



**ADB Working Paper Series**

**DEALING WITH QUANTITATIVE  
EASING SPILLOVERS IN EAST ASIA:  
THE ROLE OF INSTITUTIONS AND  
MACROPRUDENTIAL POLICY**

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**Abstract**

This paper explores the impact of advanced countries' quantitative easing on emerging market economies (EMEs) and how macroprudential policy and good governance play a role in preventing potential financial vulnerabilities. We used confidential locational bank statistics data from the Bank for International Settlements to examine whether quantitative easing has caused an appreciation of EMEs' currencies and how it has done so, and whether this has in turn boosted foreign-currency borrowing, thus making EMEs vulnerable to balance sheet and maturity mismatch problems. While focusing our analysis on East Asian economies, we compare them with Latin American economies, which were also major recipients of quantitative easing capital inflows. We found that government effectiveness plays an important role in curbing excessive borrowing when the exchange rate is overvalued.

**JEL Classification:** E44, E58, F31, F32, F34

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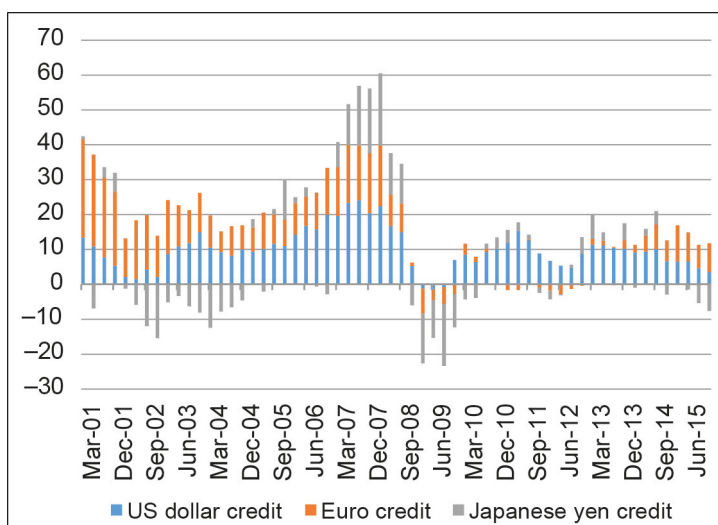
# 1. INTRODUCTION

The quantitative easing of advanced economies’ central banks in the aftermath of the global financial crisis (GFC)—the Federal Reserve Bank, the European Central Bank, the Bank of England, and the Bank of Japan in particular—have contributed to large-scale capital inflows to emerging market economies (EMEs), including those in East Asia. While the capital surge into EMEs underpinned financial stability of EMEs to some extent, for some EMEs, capital inflows turned out to be pro-cyclical, causing asset bubbles and appreciation of exchange rates. This posed a new challenge to monetary policy.

For example, Brazilian President Rousseff in 2012 mentioned that a “monetary tsunami” was making its way to EMEs. India’s Central Bank Governor Raghuram Rajan (2013) called for “prudent measures” to avoid an excess buildup of credit. Indeed, given the volatile nature of short-term capital flows and the danger of sudden stops (reversals of capital flows), many EMEs implemented macroprudential policies and (sometimes temporary) measures of capital account restrictions to better cope with capital flows. The speed at which the direction of flows can change was illustrated by Fed Chairman Bernanke’s “tamper talk,” which, just by expectation, prompted a reversal of capital flows in some EMEs and stirred fear of financial instability in a number of EMEs.

Figure 1 shows annual percentage change in global liquidity—defined here as cross-border capital flow (debt securities and bank credit). While a sharp reversal of capital flows occurred during the GFC, the growth in cross-border capital flow in United States (US) dollars turned positive as early as December 2008. However, the growth of cross-country bank and debt securities capital flows are still lower than they were before the GFC, demonstrating the severe abundance of global liquidity before the GFC.

**Figure 1: Percentage Change in Cross-Border Credit (Debt Securities and Bank Lending by Major Currencies) (US\$ trillion)**



Source: Bank for International Settlements. Global Liquidity Indicators. Table E-1. <http://www.bis.org/statistics/gli.htm>

Against this backdrop, this paper investigates the impact of quantitative easing of major advanced economies on foreign-currency borrowing of EMEs in East Asia to examine if quantitative easings had led EMEs to overborrow. In particular, it focuses on the role of institutions in dealing with capital account management and macroprudential policies adopted by East Asian EMEs<sup>1</sup> in response to capital inflows. Of the different types of capital inflows, we focus on cross-border bank lending, using data from the Bank for International Settlements (BIS) that consist of comprehensive lending information including details on currency breakdown. While the paper focuses on EMEs in East Asia, we compare our findings with Latin American countries.

## 2. LITERATURE REVIEW

This paper focuses on how EMEs responded to capital inflows, particular in the form of cross-border bank borrowing, seeing if and how the prudential policies and institutional setting dampened the foreign exchange borrowing caused by exchange rate appreciation. As a meta-survey by Frankel and Saravelos (2010) shows, a surge in capital inflows and real exchange rate appreciation (especially the short-term “hot money” flows) are among the most reliable early warning indicators of a financial crisis. Hence, preventing overborrowing is an important element in preventing financial crisis.

### 2.1 Some Features of Cross-Border Bank Lending in Emerging Market Economies

The literature finds that the quantitative easing spillover and its determinants are no different from conventional monetary easing (Glick and Leduc 2013). The stance of the International Monetary Fund (IMF) on the quantitative easing spillover to EMEs is overall positive, albeit with some nuances: quantitative easing not only supported EMEs by preventing the contagion-driven market meltdown, but also underpinned their growth. At the same time, the IMF expressed concern about the consequences of a prolonged period of capital inflows and cheap foreign financing for future financial stability. Indeed, in many EMEs, we observed a rapid expansion of credit, which historically has been followed by a period of financial instability (Schularick and Taylor 2012).

Typically, EMEs cannot borrow their own currency in cross-border borrowing, a phenomenon that has been referred to as the “original sin” problem (Eichengreen, Hausmann, and Panizza 2003). While some EMEs, as a result of the “catching-up” process, are able to raise funds in their own currencies (the recent launch of the renminbi bond index in the London Stock market is a good example), there are reasons, especially at the micro level, why agents in EMEs prefer borrowing in foreign currencies, especially in the dollar. First, many developing countries depend on commodity exports as their main source of revenue; since commodities are almost exclusively priced in the dollar, exporters in those countries prefer to use the dollar rather than local currencies in their transactions (Frankel and Saiki 2002). Even if they are exporting industrial goods because of the lower pricing power of exporters and the thin financial markets, they tend to price in the importers’ currency (Goldberg and Tille 2009; Friberg and Wilander 2008). Finally, when EMEs trade with each other, the dollar

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<sup>1</sup> Our sample of “East Asian countries” includes India. India is not part of East Asia, but we included it in our analysis as it is one of the countries that experienced a quantitative-easing monetary “tsunami” and took several measures to combat it, especially under its Central Bank Governor Rajan.

is often used because of its role as the world's vehicle currency. The need to settle trade in dollars makes them prefer dollar debt to home currency debt.

Compared with advanced countries, EMEs typically suffer from poor protection of property rights and corruption. Eichengreen, Hausmann, and Panizza (2003) claimed that the currency mismatch problem and institutional weakness (they call it the "debt-intolerance" school) are analytically distinct. We need to bridge the two by looking at how a country's prudent behavior, or a good institution in a broader sense, would make a country less vulnerable to the currency mismatch problem that led to balance-of-payments crises in EMEs in the past. In other words, we think a prudent government will not overborrow in foreign currencies.

## 2.2 Currency Appreciation and Borrowing Behaviors

Rajan (2013) claimed that strong currency and asset prices reduce agents' loan-to-value ratios, which lessens perceived risks of the leverage. This often feeds into an oversupply of credit from cross-border lending, which sometimes results in balance-of-payment problems. Against this backdrop, Rajan called on EMEs to design and implement prudential policy, the effectiveness and efficacy of which has not yet been strongly established in the literature.

The meltdown of foreign-currency debt overhang has been well noted in the past (Latin America's Tequila Crisis, Asian currency crisis, etc.). In floating exchange rate regime countries, such as Poland and Hungary, the expectation of continuing appreciation has led them to borrow heavily in euro and in Swiss franc, which was pegged to the euro between September 2011 and January 2015. During the GFC, the Polish zloty and the Hungarian forint depreciated by almost 65% vis-à-vis the euro and 20% vis-à-vis the Swiss franc. This increased the foreign-currency loans of Hungary to 47% of gross domestic product (GDP) (of which 31% was denominated in Swiss francs) and 16% of GDP in Poland. Afterward, these two countries put macroprudential tools in place. Arteta (2005) found that floating exchange rate regime countries are more likely to deposit or borrow in the US dollar, because floating regimes are positively associated with deposit dollarization more strongly as investors seek to keep their asset value stable in US dollar terms. However, a stronger home currency will make it easier for EMEs to borrow in a foreign currency. To the best of our knowledge, no studies have so far assessed how the valuation of exchange rates is related to foreign bank lending, and how they interact with institutions and macroprudential measures. Overall, existing literature seems to imply that foreign-currency lending and/or borrowing ("financial dollarization") can be detrimental to an economy. Some go one step further and suggest that it was one of the main causes of the GFC (Akca 2011).

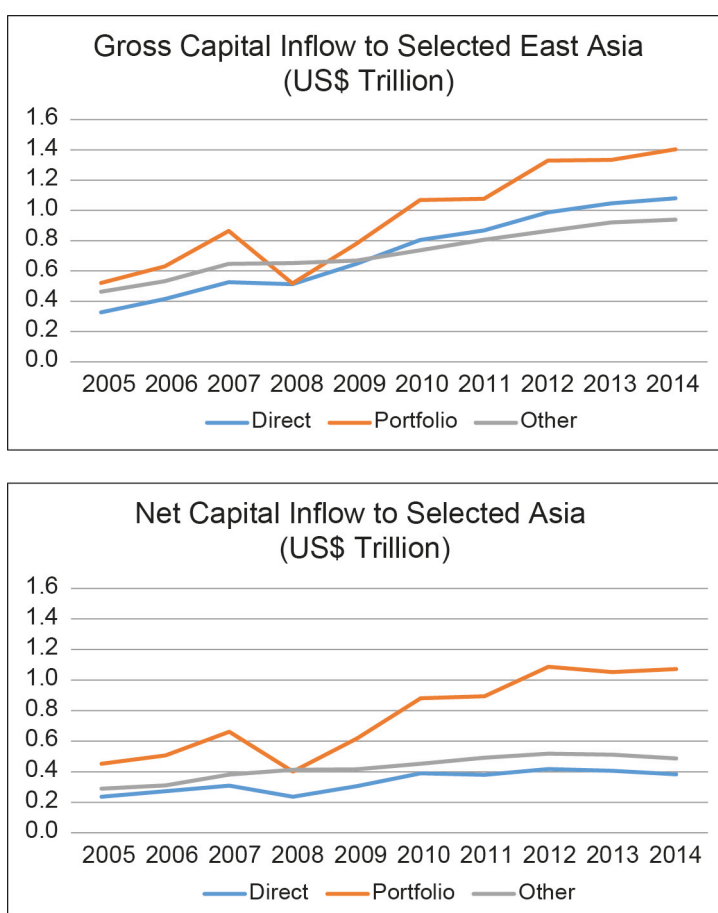
## 3. STYLIZED FACTS

Before going into the formal analysis, it may be useful to see some stylized facts concerning the GFC and the various quantitative easings that followed. Since we are particularly interested in the effect of exchange rate appreciation, and possibly overvaluation, in what follows we examine the actual data of capital flow exchange fluctuations of major EMEs (not just East Asian EMEs) around the time of the GFC and subsequent quantitative easing policies.

### 3.1 Capital Flows

Figure 2 shows both gross and net capital inflows to selected East Asian countries.<sup>2</sup> After the start of quantitative easing in 2008, we can see an increase in portfolio inflows, in terms of both gross and net. However, EMEs became disproportionately (relative to their economic size) large recipients of capital inflows in the run up to the GFC even in net terms (not reported in the graph). This indicates that, when the GFC hit their currencies, these countries were likely to have suffered from a currency mismatch problem. According to the updated systemic banking crisis database (Laeven and Valencia 2012), the following EME countries experienced currency crises after 2007: Belarus, Democratic Republic of the Congo, Ghana, Serbia, Turkmenistan, Uganda, Serbia, Ukraine, and Zambia.

**Figure 2: Net and Gross Capital Flows to East Asia**



Note: The total capital flow to India, Indonesia, the Republic of Korea, Malaysia, the Philippines, and Thailand.  
 Source: International Monetary Fund, Balance of Payment Statistics.

The plunge of capital flows to East Asian economies during the GFC was less severe compared with other EMEs because of several factors, mainly: macroeconomic management by central banks, strong economic fundamentals and high levels of financial reserves, and geographic proximity to the People’s Republic of China with its

<sup>2</sup> We also included India in our baseline sample. Strictly speaking, India is not geographically categorized under East Asia, but because of its experience in receiving quantitative easing spillover money and capital openness, as well as the various macroprudential policy (MPP) measures it has taken, we included it in our list of sample countries.

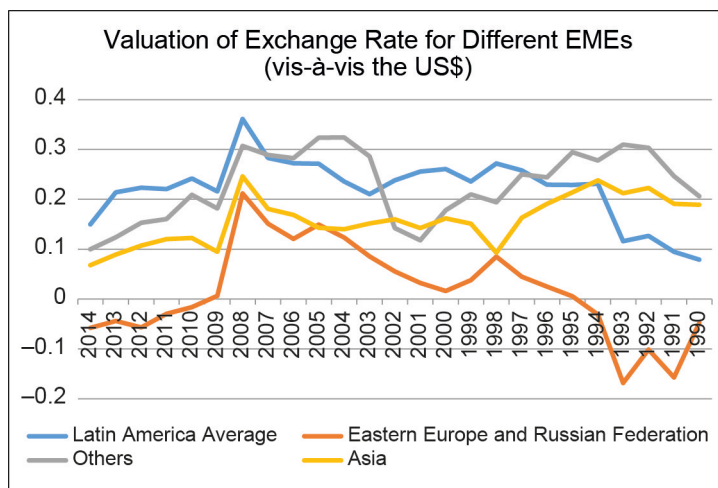


high economic growth rate. Nevertheless, with greater financial integration, the external economic environment has a growing impact on the domestic economy.

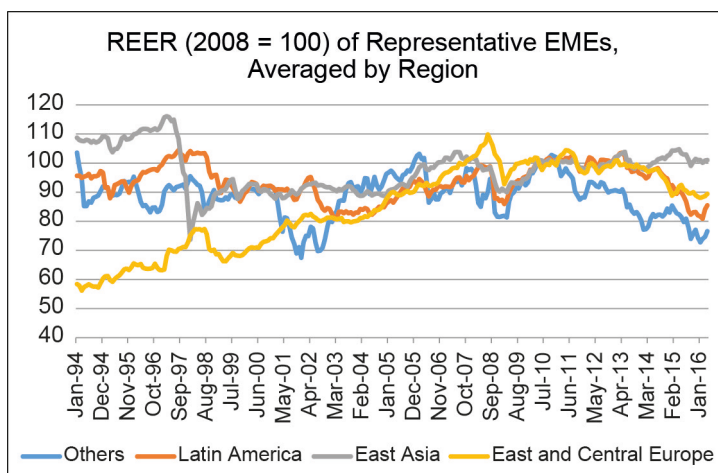
### 3.2 Exchange Rates

Figure 3a shows our measurement of exchange rate valuation, which is discussed in the next chapter. Figure 3b shows the real effective exchange rate (consumer price index [CPI] based) from the BIS.

**Figure 3(a): Exchange Rate vis-à-vis the US\$ of Selected EMEs**



**Figure 3(b): Real Effective Exchange Rate of Selected EMEs**



EME = emerging market economy, REER = real effective exchange rate.

Notes:

1. In Figure 3(a), the higher value means greater overvaluation.
2. In Figure 3(a), the degree of overvaluation is calculated by the authors. See Chapter 4 for explanation.
3. The value reported is the average for the following countries:
  - Latin America: Brazil, Chile, Colombia, Mexico, and Peru.
  - Eastern Europe and the Russian Federation: Bulgaria, Czech Republic, Hungary, Poland, Romania, and the Russian Federation.
  - East Asia: India, Indonesia, the Republic of Korea, Malaysia, the Philippines, and Thailand.
  - Others: South Africa and Turkey.

Source: Bank for International Settlements.

Roughly speaking, currency overvaluations of selected Asian countries were severe before the Asian currency crisis in 1997, but not so much before the GFC when global liquidity was very high probably due to their active management of exchange rate. On the contrary, the exchange rates of Latin America, South Africa, and Turkey have been relatively more overvalued. Looking at the development of real effective exchange rate (REER), Latin American countries tend to have higher REER than the rest of the EMEs, and the REER of the Eastern European countries has been appreciating.

## 4. THE ROLE OF MACROPRUDENTIAL POLICY AND GOOD GOVERNANCE

*Macroprudential thinking begins with the observation that the whole of the financial system is more than the sum of the parts.* – Jeffrey Frankel (2015)

### 4.1 Macroprudential Measures

The idea of macroprudential policy is not new. According to Galati and Moessner (2013) the word and concept were already used in an undisclosed document of the BIS in the late 1970s, which defined it as “a systematic orientation of regulation and supervision linked to the macroeconomy.”

Macroprudential policies take macroeconomic cycles into consideration and deploy countercyclical policy. Examples include cyclically varying provisioning requirements, cyclically varying loan-to-value (LTV) ratios, countercyclical capital buffers, capital/liquidity surcharges/levies on systemically important financial institutions, taxes on volatile funding, caps on credit growth, and higher reserve requirements (Ostry et al. 2011). Before the GFC, monetary authorities tried to maintain financial stability mainly through microprudential policies, which aim to cope with idiosyncratic risks of individual financial institutions and mitigate externalities arising from the behavior of individual institutions (such as the forward-looking provisioning of expected losses, caps on LTV ratios or minimum collateral haircuts, higher-risk weights on specific types of exposures, and leverage ratios (Ostry et al. 2011).

The GFC made it clear that microprudential policy alone is not sufficient to maintain financial stability, as financial institutions are interconnected in a very complex manner. In addition, traditional monetary policy (changing interest rates, money supply, etc.) affects not only the finance sector but also non-finance sectors, including households. On the other hand, macroprudential measures are more targeted to the finance sector and look at the finance sector as a whole, rather than the individual financial institution.

There are some overlapping aspects of macroprudential policy (MPP) and capital flow management (CFM).<sup>3</sup> However, Forbes, Fratzscher, and Straub (2015) claimed that since capital restriction measures do not discriminate among different measures—they may hurt some lenders (such as small and medium-sized enterprises) who are actually in need of foreign money. They also argued that capital flow restrictions suffer from leakage, making MPPs a preferable option, as these are more targeted to the finance

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<sup>3</sup> CFM refers to measures that are designed to limit capital flows. It aims to discourage transactions in foreign currency as well as residency-based capital flow management measures. The form and extent of CFM in Asia has varied widely, reflecting three main issues: (i) the limit to macroeconomic policy adjustment each economy faced, (ii) the specific finance sector pressures each economy faced, and (iii) concerns about the volatility of inflows.

sector. Overall, they concluded that MPPs are a better tool to employ when there is a massive inflow of capital, especially when it is a pro-cyclical one. There is a caveat, however. MPP also can “leak” via regulatory arbitrage—so international coordination is an urgent task.

In much of the earlier literature it was argued that capital flow restrictions alone can be welfare reducing (e.g., Fischer 1998) while more recent literature (Korinek 2010; Bianchi 2011) showed that carefully calibrated MPP can increase welfare under certain circumstances. Technically, one MPP tool to deal with cross-capital inflows involves the ratio of foreign-currency debt: for example, restricting agents to borrow in foreign currencies, especially mortgage loans, or higher requirements for the foreign reserve ratio of commercial banks (Frankel 2015).

## **4.2 Macprudential Policy Implementations in East Asia and Other Emerging Market Economies**

Appendix 4 shows capital inflow and outflow openness of the selected countries (Schindler’s index), along with the IMF’s macroprudential index (MPI). There is an interesting pattern across different regions: in East Asia, although some economies became more restrictive toward capital flows after the Asian crisis in 1997, MPPs were strengthened, both after the Asian crisis and the start of quantitative easing in advanced economies. Latin American countries, especially Brazil, reacted to quantitative easing spillover by restricting capital flows, especially outflows. Economies in Central and Eastern Europe loosened capital flow restriction but strengthened MPP measures.

Pradan et al. (2011) summarized the tools of MPP and CFM of selected East Asian countries, along with their motivation and objectives. They found that (i) the MPP and CFM stances vary significantly among East Asian countries, partly due to the fact that some East Asian economies (such as Hong Kong, China and Singapore) with an open capital account and an exchange rate targeting and/or currency board system cannot have independent monetary policy (“impossible trinity”). These countries mostly used MPP instruments, such as caps on LTV ratios and debt-to-income (DTI) ratios, as well as tax measures. The Republic of Korea, an East Asian economy with relatively high financial development, has been an active user of both MPP and CFM. Banks in the Republic of Korea have high exposure to short-term external debt because of growing demand for foreign exchange derivative transactions. Financial imbalances have emerged among domestic banks as well as in foreign exchange transactions, along with the housing boom. Thus, the Republic of Korea implemented MPPs for property financing. It also imposed a levy on bank non-deposit foreign exchange liabilities and a ceiling on bank foreign exchange derivative positions to deter speculative flows. Korea also implemented the CFM measure to deter foreign fund flows into their bond market.

On the other hand, developing East Asian economies such as the People’s Republic of China and India have a relatively closed capital account, which has enabled them to rely heavily on traditional monetary policy tools like reserve requirement ratios and some housing measures. The economies of the Association of Southeast Asian Nations (ASEAN) have relied on a mixture of traditional monetary policy tools, MPP, and CFM, which can complement each other. Indonesia and Thailand introduced restrictions on non-residence access to the domestic bond market, minimum bond holding periods, and withholding tax on bonds as part of their CFMs.

## 5. EMPIRICAL ANALYSIS

### 5.1 Data: Sources and Summary Statistics

Appendix 1 lists our sample countries and their regional classifications. Most importantly, our baseline East Asian countries are current members of ASEAN and the so-called “four tigers.” We exclude the PRC as a unique case (very fast growth and restricted financial activities) and Hong Kong, China because it is classified as a tax haven by the Organisation for Economic Co-operation and Development (OECD), and because it provides a loophole of speculative money in and out of the People’s Republic of China. This makes our baseline East Asian economies as follows: Brunei Darussalam; Cambodia; India; Indonesia; the Republic of Korea; Lao People’s Democratic Republic; Malaysia; Myanmar; the Philippines; Singapore; Taipei, China; Thailand; and Viet Nam. This is based primarily on ASEAN plus Singapore and the Republic of Korea, which were affected by capital inflows after the quantitative easings. We excluded the People’s Republic of China because its domestic financial market is heavily regulated and highly distorted, and its capital market is still very closed—therefore, there is strong pressure to circumvent the restriction to invest in foreign countries for higher returns. We did not include Hong Kong, China because it is a global banking center, often acting as a gateway of the People’s Republic of China’s capital inflow and outflow, and it is designated as a tax haven by the OECD.

**Table 1: Summary Statistics of Key Variables**

Growth per Region				Quinn’s Capital Openness Measure			
	2000	2005	2012		2000	2005	2012
Baseline East Asia	7.0	6.4	5.1	Baseline East Asia	52.9	53.8	72.2
Developing Europe	5.4	7.3	2.5	Developing Europe	60.3	67.4	85.4
Latin America	2.8	4.9	2.9	Latin America	79.7	77.1	77.9
South Asia	5.5	5.3	5.9	South Asia	40.0	37.5	41.7
MENA	4.5	5.7	9.9	MENA	58.7	64.4	73.2
Sub-Saharan Africa	3.5	5.2	3.7	Sub-Saharan Africa	59.0	59.0	71.6
Non-OECD Members	4.1	5.5	4.3	Non-OECD Members	97.2	97.2	98.9
OECD Members	4.3	2.5	0.0	OECD Members	61.5	62.2	73.5
Macprudential Index				Institutional Quality			
	2000	2005	2012		2000	2005	2012
Baseline East Asia	1.1	1.9	2.8	Baseline East Asia	-0.2	-0.1	0.0
Developing Europe	0.9	1.6	2.7	Developing Europe	-0.2	-0.5	-0.4
Latin America	1.9	2.7	3.2	Latin America	-0.3	-0.6	-0.6
South Asia	1.8	2.5	3.3	South Asia	-0.6	-0.6	-0.5
MENA	1.6	1.9	2.8	MENA	-0.4	-0.1	-0.1
Sub-Saharan Africa	0.8	1.0	1.4	Sub-Saharan Africa	-0.7	-0.5	-0.6
Non-OECD Members	1.3	1.9	2.6	Non-OECD Members	-0.5	-0.5	-0.5
OECD Members	0.9	0.9	1.8	OECD Members	1.4	1.3	1.4

MENA = Middle East and North America, OECD = Organisation for Economic Co-operation and Development.

Note: For institutional quality, a higher number means better quality.

Sources: Authors’ calculation based on the World Bank’s *World Development Indicators*; Quinn’s Capital Openness Measure; Macprudential Index by the International Monetary Fund; and Institutional Quality (see main text for definition).

To get a better perspective, rather than simply focusing on East Asia, we compare other EMEs for key macroeconomic and institutional variables in Table 1. These groups are mutually exclusive, i.e., a country belongs to only one regional group. The definition of “developed” and “developing (EME)” countries follows the World Bank’s definition. For the rest of this paper, we chose Latin American countries (see Appendix 1 for the full list) for the comparison group. As commonly known, baseline East Asia enjoyed a constant relatively high growth over the sample period, while its capital openness is lower and its institutional quality is better than other developing countries. As Cerutti, Claessens, and Laeven (2015) pointed out, the MPP is used more often in developing countries than in advanced countries (see Table 1, lower left panel).

In Table 2, we show the correlation of key variables on the cross-section basis as of 2005. Capital openness measures have a high correlation with institutional quality. In particular, the correlation with the legal institutional quality is as high as about 0.5 for both Quinn and Chinn–Ito’s capital openness measures. Financial openness has been documented to have a close connection with governance. For this reason, we analyze the role of capital openness separately from governance.

**Table 2: Correlation of Capital Openness, Governance, and Real GDP per Capita**

	Quinn	Chinn–Ito	WB–EDB	MPI	Fin. Depth	RGDPPC
Quinn’s Measure: Capital Openness (Quinn)	1.00					
Chinn–Ito Capital Openness Index	0.91	1.00				
Government Effectiveness (WB–EDB)	0.52	0.46	1.00			
Macroprudential Index (MPI)	–0.54	–0.42	–0.34	1.00		
Financial Depth	0.51	0.50	0.83	–0.29	1.00	
Real GDP per Capita	0.51	0.50	0.83	–0.29	0.35	1.00

GDP = gross domestic product, WB–EDB = World Bank—Ease of Doing Business.

Source: Authors.

## 5.2 Variables

We used a panel regression model with annual data covering the period 2001–2013 for Asian EMEs (excluding low-income countries with an income per capita of less than US\$1,460 per year as defined by the World Bank). Appendix 2 lists the variables, definitions, and the sources.

### 5.2.1 Cross-Border Borrowing in Foreign Currency (Dependent Variable)

Our dependent variables are annual change of cross-border lending in foreign currencies (in net terms) and exchange rate-adjusted change. The source is a confidential version of the BIS locational banking statistics. This dataset comprises loans—both in gross and net terms—of BIS reporting banks to the rest of the world (on a country level). We use the residential base version of cross-border lending data, which is broken down by currencies (lender’s currency versus borrower’s currency). In our analysis, we used the BIS reporting banks’ cross-border lending to Asian EMEs in lender’s currency (i.e., for borrowing EMEs, it is a foreign currency).

The original source is on a quarterly basis, but because quarterly frequency data for other key variables (especially the governance and capital openness data)<sup>4</sup> were lacking, we summed the change over four quarters and defined it as an annual change. The data enable us to break down, among other things, currency composition (i.e., lender's currency versus borrower's currency) of bank lending. Since interbank lending and/or borrowing contains overnight market activities, or to cover the cash shortage on a very short-term basis, we focus on cross-border lending to non-bank sectors in the lender's currency. In what follows, we explain the variables of interest.

We assume that, other things being equal, countries with strong institutional settings will attract more capital (because of more reliable rule of law, enforcement of contracts, etc.).

### 5.2.2 Currency Valuation

Exchange rate appreciation would also make the borrower's currency stronger vis-à-vis the borrowing currencies, thus a borrower has more incentive to borrow in lender's currency, while a lender has more incentive to lend as the borrower's balance sheet (asset side) looks strong.<sup>5</sup>

However, when the home currency depreciates, a currency crisis occurs and companies and household become over-leveraged.

Although there is no consensus on how to measure the "equilibrium" value of exchange rates, the traditional approach to gauge real exchange rate overvaluation is as follows:

$$\ln (RER_{i,t}) = \ln \frac{XRAT_{i,t}}{PPP_{i,t}} \quad [1]$$

$XRAT$  is the nominal exchange rate, and  $PPP$  is the purchasing power parity conversion factor (both from the World Bank's World Development Indicators database). The rough interpretation is that if the log of the ratio of nominal exchange rate (local currency per foreign) to  $PPP$  conversion factor is greater than 0, the currency is undervalued, and vice versa. However, this suffers from the Balassa–Samuelson effect (Frankel 2006), which is one of the first studies to stress the importance of including the GDP per capita into the exchange rate valuation. Thus, following Frankel (2006) and Rodrik (2008), we regress this traditional measure of overvaluation on real GDP per capita (in natural logs) with year fixed effects in panel-data setting, and take the error term  $\varepsilon$  as the measure of undervaluation:

$$\ln \left( \frac{XRAT_{i,t}}{PPP_{i,t}} \right) = \alpha + \beta \ln(RGDPCH_{i,t}) + \gamma_t + \varepsilon_{i,t}, \quad [2]$$

$RGDPCH$  is GDP per capita. We confirm that the error term is normally distributed. We define negative values of the residual as the degrees of undervaluation after controlling for the Balassa–Samuelson effect. Since we are interested in the effect of overvaluation, we use  $-\varepsilon_{i,t}$ , as our measure of overvaluation.

<sup>4</sup> The Quinn's openness measure is based on the qualitative information of the IMF's Annual Report on Exchange Arrangement and Exchange Restrictions, which measures the financial openness as of the end of the respective year. This makes conversion of the annual data to quarterly data quantitatively difficult. Also, empirically, this means that it is appropriate to take one lag for the capital openness measure.

<sup>5</sup> Shin (2015) pointed out that exchange rate appreciation is becoming expansionary, not contractionary as the traditional Mundell–Fleming model claims, because the financial channel is dominating the goods channel.

### 5.2.3 Macroprudential Index

Another key variable we brought into our model is the MPI developed by Cerutti, Claessens, and Laeven (2015). This dataset covers 119 countries over 2000–2013. The MPI covers many instruments such as loan-to-value ratio, reserve requirements, and debt-to-income ratio. We use the borrower-targeted macroprudential tool index (henceforth BTM), as it is heavily used in East Asia. The higher the MPI, the more macroprudential measures are in place and/or strictly implemented. This is based on the IMF's Global Macroprudential Policy Instruments survey of each country's executives (Cerutti, Claessens, and Laeven 2015). The MPI is the sum of a (different combination of) binary valuation of 12 tools (LTV, DTI, etc.). As mentioned above, EMEs employ MPIs more frequently than advanced countries, and MPIs are less effective for countries with more open and deeper financial markets (as one will find in advanced economies), because there is more room for regulatory arbitrage, i.e., investors simply investing somewhere else. This is also in line with the argument of Engel (2015), who stressed the importance of international coordination in macroprudential policies. However, the very nature of MPP—tied to the economic cycle of an individual country—makes it very difficult to coordinate the policy across countries. Although Cerutti's database was the first attempt to comprehensively quantify macroprudential measures, it has some shortcomings, which may be improved in future versions. First, it only targets domestic (residence based) banks (not insurance companies, hedge funds, shadow banking, etc.). Second, it is a binary variable (1 when the measure is in place, 0 otherwise), so it fails to capture the reach and depth of its implementation and enforcement, let alone efficacy.<sup>6</sup> Various MPP measures were taken in East Asian EMEs, in different forms, and often combined with capital flow measures, but LTV is the most frequently used measure in East Asia (for details, see Lee, Asuncion, and Kim 2015).

Macroprudential policies can be divided into borrower-based (caps on LTV and DTI ratio) and lender-based, but it has been shown that for East Asia, borrower-based income has been used extensively and showed some impact (Cerutti, Claessens, and Laeven 2015; Bruno, Shim, and Shin 2015).

### 5.2.4 Institutional Quality Database

Among the various indicators for institutional quality, the most popular one is the International Country Risk Group database. But in 1997 the World Bank started issuing its own estimations of institutional quality (now called Ease of Doing Business [World Bank EDB]). It was published biannually until 2002, and annually thereafter. We use this World Bank measure as it is more focused on economic factors, rather than the International Country Risk Group index, which contains many other factors such as crime rate and ethnic tensions.<sup>7</sup>

The World Bank data consist of several components that mainly relate to business climate (getting credit, tax systems, etc.). Here, we use the government's effectiveness as strong legal framework and enforcement are relevant for overseeing and regulating, if necessary, cross-border lending. The indicator is compiled from many sources, such as the Economist Intelligence Unit and the Asian Development Bank, and defined as "capturing *perceptions* of the quality of public services, the quality of the civil service

<sup>6</sup> The measures developed by Bruno, Shim, and Shin (2015) also capture the scope of each instrument, but as the sample size is rather small (60 countries), we use the index of Cerutti, Claessens, and Laeven (2015).

<sup>7</sup> That said, there is a very high correlation between these two measures. (The correlation between the principal component of ease of Doing BusinessT and our measure is 0.97).

and the degree of its independence from political pressures, the quality of policy formulation and implementation, and the credibility of the government's commitment to such policies" (World Bank, Doing Business). The credibility and commitment of public institutions are at the core of this index. This can also be interpreted as how prudent the government is perceived to be.

A strong institutional and governance framework helps MPPs to be more effective, as good governance would result in a healthy central bank, regulatory authorities, and relevant government institutions via strength of powers and clear accountability (IMF 2013). Numerous studies have been done on the positive relationship between good governance and per capita income growth especially for lower-income countries; however, to the best of our knowledge, no scholarly studies examine how institutional factors would safeguard financial stability. In Appendix 5, we present the mean and  $\pm 2$  standard deviations of baseline Asia and Latin America. On average, baseline Asia has higher government effectiveness, but perhaps because of a smaller sample size compared with Latin American countries, the standard deviation is higher for baseline Asia.

### 5.2.5 Other Variables

We also included other variables to control country-specific factors that affect cross-border foreign-currency borrowing by EMEs such as financial depth; the real interest rate differential from the United States benchmark rate; economic cycle; stock of foreign direct investment (FDI) per GDP; trade openness defined as (export + import)/GDP; global liquidity (source: BIS) defined as total credit outstanding of international banks; and VIX (the Chicago Board Options Exchange [CBOE] Volatility Index). The source and description are presented in Appendix 2.

## 6. MODEL

Because of the weakness of the MPI as discussed above, we included the government effectiveness index to measure a government's prudence. The basic idea is that a prudent government would closely monitor foreign-currency liabilities and take effective actions. Our model is as follows:

$$Y_{i,t} = \alpha_{i,t} + \beta_1 GovtEffective_{i,t} + \beta_2 Overval_{i,t} + \beta_3 Overval_{i,t} * GovtEffective_{i,t} + \beta Z_{i,t} + \varepsilon_{i,t} \quad [3]$$

$Y$  is the annual change in foreign-currency cross-border borrowing (exchange rate adjusted, BIS reporting banks' lending to sample countries in lender's currency) per GDP of the recipient country.

We used clustered standard errors (country level) to allow for unobserved correlation in errors within a country: if we do not control this, the standard errors would be underestimated and the significance overestimated (Baum, Nichols, and Schaffer 2011). We conducted a panel unit-root test to make sure that all the variables used are stationary. We divided samples into two time periods: (i) the pre-quantitative easing period (2001–2007, so-called "global saving glut" period); and (ii) the quantitative easing period (2008–2013). The sample period is divided this way because, before the GFC, capital was flowing from emerging economies to advanced economies (Lucas paradox), largely to the US, fueling housing bubbles, which was a major contributor to the GFC. As discussed, global liquidity after the quantitative easing started was still high, but it is a result of quantitative easing policy, so the source of global liquidity was



very different. Going further, global liquidity is likely to decline as the Fed’s monetary policy has been in a tightening cycle since December 2015. More importantly, after the quantitative easing started, the capital flow reversed—it is now flowing from advanced economies to EMEs.

Dividing our sample into these two periods gives us a clear picture of how EMEs coped with capital inflows as a result of quantitative easing. We looked at selected East Asian countries (“Baseline East Asia”) and Latin American countries (for comparison). We excluded banking centers and tax haven countries (Appendix 3) from our sample, as capital flows to these countries are driven by different motives, rather than macroeconomic fundamentals or institutions.

Second, we looked at the role of capital openness, using Quinn’s measure of capital openness.<sup>8</sup>

$$Y_{i,t} = \alpha_{i,t} + \beta_1 CAP_{i,t-1} + \beta_2 Overval_{i,t} + \beta_3 Overval_{i,t} * CAP_{i,t} + \beta Z_{i,t} + \varepsilon_{i,t} \quad [4]$$

Further, to test the effectiveness of macroprudential policy, we use the MPI (borrower’s component) by Cerutti, Claessens, and Laeven (2015).

$$Y_{i,t} = \alpha_{i,t} + \beta_1 Overval_{i,t} + \beta_2 MPI_{i,t} + \beta_3 Overval_{i,t} * MPI_{i,t} + \beta Z_{i,t} + \varepsilon_{i,t} \quad [5]$$

## 7. RESULTS

Table 3 presents the estimation results (columns 3 and 4 for pre-crisis and post-crisis East Asia, and columns 7 and 8 for Latin America). Interestingly, capital openness is negative, perhaps because this is *net* bank lending. One potential explanation is that countries with open capital markets like Singapore (a BIS-reporting country) was lending to other countries. Or, more capital-open countries have better governance (as we saw in the correlation table), so the respective government was taking measures to stop excessive capital inflows, which leads to an asset bubble. For the MPI, as we predicted from the shortcomings of the data discussed above, we did not get significant results. The coefficients of overvaluation and its cross-term with MPI–BTM are significant before the crisis, possibly indicating that the MPI was actively employed before the crisis in East Asia. Since we are interested in how our sample countries reacted to quantitative easing, we look at the second column. There, we can clearly see the negative correlation between government effectiveness and foreign-currency cross-border borrowing. Notably, the cross-term between overvaluation and government effectiveness has been negative and statistically significant for both regions since 2008. This indicates that the incentive to borrow in foreign currency when the home currency is strong was reduced probably because efficient governments take action against overborrowing.

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<sup>8</sup> We did not use the Chinn–Ito index because it is slow moving by design (because of its 5-year average calculation), and it does not capture the sudden change in capital flow management policy, which frequently occurred during this period. Since the IMF’s Annual Report on Exchange Arrangements and Exchange Restrictions, on which Quinn’s measure is based, takes the snapshot of capital openness at the end of the year (December every year), we take a lag of capital openness.

**Table 3: Cross-Country Foreign Currency Borrowing and the Role of Good Governance and Capital Openness**

	[1]	[2]	[3]	[4]
	<b>Baseline Asia Pre-crisis</b>			
Exchange rate overvaluation	0.00615 [.9393]	0.00871 [1.074]	0.00505 [.4148]	0.0200 [.6874]
Government effectiveness	-0.00508 [-1.569]	-0.00779** [-2.263]		
Overvaluation x Government effectiveness	0.00164 [.2866]	-0.0189** [-1.974]		
Quinn's capital openness (1 lag)			-0.000119* [-1.791]	-0.0000807 [-.6344]
Overvaluation x Quinn's capital openness (1 lag)			0.0000386 [.1934]	-0.000428 [-.7332]
Financial depth	0.0000474 [1.227]	0.000104*** [3.281]	-0.0000363 [-1.242]	0.0000385 [1.287]
Interest rate difference from the US real interest rate	0.000121 [.5008]	0.000106 [1.239]	-0.0000791 [-.5839]	0.000127 [.2708]
Cycle (HP filtered)	0.177* [1.781]	0.0267 [.4919]	0.142 [1.296]	0.0990* [1.83]
FDI per GDP	0.0000136 [.5503]	0.0000678*** [2.812]	0.0000321 [.9941]	-0.0000124 [-.2617]
Trade Openness (EX+IM)/GDP	0.00000779 [.646]	-0.0000716*** [-4.022]	-0.0000126 [-.7218]	-0.0000157 [-.539]
Global Liquidity	0.00230 [.7563]	0.0102 [.9556]	0.00590 [1.477]	0.0132 [.7094]
VIX	-0.000347 [-1.512]	-0.00162 [-.9399]	0.0000215 [0.1065]	-0.00192 [-.6882]
Number of observations	63	40	64	30
R-squared	0.2866	0.2269	0.29	0.2085
	[5]	[6]	[7]	[8]
	<b>Latin America Pre-crisis</b>			
Exchange rate overvaluation	-0.0173 [-1.01]	-0.198** [-2.155]	0.0119 [.9112]	-0.0265 [-.3333]
Government effectiveness	0.00691 [.6764]	-0.00209 [-.075]		
Overvaluation x Government effectiveness	0.0135 [.7469]	-0.402*** [-2.956]		
Quinn's capital openness (1 lag)			-0.00000408 [-.0372]	-0.000632** [-2.078]
Overvaluation x Quinn's capital openness (1 lag)			0.00000495 [.0336]	0.000444 [.3713]

*continued on next page*

Table 3 continued

	[5]	[6]	[7]	[8]
	<b>Latin America Pre-crisis</b>			
Financial depth	0.000138 [.3954]	0.000328 [.3513]	0.000160 [.7414]	-0.000402 [-1.096]
Interest rate difference from the US real interest rate	-0.000102 [-.3819]	-0.000372 [-.4387]	-0.0000807 [-.3803]	0.00191** [2.525]
Cycle (HP filtered)	0.133 [.8202]	0.0760 [.2004]	0.00973 [.1046]	-0.380 [-.5783]
FDI per GDP	0.00000620 [.0516]	0.000117 [.4348]	0.000231 [.8417]	0.000655 [1.154]
Trade Openness (EX+IM)/GDP	0.0000892 [.5917]	-0.000101 [-.2596]	0.000151 [1.011]	0.00147*** [4.019]
Global Liquidity	0.00678 [.7523]	0.0292 [.7572]	0.00300 [.3872]	-0.00536 [-.4698]
VIX	-0.00129 [-1.373]	-0.00448 [-.9272]	-0.00136 [-1.233]	-0.00224* [-1.862]
Number of observations	132	85	132	53
R-squared	0.0816	0.372	0.1446	0.6341

Cycle (HP filtered) = HP-filtered cycle of log of real GDP in local currency term (lambda: 6.25), EX = export, FDI = foreign direct investment, Financial depth = domestic private credit to the real sector by deposit money banks as percentage of local currency, GDP = gross domestic product, IM = import, VIX = CBOE Volatility Index.

Notes:

1. t statistics in brackets.

2. \*\*\*, \*\*, \* denote statistical significance at 1%, 5%, and 10% level, respectively.

3. Raw data from the World Bank; Bank for International Settlements; International Monetary Fund-International Financial Statistics; Federal Reserve Economic Data database; Organisation for Economic Co-operation and Development; Dharmapala and Hines (2006); and Cerutti, Claessens, and Laeven (2015).

Source: Authors.

Table 4: Cross-Country Foreign Currency Borrowing and the Role of Macroprudential Index

	[1]	[2]	[3]	[4]
	<b>Baseline Asia</b>		<b>Latin America</b>	
	<b>Pre-crisis</b>	<b>After Crisis</b>	<b>Pre-crisis</b>	<b>After Crisis</b>
Overvaluation	0.0101* [1.702]	-0.00128 [-.1716]	-0.00445 [-.3389]	0.0511 [.8074]
MPI-BTM (Borrower targeted measure)	0.00431 [1.01]	-0.00113 [-.2173]	0.00470 [.9968]	0.00403 [.4823]
MPI-BTM x Overvaluation	-0.0177* [-1.706]	-0.00130 [-.2235]	0.0194 [.9287]	0.000373 [.0079]
Real interest rate difference from the US	0.000320** [2.083]	0.000146 [1.339]	-0.00000784 [-.0422]	-0.000578 [-1.317]
HP filtered cycle	0.164 [1.552]	0.0159 [.288]	0.315 [.7779]	0.0970 [.3392]
FDI per GDP	0.0000206 [.6761]	0.0000313 [.6469]	0.0000223 [.1327]	0.0000271 [.1097]

continued on next page

Table 4 continued

	[1]	[2]	[3]	[4]
	Baseline Asia		Latin America	
	Pre-crisis	After Crisis	Pre-crisis	After Crisis
Trade (EX+IM)/GDP	-0.0000360 [-1.501]	-0.0000502 [-1.058]	-0.0000235 [-.2981]	-0.0000412 [-.295]
Financial depth	-0.0000655 [-.8639]	0.0000634 [.7187]	-0.000386 [-1.208]	-0.000450 [-.7609]
log(logal liquidity)	0.00433 [1.191]	0.0113 [.8392]	0.00463 [.5754]	0.0515 [1.01]
VIX	-0.0000637 [-.5255]	-0.00190 [-.8081]	0.000166 [1.038]	-0.00596 [-.9354]
R-squared	0.3581	0.1987	0.1057	0.1101
Observation	64	36	94	54

Cycle (HP filtered) = HP-filtered cycle of log of real GDP in local currency term (lambda: 6.25), EX = export, FDI = foreign direct investment, Financial depth = domestic private credit to the real sector by deposit money banks as percentage of local currency, GDP = gross domestic product, IM= import, VIX = CBOE Volatility Index.

Notes:

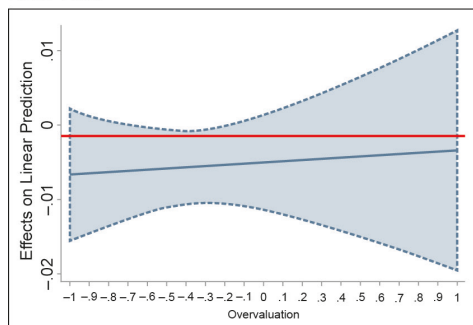
1. t statistics in brackets.
2. \*\*\*, \*\*, \* denote statistical significance at 1%, 5%, and 10% level, respectively.
3. Raw data from the World Bank; Bank for International Settlements; International Monetary Fund-International Financial Statistics; Federal Reserve Economic Data database; Organisation for Economic Co-operation and Development; Dharmapala and Hines (2006); and Cerutti, Claessens, and Laeven (2015).

Source: Authors.

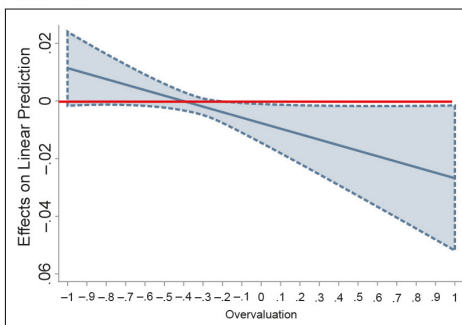
Figure 4: The Coefficients of Interactive Term (overvaluation × governance)

East Asian Countries

2000–2007

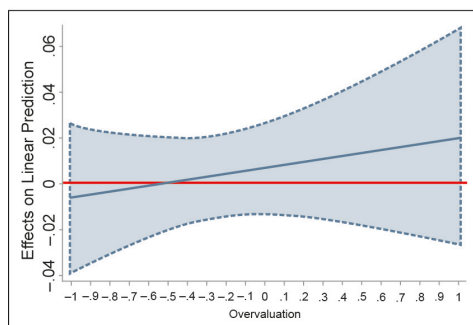


2009–2014

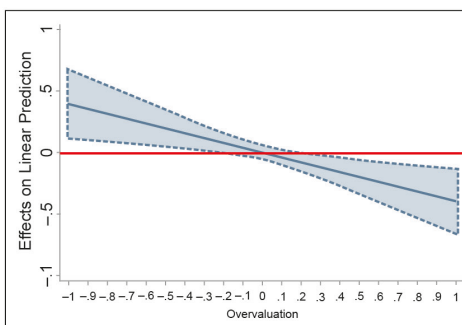


Latin American Countries

2000–2007



2009–2014



Source: Authors.

Interpreting the coefficients on cross-terms of two continuous variables—governance and overvaluation—requires caution, as the coefficients would change as the value of either continuous variable changes. To check this, we drew a scatter plot (Figure 4). The line denotes the coefficient, and the x-axis and y-axis denote two continuous variables. The dotted line shows values of two standard deviations. From the graph, the significance is clearly robust to different values of either one of the continuous variables. This means that more effective governments curbed cross-border foreign-currency borrowing. Government effectiveness itself was only significant for East Asia after the crisis, indicating a more proactive approach on the government side. For the MPI, we observed a significant effect only before quantitative easing for East Asia. This may be a result of the government's ongoing effort to prevent a repeat of the 1997 Asian financial crisis. Before the GFC, East Asia was facing high pressure of capital inflow because of its robust economic growth. But this needs further examination.

## 8. CONCLUSIONS AND POLICY IMPLICATIONS

In this paper, we looked into the role, governance, and macroprudential measures to deal with cross-border bank lending to EMEs against the backdrop of quantitative easing of advanced economies. In this context, we paid particular attention to the effect of quantitative easing-related capital inflows on exchange rate valuations and foreign-currency borrowing of EMEs. We also investigated the role of institutions to curb overborrowing in foreign currencies. Our key findings are as follows: (i) After the GFC, there is a clear indication that a more effective government can curb foreign-currency borrowing; this holds in East Asia and Latin America; and (ii) East Asian countries have been more proactive in responding to excessive credit buildup, i.e., the overvaluation effect on foreign-currency borrowing. The policy implication is that, since East Asia has a higher score in government effectiveness, it is less likely, especially compared with Latin American countries, to suffer from the negative result of overborrowing (currency mismatch, sudden stop, balance-of-payment crisis, etc.) in the near future.

In sum, countries with good governance and the right macroprudential measures in place are less likely to suffer from currency mismatch as well as deleveraging as a result of overborrowing in foreign currencies.

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## APPENDIX 1: SAMPLE DATA COUNTRIES

Baseline East Asia	Latin America	
Brunei Darussalam	Argentina	Guyana
Cambodia	Barbados	Honduras
India	Belize	Jamaica
Indonesia	Brazil	Mexico
Lao People's Democratic Republic	Chile	Nicaragua
Malaysia	Colombia	Panama
Myanmar	Costa Rica	Paraguay
Philippines	Dominica	Peru
Republic of Korea	Dominican Republic	St. Vincent and Grenadines
Singapore	Ecuador	Suriname
Taipei, China	El Salvador	Trinidad and Tobago
Viet Nam	Grenada	Uruguay
	Guatemala	Venezuela

Source: Authors' compilation.

## APPENDIX 2: VARIABLES AND DATA SOURCES

Variable	Description	Source
Net foreign currency borrowing	Exchange rate adjusted change in net cross-border borrowing from BIS reporting bank countries in lender's currency, on residential basis.	BIS Locational Banking Statistics
Overvaluation	See equation [1] in the main text for the definition	Calculated based on data from the World Bank WDI
Government Effectiveness	Government effectiveness captures perceptions of the quality of public services, the quality of the civil service and the degree of its independence from political pressures, the quality of policy formulation and implementation, and the credibility of the governments commitment to such policies.	The World Bank's Ease of Doing Business
Financial Depth	Domestic private credit to the real sector by deposit money banks as percentage of local currency GDP	World Bank WDI
Interest Rate relative to US	Real interest rate of home country minus US real interest rate	IMF-IFS
HP-filtered cycle	HP filtered cycle of log of real GDP in local currency term (lambda: 6.25)	World Bank WDI
FDI/GDP	Inflow of FDI divided by GDP	World Bank WDI
(EX+IM)/GDP	Exports and Imports divided by GDP (Trade openness)	World Bank WDI
Log (Global Liquidity)	Global credit it aggregates (banks + nonbanks)	BIS Global liquidity database
VIX	CBOE Volatility Index	FRED database
Offshore	Offshore market according to OECD definition	OECD
Tax Haven	Tax Haven	Dharmapala and Hines (2006)
MPIBTM	Borrower targeted macroprudential measure	Cerutti et al. (2015)

BIS = Bank for International Settlements, WDI = World Development Indicators, US = United States, IMF = International Monetary Fund, IFS = International Financial Statistics, HP = Hodrick-Prescott, GDP = gross domestic product, FDI = foreign direct investment, VIX = Implied volatility of S&P500 index, CBOE = Chicago Board Options Exchange, FRED = FRED economic data by the Federal Reserve Bank of St. Louis, OECD = Organisation for Economic Co-operation and Development, MPIBTM = Borrower targeted macroprudential measure.

Source: Authors' compilation.

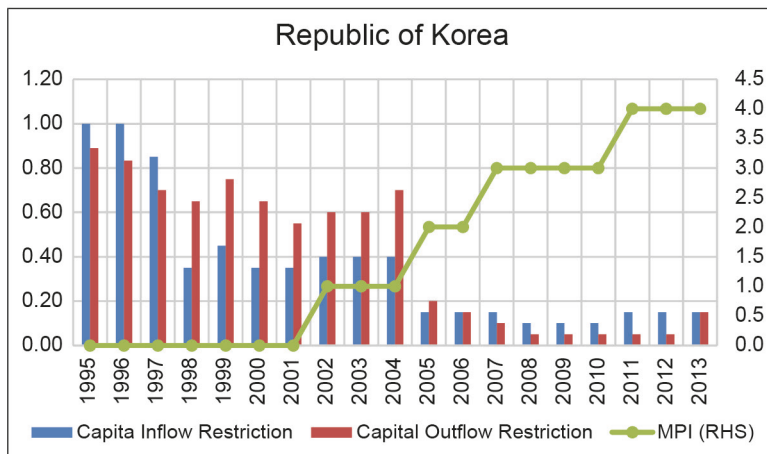
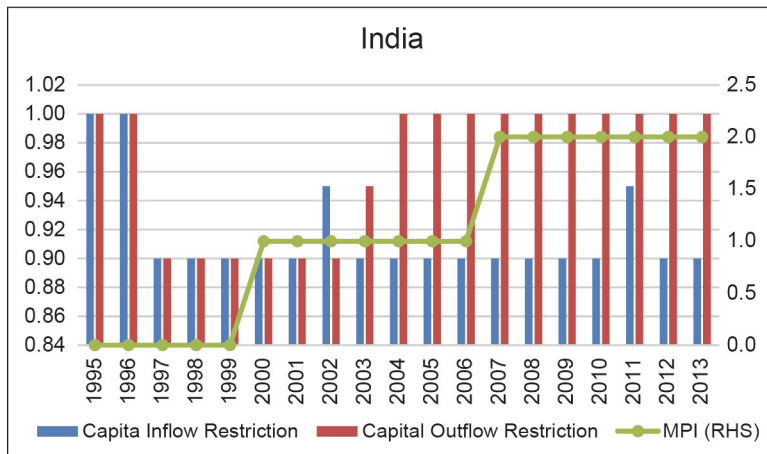
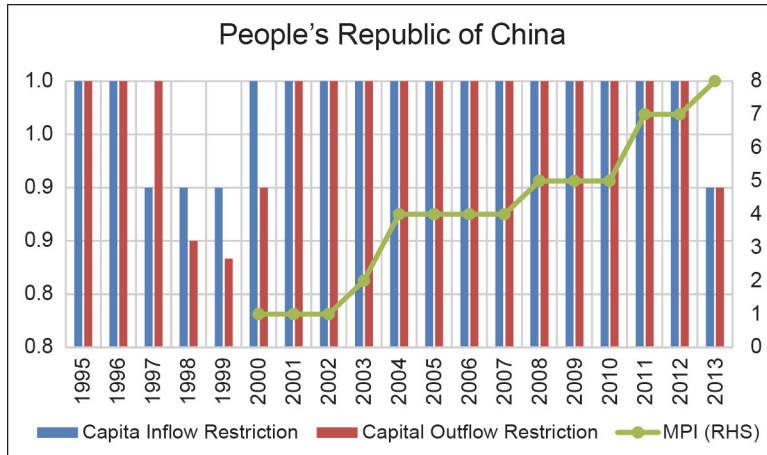
### APPENDIX 3: LIST OF TAX HAVENS AND BANKING CENTER COUNTRIES

	<b>Tax Havens</b>	<b>Banking Center</b>
Andorra	Lebanon	Ireland
Anguilla	Liberia	Liberia
Antigua and Barbuda	Liechtenstein	Luxembourg
Bahamas	Luxembourg	Malta
Bahrain	Macao	Panama
Barbados	Maldives	Samoa
Belize	Malta	Salomon Ireland
Bermuda	Marshall Islands	Singapore
British Virgin Islands	Monaco	South Sudan
Cayman Islands	Montserrat	St. Kitts and Nevis
Channel	Netherlands Antilles	Switzerland
Cook Islands	Panama	Tuvalu
Cyprus	St. Kitts and Nevis	Vanuatu
Dominica	St. Vincent and Grenadines	
Gibraltar	Seychelles	
Grenada	Singapore	
Hong Kong, China	Turks and Islands	
Ireland	Vanuatu	
Isle of Man		
Jordan		

Note: See Dharmapala and Hines (2006) for a definition of “tax havens” and Quinn et al. (2011) for “banking center.”  
Sources: Dharmapala and Hines (2006); and Quinn et al. (2011).

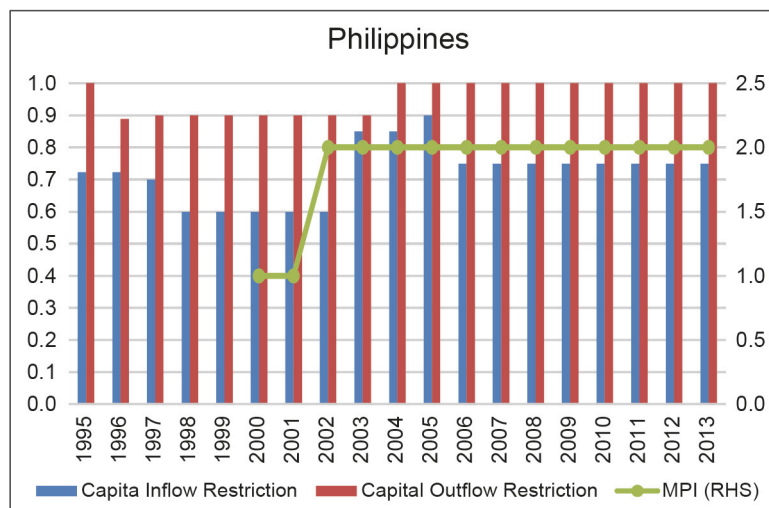
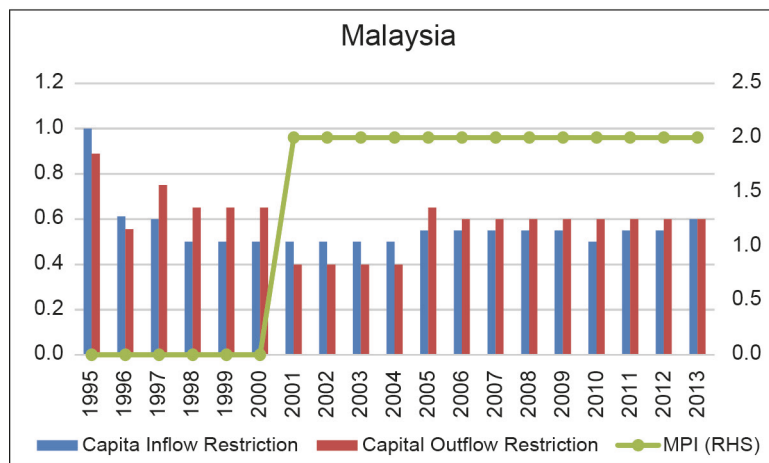
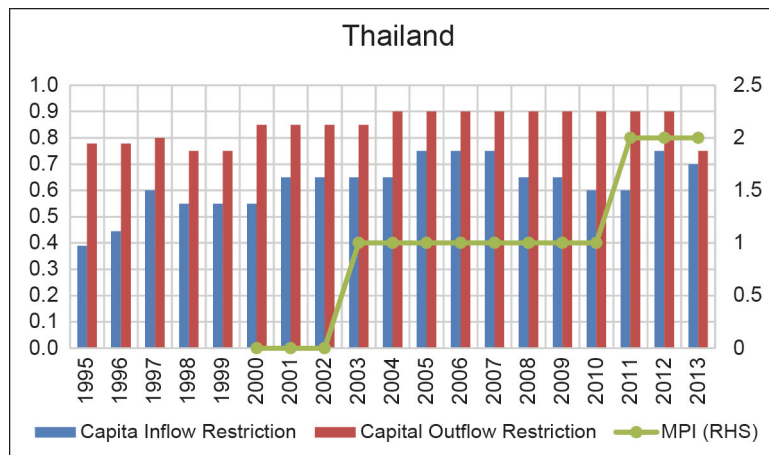
# APPENDIX 4: CAPITAL INFLOWS–OUTFLOW RESTRICTION MEASURES AND MACROPRUDENTIAL INDEX

## East Asia and India



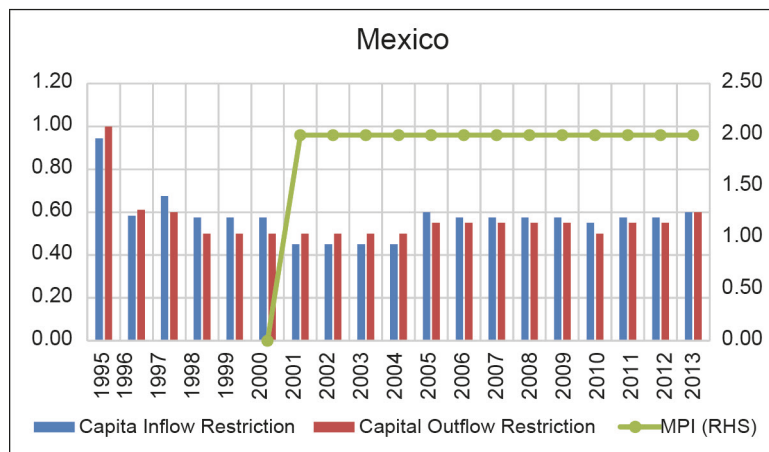
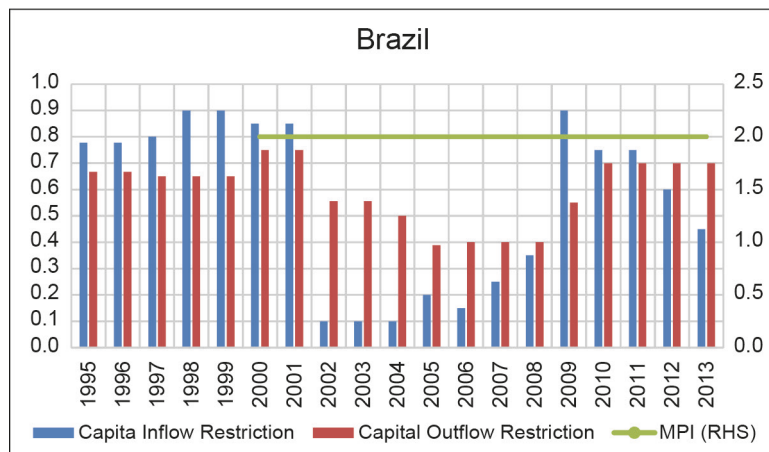
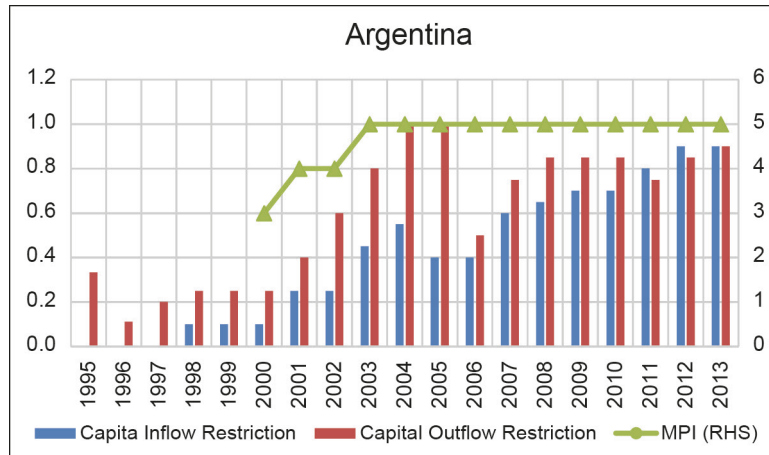
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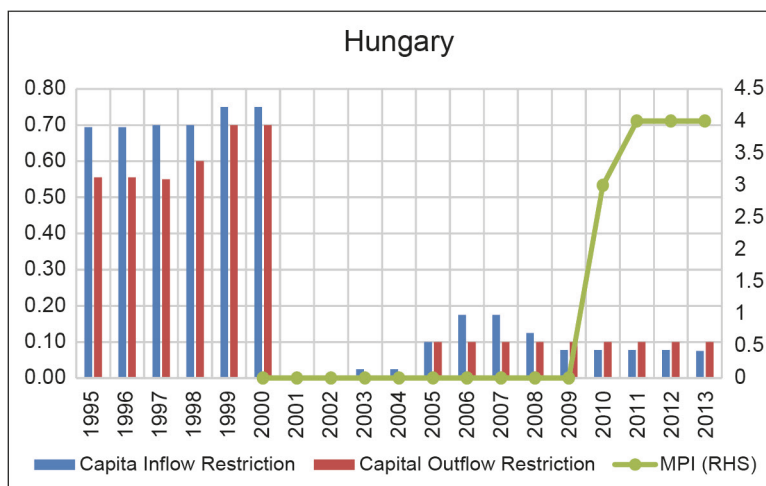
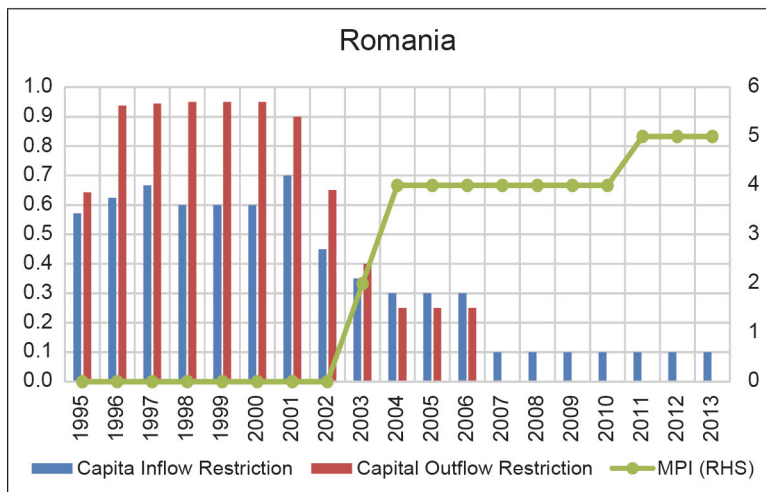
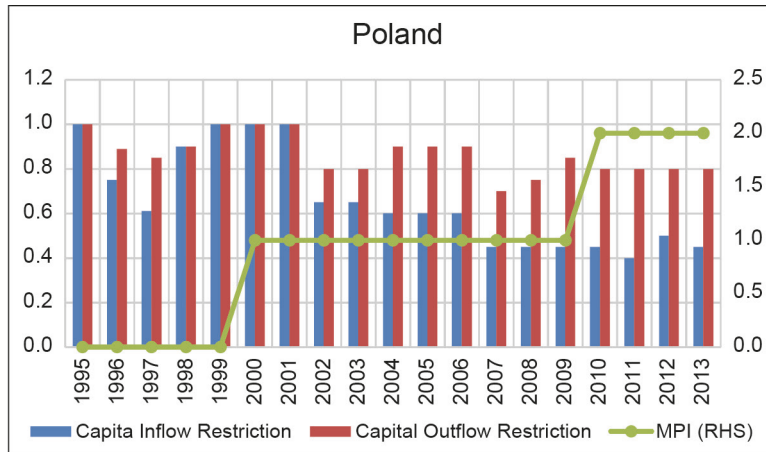
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### Latin America



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### Emerging Europe

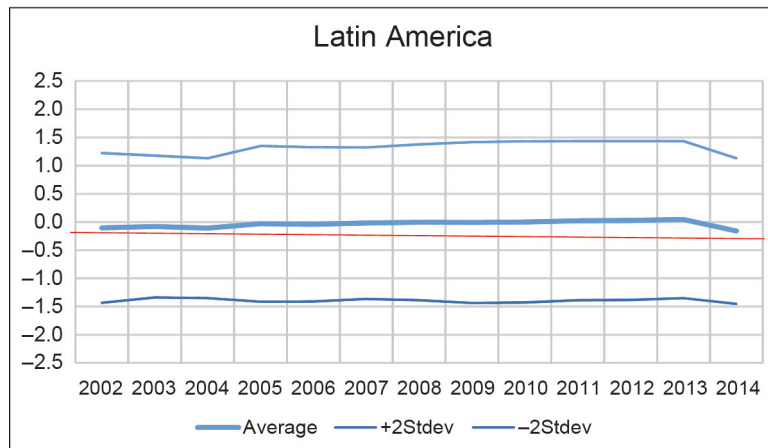
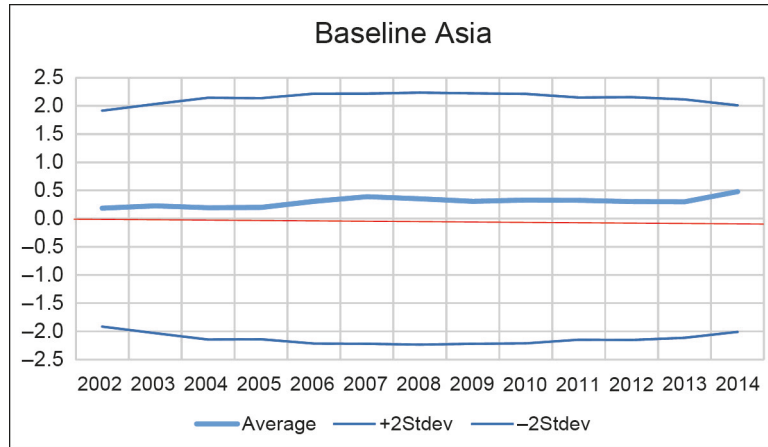


MPI = macroprudential index, RHS = right-hand side.

Note: Higher capital index corresponds to higher restriction.

Source: International Monetary Fund Schindler's Index and Macroprudential Index.

## APPENDIX 5: GOVERNMENT EFFECTIVENESS SCORES OF SAMPLE COUNTRIES (BASELINE ASIA AND LATIN AMERICA, MEAN AND $\pm 2$ STANDARD DEVIATIONS)



Source: Author's calculation based on the World Bank's Ease of Doing Business.