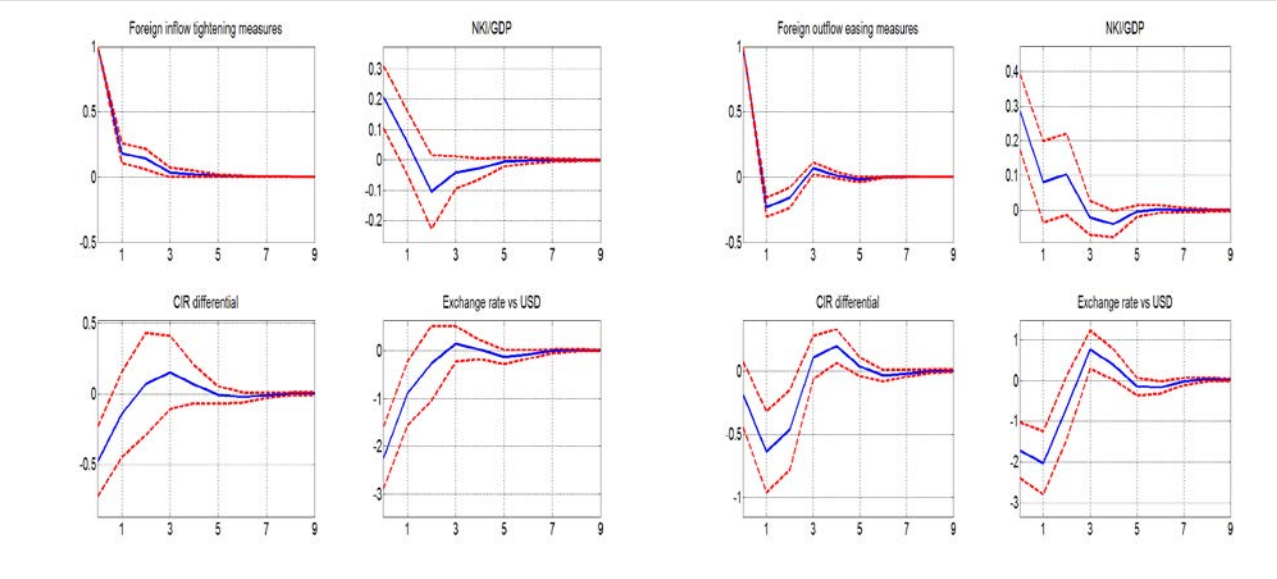
If multilateral effects arise from international investors adjusting their portfolio allocation across EMEs in response to capital control measures in one of them, it is more likely that these spillovers are present in large EMEs that are typically targeted by international investors. This seems indeed to be the case in the sense that multilateral effects have been more prevalent across BRICS countries than between BRICS and other, smaller, emerging market economies.

The multilateral effects across the five BRICS countries shown in Figure 14 are more significant than the impact of changes in capital controls in the BRICS on non-BRICS countries in Figure 15. For the BRICS, spillovers of both inflow tightening and outflow easing measures take place via net capital flows and exchange rates. These spillovers are significant and quick (they tend to occur within the same quarter or after one quarter at the latest). For the non-BRICS, inflow tightening measures in BRICS generate spillovers, but outflow easing measures in BRICS do not (in contrast to spillovers among BRICS). In addition, the size of the exchange rate impact among the BRICS is larger than for spillovers to non-BRICS, although the spillovers via net

capital inflows are somewhat larger for the non-BRICS. More specifically, a one unit shock to net inflow tightening measures in BRICS leads to a currency appreciation of approximately 2% among the other BRICS, while the impact of the same shock on the currencies of non-BRICS is smaller at around 1%. Moreover, a one unit shock to net easing outflow measures by BRICS leads to a 2% appreciation of the other BRICS currencies, whereas the impact of the same shock on the non-BRICS currencies is barely significant and substantially smaller at around 0.5%. Net easing outflow measures in BRICS also push up net capital inflows in other BRICS in the same quarter, whereas the impact on the non-BRICS is slower and less significant. Spillovers among the BRICS thus differ from those to the non-BRICS in two ways: First, among the BRICS both inflow and outflow measures generate spillovers, while for the non-BRICS this applies only to inflow measures. Second, the spillovers via exchange rates are larger for the BRICS than for the non-BRICS.

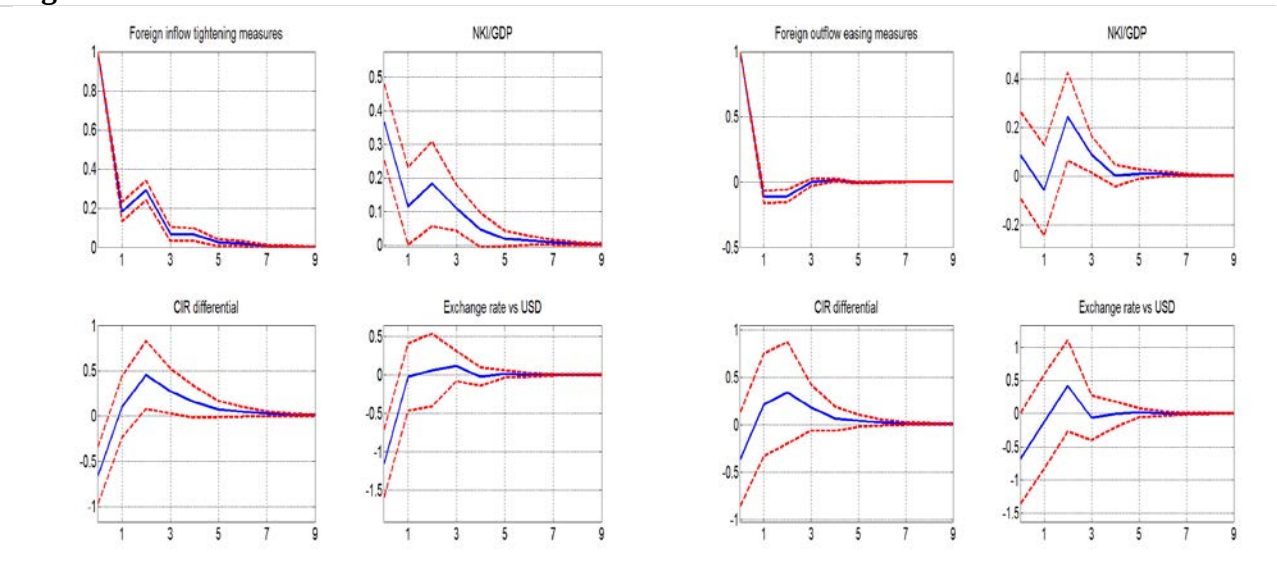
Splitting up the sample into a pre- and post-crisis periods shows that the nature of multilateral effects changed in both groups in different ways. While among the BRICS inflow tightening measures generated spillovers before the crisis via exchange rates, after the crisis these measures had an impact via capital flows instead exchange rates. Moreover, in addition to net inflow tightening measures, after the crisis also outflow easing measures generated more spillovers among the BRICS (via all channels in our model). For non-BRICS countries multilateral effects in general became more important after the crisis compared with the years before. In more detail, after the crisis both inflow tightening and outflow easing measures in BRICS had spillovers to non-BRICS via net capital flows and exchange rates, while before the crisis only inflow tightening measures in BRICS had an upward impact on net capital flows in the non-BRICS. This analysis thus confirms that multilateral effects became more prevalent during and after the global financial crisis compared with the years before the crisis.

Figure 14: Inflow and outflow measures – Multilateral effects among BRICS



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 15: Inflow and outflow measures – Multilateral effects on non-BRICS



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 Country–specific results

Our analysis for individual countries using country-specific near-VARs confirms that capital flow policies can have significant cross-border spillovers. More detailed results for regional sub-samples (full model results for Asia and Latin America) are broadly in line with the above picture for the full sample (see Appendix C, Figures C3-C4). However, the economic impact of Brazilian inflow tightening measures on hot net capital inflows and the spot 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.

Table 3, based on Figures C5 to C16 in Appendix C, summarizes our results for the individual countries in the sample for which we have sufficient data. Summarizing the results for all countries, the following points are noteworthy. First, we find significant spillovers in all countries in the sample. Second, net inflow tightening measures more often have a significant impact on other countries than net outflow easing measures. Third, spillovers of capital flow measures occur mostly via exchange rates and less frequently via interest rate differentials or net capital inflows, although spillovers via the latter channels can also be significant. Finally, India stands out as the most insulated of the BRICS with no significant multilateral effects of other countries' capital control changes, whereas Russia and South Africa stand out as the most integrated (or vulnerable) of the BRICS with significant spillovers from other BRICS' actions. China and Brazil are ranked in the middle. According to our baseline model, the other countries with strong spillovers (i.e. the largest number of significant impacts) are Mexico, the Philippines and Malaysia.

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

	NKI/GDP		CIR differential		Exchange rate	
	Net inflow tightening	Net outflow easing	Net inflow tightening	Net outflow easing	Net inflow tightening	Net outflow easing
BRA	N	Y	N	Y	Y	Y
CHL	Y	N	N	N	Y	N
CHN	Y	N	N	Y	Y	Y
IDN	N	N	N	N	N	N
IND	N	(N)	N	N	N	(N)
MEX	(Y)	(Y)	Y	N	Y	Y
MYS	N	N	Y	(Y)	(Y)	(Y)
PER	N	N	Y	N	(N)	N
PHL	Y	N	Y	Y	Y	Y
RUS	Y	Y	Y	Y	Y	Y
THA	N	N	(Y)	N	Y	N
ZAF	Y	Y	(Y)	Y	Y	Y

This table summarizes the results of Appendix C, Figures C5-C16, showing the significance of multilateral 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.

To conclude, our evidence suggests that multilateral 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. The spillovers from BRICS to each other were significant in both pre- and post-global financial crisis periods, but the spillovers from BRICS to non-BRICS became more significant in the post-global financial crisis period. Capital control actions in BRICS seem to have an impact on other countries through a variety of channels, including in particular via exchange rates, although other channels (net capital inflows and interest rate differentials) were also relevant. The impact of changes in foreign capital controls is thus larger than for those stemming from changes in domestic controls. A possible explanation for this finding is that policy-makers in EMEs tend to tighten capital controls in response to surges in net capital inflows or upward pressure on their currencies, i.e. in situations in which the effectiveness of such measures may be weaker. Changes to capital controls in other countries, by contrast, are more exogenous and their effects are thus less likely to be undermined, for example, by positive shift in investor preference towards the country that is affected.

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 (MPA) using the Aizenman, Chinn, Ito index of Monetary Policy Autonomy (Aizenman et al., 2008), 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. a single variable for capital flow measures instead of two (i.e. net restricting measures instead of NKI increasing and NKI reducing measures together and the inclusion of domestic real GDP growth) and other modifications listed in Table 4.

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 strong evidence of multilateral effects. For multilateral effects, these 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).

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 notable impact on the impulse responses.

Table 4: List of Robustness Checks

Domestic effects		**Multilateral effects**	
Model	Specification	Model	Specification
PVAR	Net restricting NKI measures, NKI, absolute CID, exchange rate	Near-PVAR	Foreign NKI reducing and foreign NKI increasing measures, NKI, absolute CID, exchange rate
PVAR	NKI reducing and NKI Increasing measures, NKI, absolute CID, exchange rate	Near-PVAR	Foreign net tightening in and foreign net easing out measures, gross inflows, absolute CID, exchange rate
PVAR	BRICS only	Near-PVAR	Foreign Net restricting, domestic net restricting, NKI, absolute CID, exchange rate
PVAR	MPA instead of absolute CID	Near-PVAR	MPA instead of absolute CID
PVAR	Drop absolute CID	Near-PVAR	Drop absolute CID
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 CID and exchange rate	Near-PVAR	Reverse order CID 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	Demeaning of endogenous variables, except capital controls		
TPVAR	High NKI regime - net tightening in and hot net easing out measures, NKI, absolute CID, exchange rate	Near-TPVAR	High NKI regime - Foreign net tightening in and foreign hot net easing out measures, NKI, absolute CID, exchange rate
TPVAR	Low NKI regime - net tightening in and hot net easing out measures, NKI, absolute CID, exchange rate	Near-TPVAR	Low NKI regime - Foreign net tightening in and foreign hot net easing out measures, NKI, absolute CID, 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, absolute CID, exchange rate	Near-TPVAR	High NKI regime - Foreign NKI reducing and foreign NKI increasing measures, NKI, absolute CID, exchange rate
TPVAR	Low NKI regime - NKI reducing and hot NKI increasing measures, NKI, absolute CID, exchange rate	Near-TPVAR	Low NKI regime - Foreign NKI reducing and foreign NKI increasing measures, NKI, absolute CID, exchange rate
		Near-TPVAR	High CID regime - Foreign net tightening in and foreign net easing out measures, NKI, absolute CID, exchange rate
		Near-TPVAR	Low CID regime - Foreign net tightening in and foreign net easing out measures, NKI, absolute CID, exchange rate

Note: NKI: Net capital inflows (excluding FDI), MPA: Monetary Policy Autonomy Index (see Aizenman et al., 2008), absolute CID: absolute value of the covered interest rate differential. Results are available from the authors upon request.

As the expected impact of capital control actions on covered interest rate differentials is ambiguous for multilateral effects (see Section IV), 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 the dynamics of the process that we are interested in sufficiently well.

9. Conclusions

This paper evaluates the effectiveness of capital controls in emerging market economies since 2000. We use a new, detailed dataset on capital control changes to assess the effectiveness of different types of controls. 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 the interest rate differentials, exchange 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 there are multilateral effects of changes in capital controls in BRICS.

Our main conclusion for the domestic effects of capital flow measures is that there is no meaningful evidence that they were effective in delivering on their policy objectives. More specifically, net inflow tightening measures in EMEs did not have a significant impact on (non-FDI) net capital inflows on average. These measures had a significant but opposite impact on exchange rates and monetary policy autonomy, i.e. allowing a weaker exchange rate but only at the cost of lower monetary policy autonomy and vice versa. Inflow tightening measures, therefore, do not seem to allow countries to choose at the margin a trilemma configuration of a more closed capital account, more monetary policy autonomy and a preferred exchange rate. Net outflow easing measures do not have a significant expected impact on any of the variables in the

model. These results hold for both the years before and after the global financial crisis. We do not find a clear difference between countries with extensive and long-standing capital controls (India and China) and other countries.

Our main finding is that multilateral 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 – in particular net inflow tightening measures – had significant implications for other countries. Capital flow policies seem to have an impact on other countries through a variety of channels, in particular via exchange rates, although other channels (interest rates and capital flows) were also important. Multilateral effects have been more prevalent across BRICS countries than between BRICS and other, smaller, emerging market economies. 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. This change stems in particular from the fact that spillovers from capital flow policies in BRICS countries to non-BRICS became more significant in the post-global financial crisis period. Spillovers from BRICS to each other were significant in both pre- and post-global financial crisis periods. In addition to net inflow tightening measures, after the crisis net outflow easing measures in BRICS also generated cross-border effects to other BRICS 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, influence the exchange rate while retaining monetary policy independence. It does not ask 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. Capital controls encompass a wide array of instruments and the impact of specific instruments may deviate from the average. In the context of macro-prudential policy, there is a large and growing literature that examines the costs and benefits of specific prudential tools, for example, countercyclical capital buffers and counter-cyclical loan-to-value ratios. The next steps in 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 macroeconomic and macro-prudential objectives.

References

Agenor, P.R. and A. W. Hoffmaister (1998), "Capital inflows and the real exchange rate: Analytical framework and econometric evidence." In Managing Capital Flows and Exchange Rates: Perspectives from the Pacific Basin, Cambridge University Press.

Agenor, P.R., A. W. Hoffmaister, and C. Medeiros (1997), "Cyclical Fluctuations in Brazil's Real Exchange Rate: The Role of Domestic and External Factors." IMF Working Paper, WP/97/128.

Ariyoshi, A., K. Habermeier, B. Laurens, I. Otker-Robe, J. I. Canales-Kriljenko and A. Kirilenko (2000), "Capital Controls: Country Experiences with Their Use and Liberalization", IMF Occasional Paper No. 190.

Aizenman, J., M. D. Chinn, H. Ito (2008), "Assessing the emerging global financial architecture: Measuring the trilemma's configurations over time", NBER Working Paper 14533.

Aizenman, J. and Pasricha, G.K. (2013), "Why do emerging markets liberalize capital outflow controls? Fiscal versus net capital flow concerns", Journal of International Money and Finance, Volume 39, Pages 1-246.

Baba C. and A. Kokenyne (2011), "Effectiveness of Capital Controls in Selected Emerging Markets in the 2000s", IMF Working Paper, WP11/281.

Beirne J. and C. Friedrich (2014), "Capital flows and macroprudential policies: A multilateral assessment of effectiveness and externalities", ECB Working Paper, No 1721, August 2014.

Binici M., M. Hutchison, M. Schindler (2010), "Controlling capital? Legal restrictions and the asset composition of international financial flows", Journal of International Money and Finance, 29, pp 666–684.

BIS, FSB, and IMF (2011, February), "Macroprudential policy tools and frameworks: Update to G20 finance ministers and central bank governors", Technical Report, Bank for International Settlements.

Broto C., J. Díaz-Cassou, A. Erce (2011), "Measuring and explaining the volatility of capital flows to emerging countries", Journal of Banking and Finance, 35, pp 1941-1953.

Canova, F. (2007), Methods for Applied Macroeconomic Research, Princeton University Press.

Canova, F. and M. Ciccarelli (2013), "Panel Vector Autoregressive Models: A Survey", ECB Working Paper Series, No. 1507.

Cardoso E. and I. Goldfajn (1998), "Capital Flows to Brazil: The Endogeneity of Capital Controls", IMF Staff Paper, Vol. 15, No 1, March 1998.

Chinn, M. D. and H. Ito (2008). “A New Measure of Financial Openness” Journal of Comparative Policy Analysis, 10, 3: 309 – 322 (September).

De Gregorio J., S. Edwards and R.O. Valdes (2000), “Controls on capital inflows: do they work?”, Journal of Development Economics, Vol. 63, pp 59–83.

De Gregorio J. (2013), “Capital Flows and Capital Account Management”, Paper presented at the Rethinking Macro Policy II: First Steps and Early Lessons Conference, 16-17 April 2013.

Doan, T. (2009), RATS User’s Manual. Evanston, Ill.: Estima

Edwards S. and R. Rigobon (2009), “Capital controls on inflows, exchange rate volatility and external vulnerability”, Journal of International Economics, 78, pp 256–267.

Fernández, A., Rebucci, A. and M. Uribe (2013) “Are capital controls prudential? An empirical investigation” NBER working paper no 19671, November 2013
Forbes K., M. Fratzscher, T. Kostka and R. Straub (2012), “Bubble They Neighbor: Portfolio Effects and Externalities”, ECB Working Paper, No 1456, August 2012.

Forbes K., M. Fratzscher and R. Straub (2013), “Capitals controls and macroprudential measures: What are they good for?”, Discussion Papers, DIW Berlin, No. 1343.

Fratzscher, M. (2012) “Capital Controls and Foreign Exchange Policy”, European Central Bank Working Paper, No. 1415, February 2012.

Fratzscher M., M. Lo Duca and R. Straub (2013), “On the international spillovers of US Quantitative Easing”, ECB Working Paper, No 1557, June 2013.

Giordani P., M. Ruta, H. Weisfeld and L. Zhu (2014), “Capital Flow Deflection”, IMF Working Paper, WP/14/145.

Habermeier K., A. Kokenyne and C. Baba (2011), “The Effectiveness of Capital Controls and Prudential Policies in Managing Large Inflows”, IMF Staff Discussion note, 5 August 2011, SDN/11/14.

Hutchison, Michael, Pasricha, Gurnain and Nirvikar Singh (2013) “Effectiveness of Capital Controls in India: Evidence from the Offshore NDF Market” IMF Economic Review, 60, 3: 395-438.

IMF (2011a) “Recent experiences in managing capital inflows: Cross-cutting themes and possible framework” IMF Policy Paper, February.

IMF (2011b) “International Capital flows: Reliable or Fickle?” World Economic Outlook, Chapter 4, April 2011.

Jinjarak, Y., Noy, I. and H. Zheng (2013) “Capital controls in Brazil: Stemming a tide with a signal?”, Journal of Banking & Finance, Vol. 37(8), pp 2938-2952.
Klein, M. W (2012), “Capital controls: Gates and walls”, Brookings Working Paper, September.

Klein M.W. and J.C. Shambaugh (2013), “Rounding the Corners of the Policy Trilemma: Sources of Monetary Policy Autonomy”, NBER Working Paper 19461.

Koop, G. (2003), "Bayesian econometrics", J Wiley and Sons, Sussex, England (2003).

Lane P.R. and G.M. Milesi-Ferretti (2007), “The external wealth of nations mark II: Revised and extended estimates of foreign assets and liabilities, 1970–2004”, Journal of International Economics, 73, November, 223-250.

Magud N.E., C. M. Reinhart, K. S. Rogoff (2011), “Capital Controls: Myth and Reality – A Portfolio Balance Approach”, NBER Working Paper 16805.

Miniane J. and J.H. Rogers (2007), “Capital Controls and the International Transmission of U.S. Money Shocks”, Journal of Money, Credit and Banking, Vol. 39, No. 5.

Ostry J.D., A.R. Ghosh, K. Habermeier, L. Laeven, M. Chamon, M. S. Qureshi and A. Kokenyne (2011), “Managing Capital Inflows: What Tools to Use?”, IMF Staff Discussion note, 5 April 2011, SDN/11/06.

Ostry J.D., A.R. Ghosh and A. Korinek (2012), “Multilateral Aspects of Managing the Capital Account”, IMF Staff Discussion note, 7 September 2012, SDN/12/10.

Pandey R., Pasricha, G.K., I. Patnaik and A. Shah (forthcoming) “Motivations for capital controls and their effectiveness” Bank of Canada Working Paper, forthcoming.

Pasricha, G.K. (2010), “Bank Competition and International Financial Integration: Evidence Using a New Index”, Bank of Canada Working Paper 2010-35.

Pasricha, G.K. (2012), “Measures to manage capital flows in emerging market economies” North American Journal of Economics and Finance, special issue on “International Finance in the aftermath of the 2008 Global Crisis” 23, 3: 286-309.

Patnaik I. and A. Shah (2012), “Did the Indian capital controls work as a tool of macroeconomic policy?” IMF Economic Review, September.

Perna C. and M. Sibillo (2014), “Mathematical and statistical methods for actuarial sciences and finance”, Springer.

Qureshi M.S., J.D. Ostry, A. R. Ghosh, M. Chamon (2011), “Managing Capital Inflows: The Role of Capital Controls and Prudential Policies”, NBER Working Paper 17363.

Schindler M., 2009. “Measuring Financial Integration: A New Data Set” IMF Staff Papers, Palgrave Macmillan, vol. 56(1), pages 222-238, April.

Saborowski C., S. Sanya, H. Weisfeld and J. Yepez (2014), “Effectiveness of Capital Outflow Restrictions”, IMF Working Paper WP/14/8.

Sims, C. (1980), “Macroeconomics and Reality”, Econometrica, Vol. 48, No. 1, pages 1-48.
Valdés-Prieto, S, and M. Soto (1998), “The Effectiveness of Capital Controls: Theory and Evidence from Chile”, Empirica, Vol. 25(2), pp 133-164.

Zellner, A. (1962), “An efficient method of estimating seemingly unrelated regressions and tests of aggregation bias”, Journal of American Statistical Association, 57(298), 348-368

Appendix A: Construction of the Dataset on Capital Control Actions

The dataset covers 18 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 un–weighted 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 un–weighted 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 was not automatic. Each CCA in the dataset was 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.

Table A1. Countries in Sample

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

Appendix B: Description and summary statistics of variables used

Table B.1: Variables used in the baseline model

Variable	Description/Source
NKI[1]	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[1]	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. Source: IMF-BOP.
Gross outflows[1]	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. Source: IMF-BOP.
Covered interest rate differential	The covered interest rate differential is measured as $i - [\frac{F}{S}\{(1 + i^*(\frac{Actual}{360\times100})\} - 1]\frac{365}{Actual} \times 100)$, where i is the domestic three-month interest rate expressed as a percentage per annum, F and S are forward and spot exchange rates expressed in domestic currency units per unit of the foreign currency and i^* is the foreign interest rate (of the same maturity as the forward rate and the domestic interest rate, namely 3 months). *Actual* refers to the actual number of days in a 3-month contract, computed as in Hutchison et al. (2013). The terms with *Actual* correct for the fact that the LIBOR rates are annualized assuming 360 calendar days while the others are annualized assuming 365 calendar days. The calculation is performed using daily data, except for Chile and Morocco for which quarterly data are used. 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 B.2: 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

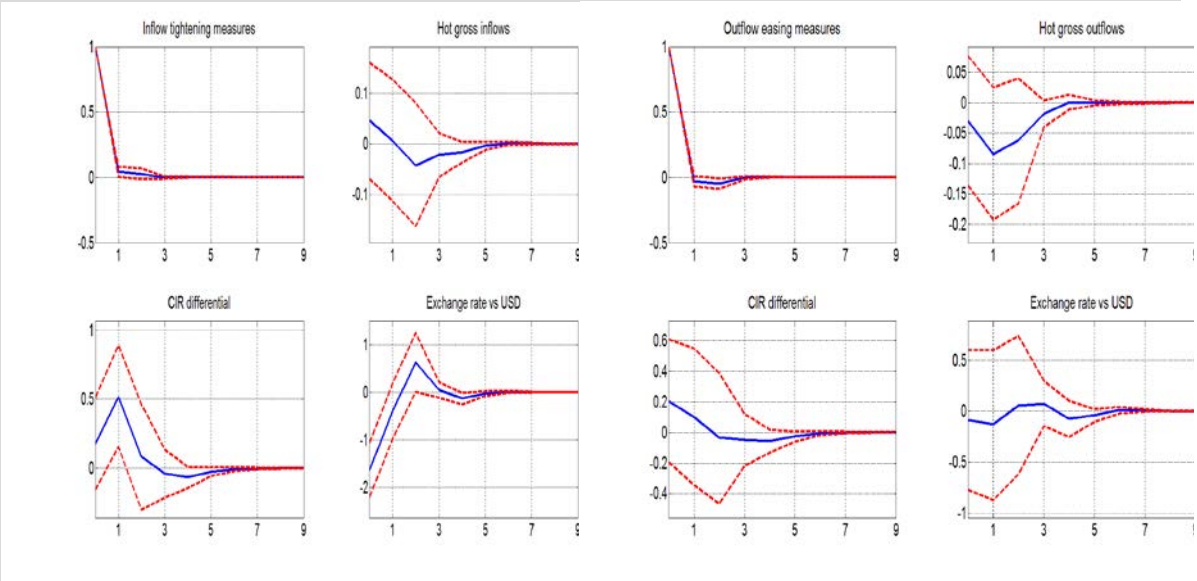
Table B.3: Summary statistics of country-specific variables

	NKI/GDP				Gross inflows/GDP				Gross outflows/GDP				Spot exchange rate				Absolute CIR differential			
	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	5.62	12.02	67.04	0.57
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	2.51	4.07	23.47	0.01
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	0.66	0.61	2.33	0.04
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	3.73	2.50	12.91	0.56
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	1.40	1.23	5.82	0.01
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	2.36	3.26	12.66	0.02
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	3.05	5.52	27.13	0.03
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	1.97	1.33	6.35	0.12
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	1.08	1.34	6.75	0.03
MAR	0.30	0.62	1.81	-0.84	0.53	0.49	1.66	-0.49	0.23	0.32	1.01	-0.58	-0.63	4.78	17.75	-8.05	2.61	1.90	9.54	0.16
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	0.63	0.49	2.15	0.00
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	0.38	0.34	1.47	0.00
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	1.19	1.28	6.84	0.03
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	1.65	1.68	9.65	0.02
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	1.77	4.52	26.30	0.03
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	3.63	6.46	28.37	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	1.01	0.69	2.38	0.03
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	0.43	0.37	1.46	0.00

Note: sd= standard deviation, max = maximum, min = minumum

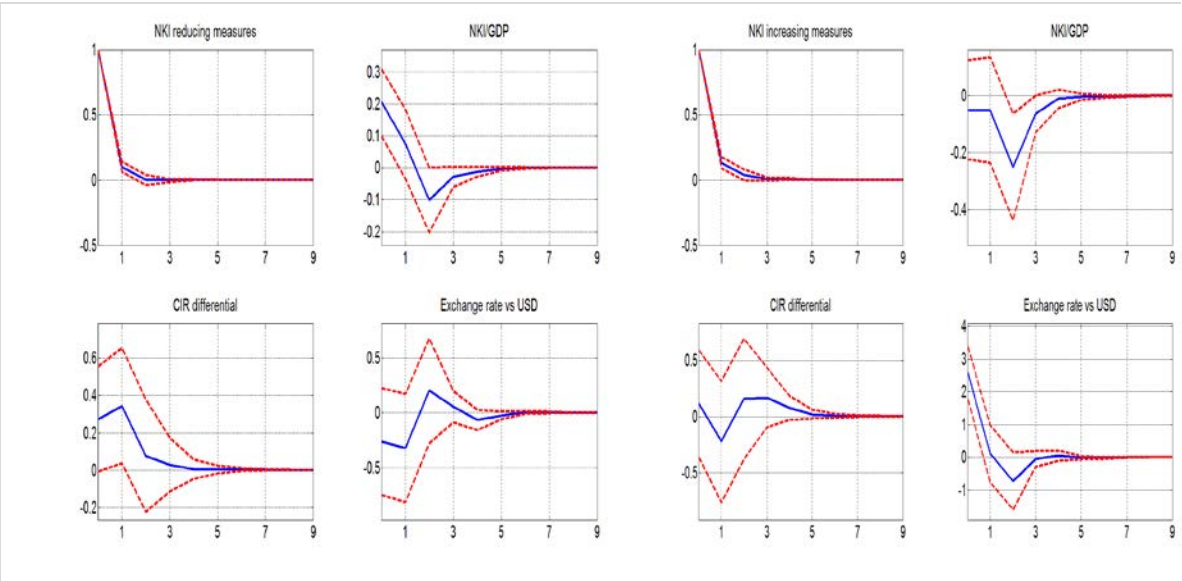
Appendix C: More detailed results

Figure C1: Gross inflows and outflows – Impulse responses to a shock in capital controls



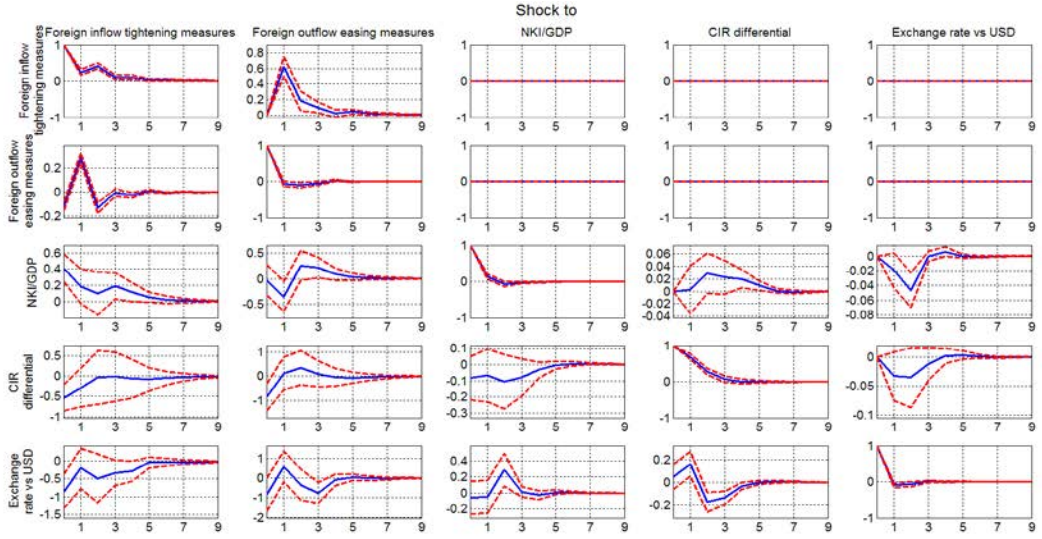
Note: The blue line denotes the median impulse response to a positive shock to capital control variable shown in each panel. The dotted red lines represent the 16 and 84 percentiles. The impulse responses are normalized to a one unit shock and are expressed in the unit of each respective variable. The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

Figure C2: Net capital inflows (NKI) – Impulse responses to a shock in capital controls



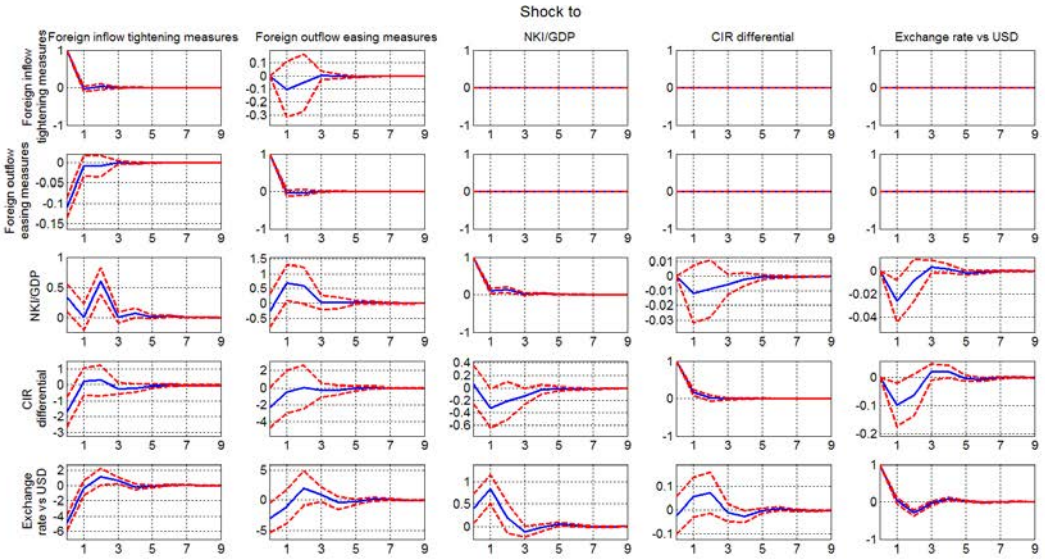
Note: The blue line denotes the median impulse response to a positive shock to the capital control variable shown in each panel. The dotted red lines represent the 16 and 84 percentiles. The impulse responses are normalized to a one unit shock and are expressed in the unit of each respective variable.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

Figure C3: Inflow and outflow measures – Multilateral effects: China/India on Asia



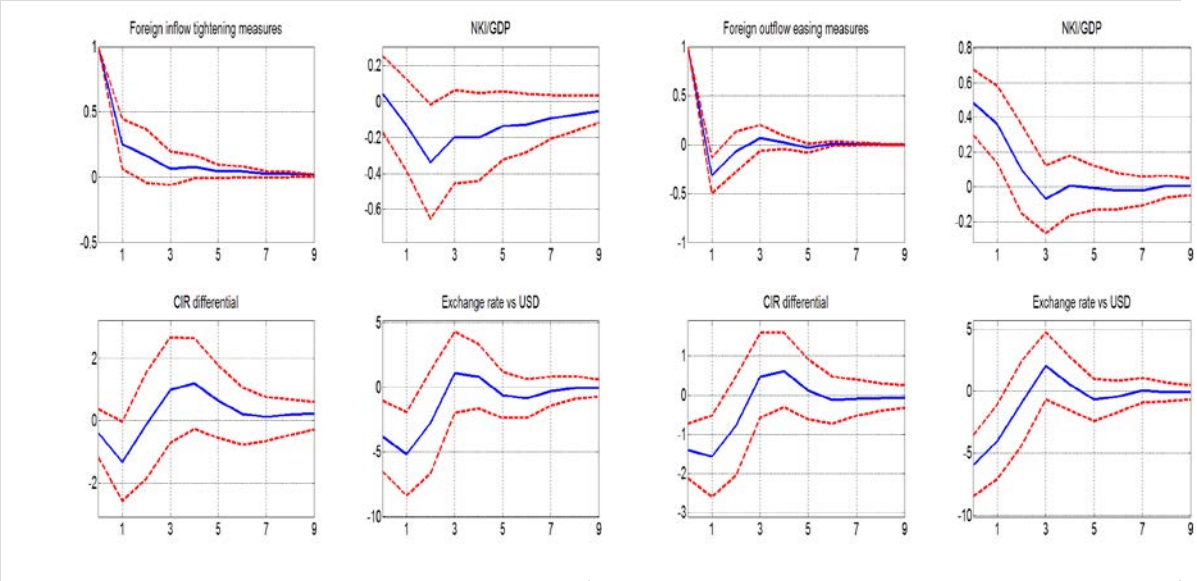
Note: The blue line denotes the median impulse response to a positive shock to the variable at the top of each column. The capital control measures refer to net inflow/outflow measures taken in the Asian BRICS countries (i.e. China and India) and the other variables relate to the other Asian countries in the sample (Indonesia, Korea, Malaysia, the Philippines and Thailand). 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 C4: Inflow and outflow measures – Multilateral effects: Brazil on Latin America



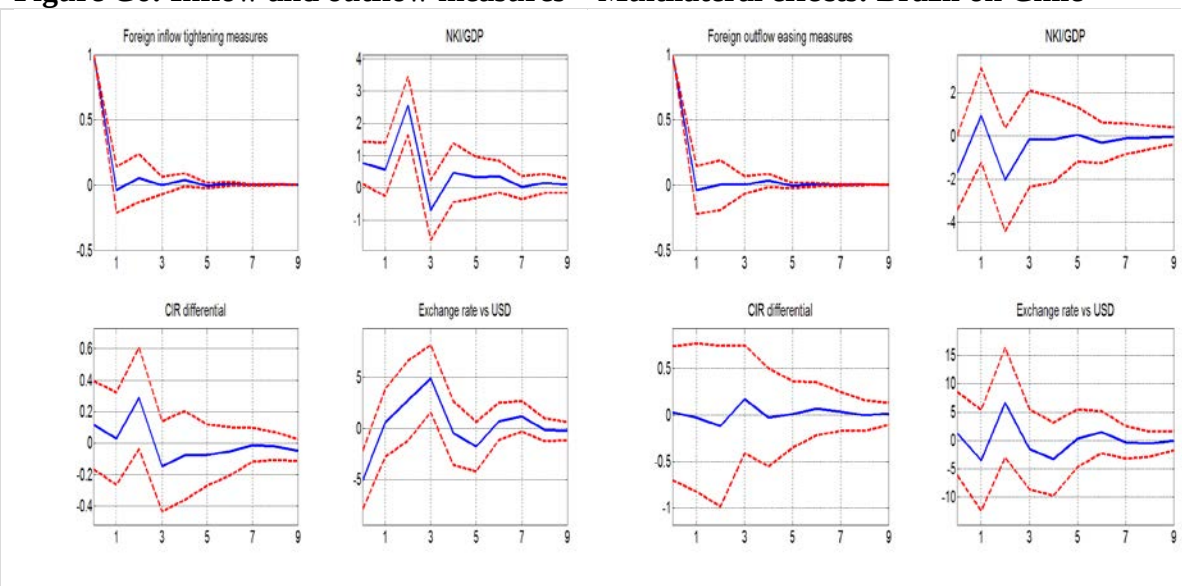
Note: The blue line denotes the median impulse response to a positive shock to the variable at the top of each column. The capital control measures refer to net inflow/outflow measures taken in the Latin American BRICS country (i.e. Brazil) and the other variables relate to the other Latin American countries in the sample ((Argentina, Chile, Colombia, Mexico and Peru). 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 C5: Inflow and outflow measures – Multilateral effects: Other BRICS on Brazil



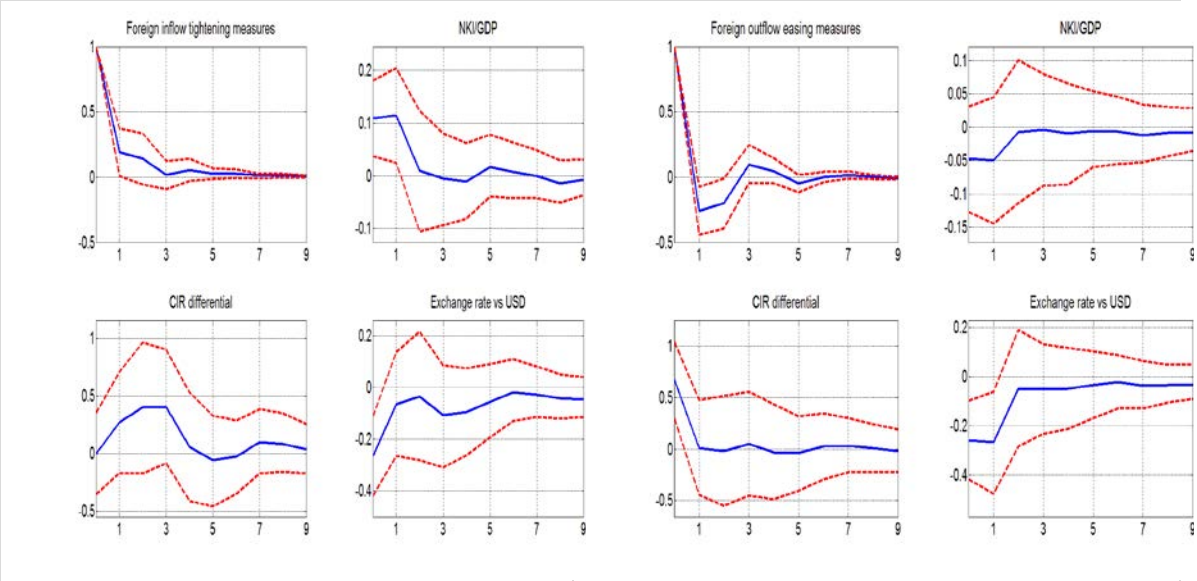
Note: The blue line denotes the median impulse response to a positive shock to the capital control variable shown in each panel. The dotted red lines represent the 16 and 84 percentiles. The impulse responses are normalized to a one unit shock and are expressed in the unit of each respective variable.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

Figure C6: Inflow and outflow measures – Multilateral effects: Brazil on Chile



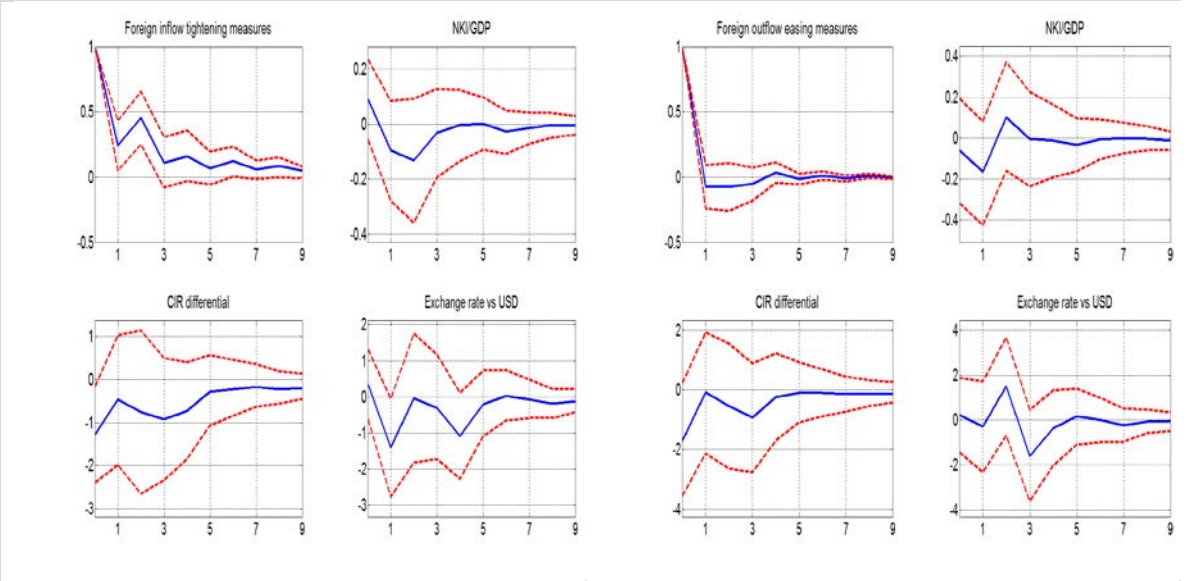
Note: The blue line denotes the median impulse response to a positive shock to the capital control variable shown in each panel. The dotted red lines represent the 16 and 84 percentiles. The impulse responses are normalized to a one unit shock and are expressed in the unit of each respective variable.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

Figure C7: Inflow and outflow measures – Multilateral effects: Other BRICS on China



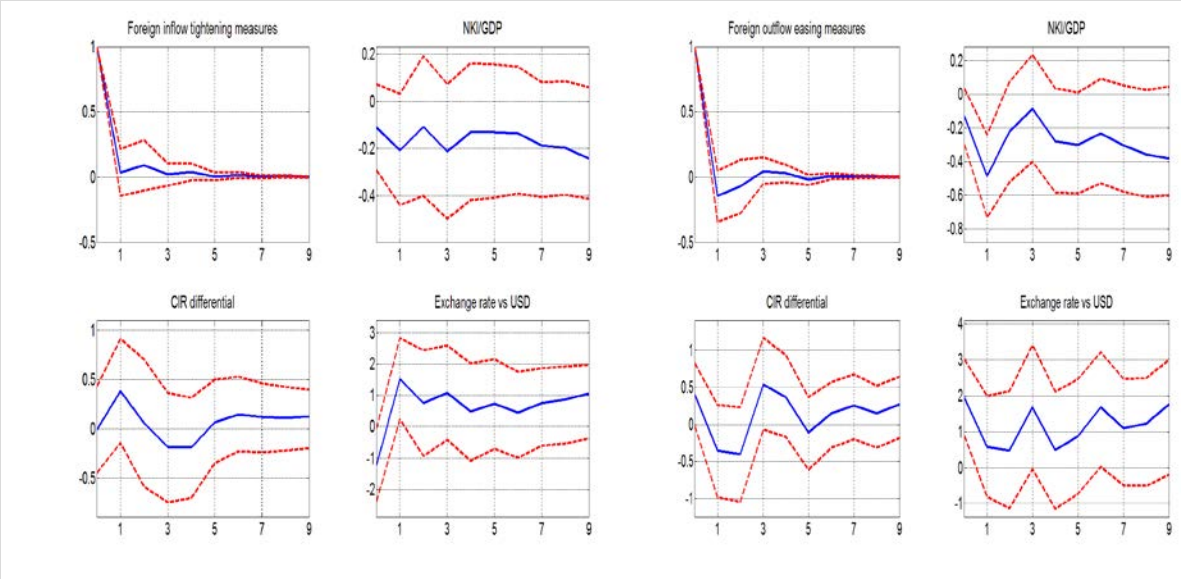
Note: The blue line denotes the median impulse response to a positive shock to the capital control variable shown in each panel. The dotted red lines represent the 16 and 84 percentiles. The impulse responses are normalized to a one unit shock and are expressed in the unit of each respective variable.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

Figure C8: Inflow and outflow measures – Multilateral effects: China/India on Indonesia



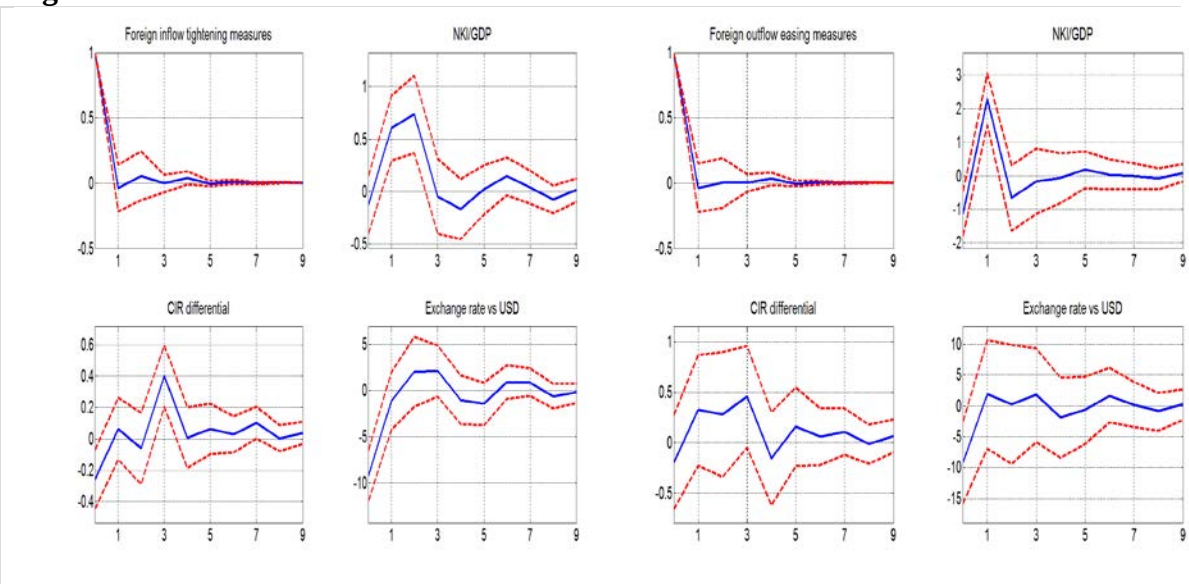
Note: The blue line denotes the median impulse response to a positive shock to the capital control variable shown in each panel. The dotted red lines represent the 16 and 84 percentiles. The impulse responses are normalized to a one unit shock and are expressed in the unit of each respective variable.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

Figure C9: Inflow and outflow measures – Multilateral effects: Other BRICS on India



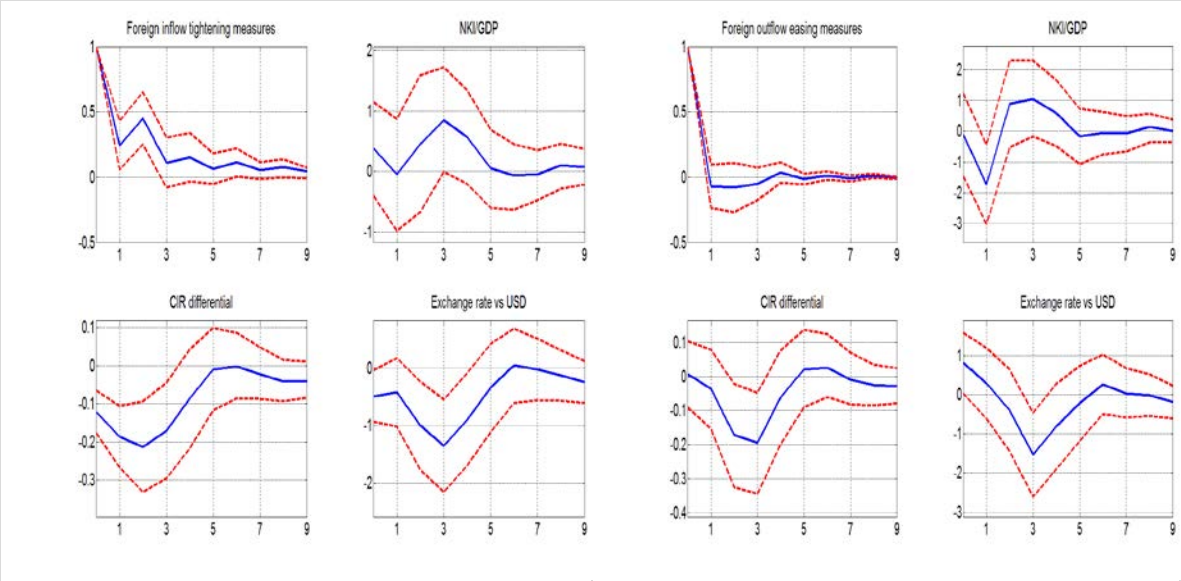
Note: The blue line denotes the median impulse response to a positive shock to the capital control variable shown in each panel. The dotted red lines represent the 16 and 84 percentiles. The impulse responses are normalized to a one unit shock and are expressed in the unit of each respective variable.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

Figure C10: Inflow and outflow measures – Multilateral effects: Brazil on Mexico



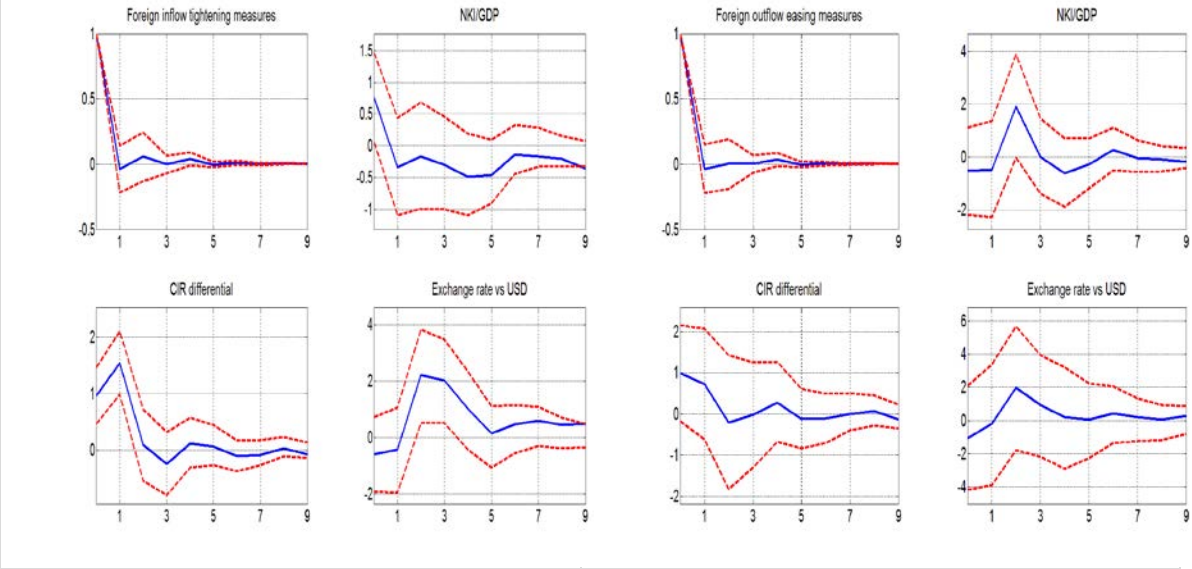
Note: The blue line denotes the median impulse response to a positive shock to the capital control variable shown in each panel. The dotted red lines represent the 16 and 84 percentiles. The impulse responses are normalized to a one unit shock and are expressed in the unit of each respective variable.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

Figure C11: Inflow and outflow measures – Multilateral effects: China/India on Malaysia



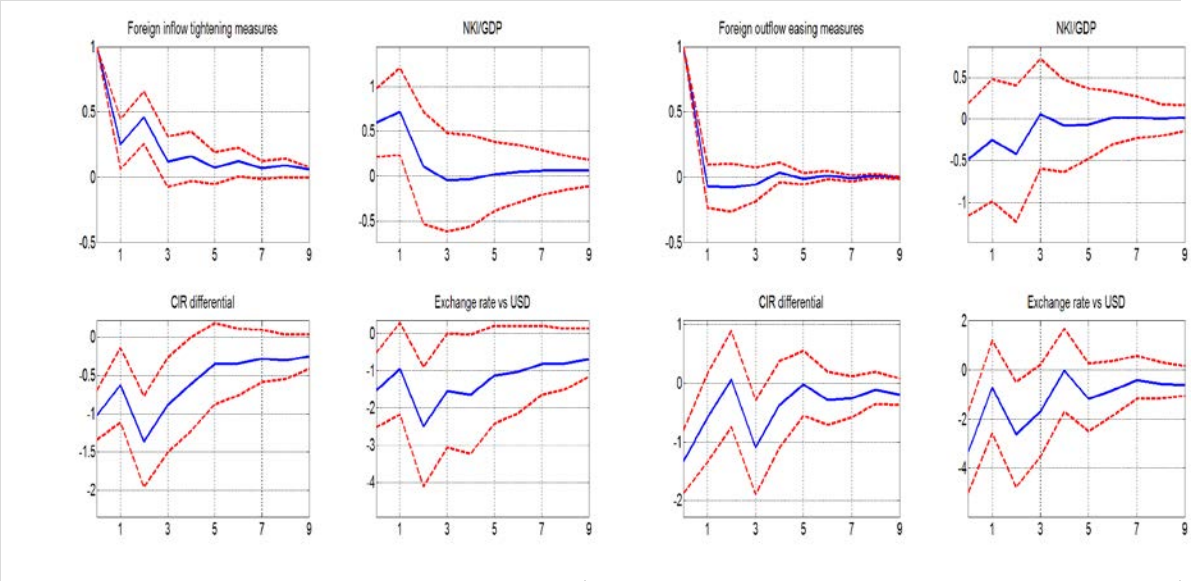
Note: The blue line denotes the median impulse response to a positive shock to the capital control variable shown in each panel. The dotted red lines represent the 16 and 84 percentiles. The impulse responses are normalized to a one unit shock and are expressed in the unit of each respective variable.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

Figure C12: Inflow and outflow measures – Multilateral effects: Brazil on Peru



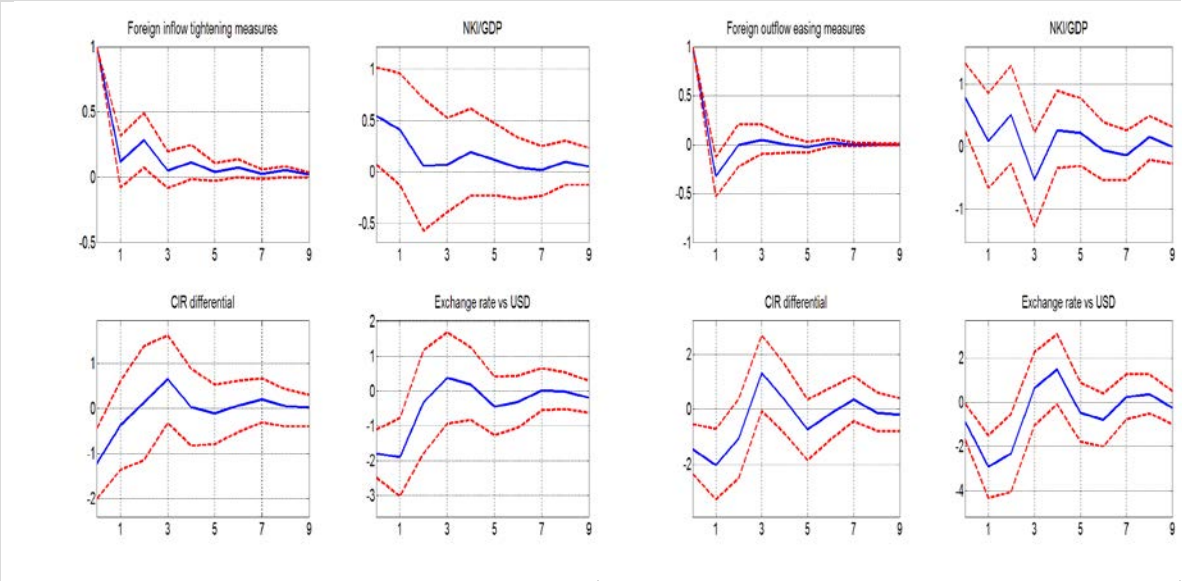
Note: The blue line denotes the median impulse response to a positive shock to the capital control variable shown in each panel. The dotted red lines represent the 16 and 84 percentiles. The impulse responses are normalized to a one unit shock and are expressed in the unit of each respective variable.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

Figure C13: Inflow and outflow measures – Multilateral effects: China/India on Philippines



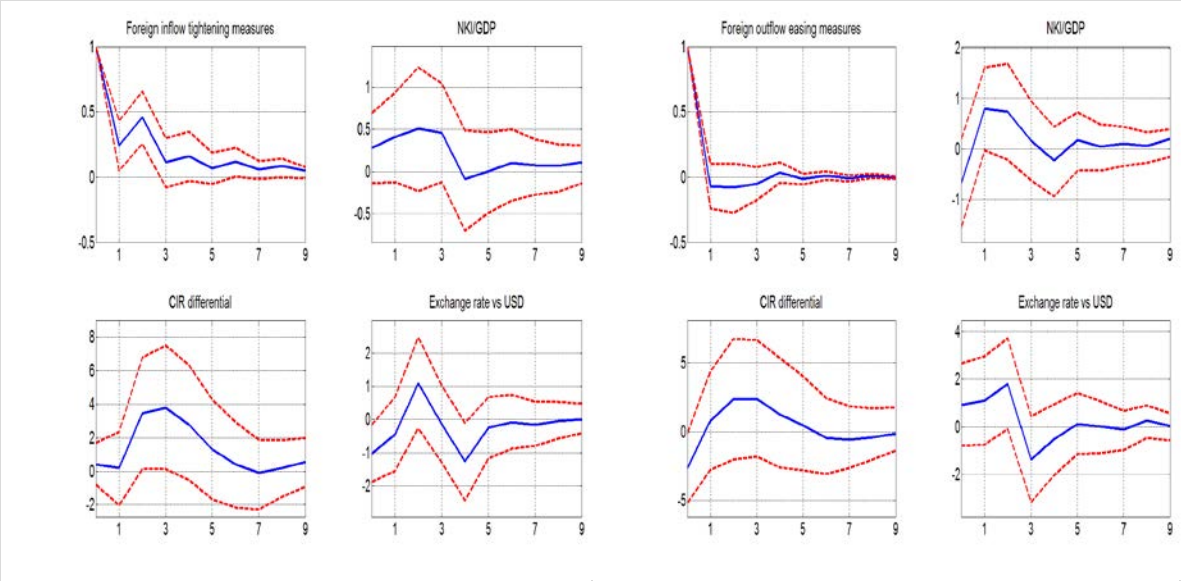
Note: The blue line denotes the median impulse response to a positive shock to the capital control variable shown in each panel. The dotted red lines represent the 16 and 84 percentiles. The impulse responses are normalized to a one unit shock and are expressed in the unit of each respective variable.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

Figure C14: Inflow and outflow measures – Multilateral effects: Other BRICS on Russia



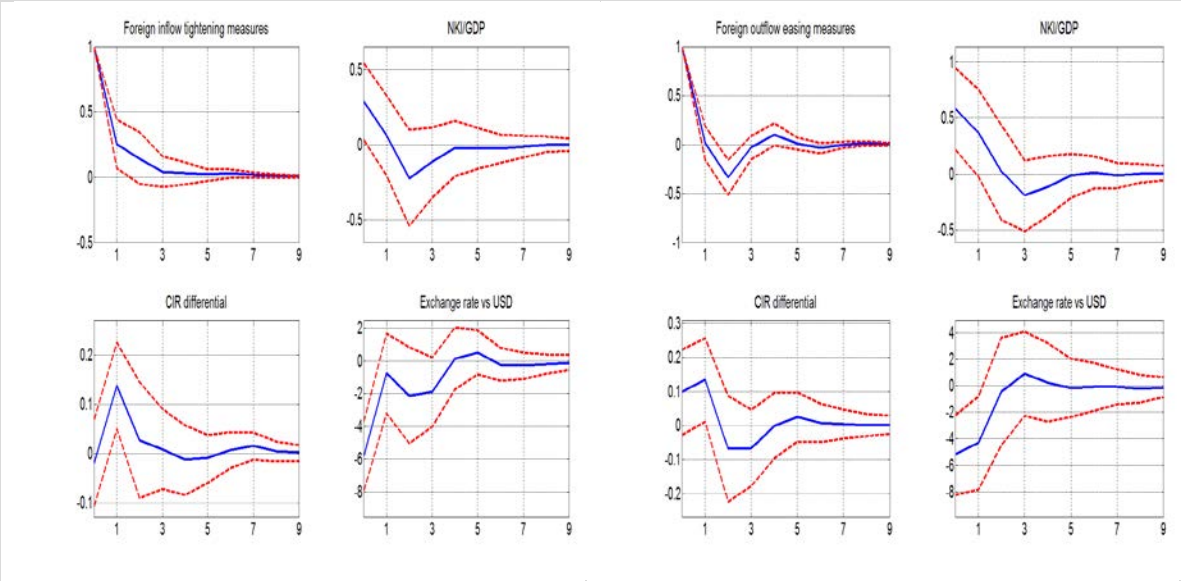
Note: The blue line denotes the median impulse response to a positive shock to the capital control variable shown in each panel. The dotted red lines represent the 16 and 84 percentiles. The impulse responses are normalized to a one unit shock and are expressed in the unit of each respective variable.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

Figure C15: Inflow and outflow measures – Multilateral effects: China/India on Thailand



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 C16: Inflow and outflow measures – Multilateral effects: Other BRICS on South Africa



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.