POLICY RESPONSES TO CAPITAL INFLOWS

IN EMERGING ASIA AND EUROPE MARKETS

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Policy responses to capital inflows: in emerging Asia and Europe markets

Abstract:

This thesis identified large net private capital inflows to emerging markets over last three decades and studied four policy responses towards these inflows, the policies are exchange rate policy, sterilization policy, fiscal policy and capital controls on inflows and outflows. Regions show different pattern in policy evolvement over time, emerging Asia keeps high intervention in exchange rate and high control over capital throughout time, emerging Europe originally had high foreign exchange market intervention and capital control but loosened them over the early 2000s, Nordic countries as sample for small and open advanced economy, remained their autonomy in exchange intervention, and have the lowest growth in government spending and lowest capital control. When seeking policy reaction that help preventing bad consequences of large private inflows, nonpolitical factors such as cumulative size and global output growth stand out as playing significant role, suggesting that effort not only put by specific country but global conditions correlate greatly with surges as trade and business getting globally integrated. However, discipline in government spending and less control over outflows seem to work with softer ending, and intervention in foreign exchange market is useful in limiting currency appreciation. To limit the cumulative size of capital inflow, capital control on both inflows and outflows helps.

Keywords:

Capital inflow, Emerging markets, Surge episodes, Policy responses

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I. Introduction

The effect of capital flows to emerging markets has long been a topic of political interest and a large literature had studied topics around in order to find proof or give guidance for emerging countries' practice towards large capital inflows.

Capital inflows are essential for emerging markets economic growth, as they bring credit, knowledge, and discipline to emerging markets (Tong and Wei, 2011). The access to foreign funds also enhances capital allocation efficiency and productivity (Ahmed and Zlate, 2014). However, capital inflows also bring about economic instability and political challenge. Large capital inflows could complicate the pursuit of appropriate macroeconomic policies to maintain solid economic growth without rising inflation (Ahmed and Zlate, 2014). The potential exchange rate appreciation could hurt export sector and competitiveness. In terms of inflow type, debt flows are more procyclical and volatile (Forbes and Warnock, 2012) and are significant contributor to domestic household and corporate sector credit booms (Igan and Tan, 2015), while both debt and equity inflows can contribute to bubbles in domestic asset markets (Hoggarth et al., 2016). In addition, episodes of large capital inflows are more likely to end in financial crisis and are often associated with large falls in output (Ghosh et al., 2016).

This thesis exams the capital inflows for emerging European and Asia markets over the last three decades (1985-2018). The first major inflows happened during 1990s and ended with Asia crisis in 1997, the second major inflows happened in early 2000s and ended when global financial crisis hit, then there were several smaller and more volatile inflows in last decade, with the endings influenced by US sovereign debt rating downgrade in 2011, and taper tantrum in 2013, see **Figure 1**. Capital inflows could benefit economic growth and investment diversity but also might led to overheating, exchange rate appreciation and hard landings (sharp decrease of economic growth). This study follows Roberto et al. 2009 but expanded study period for 14 years for a more comprehensive view about policy changes over history. Nordic countries are included here as a sample for small and open developed economies for contrast.

The policy responses between countries and decades range differently, but in general five tools are applied in emerging markets to mitigate untoward consequences after large

inflows: monetary (interest rate) policy, fiscal policy, exchange rate intervention, prudential measures, and capital controls (Ghosh et al. 2017). Prudential measures became more popular after the hitting of global financial crisis (GFS). Here four policies are studied (i.e. exchange rate intervention, sterilization, fiscal policy, and capital controls) to find their evolvement over time and efficacy.

This paper is organized as follows: in Section II, the data and methodology of identifying large net private capital inflow episodes is explained, along with the result and summary table; Section III explains four types of policy responses regarding large net private capital inflows, and results are demonstrated in regional dimension; Section IV links economic outcomes to policy changes before, during and after large capital inflows, and draws conclusions about empirical testing; Section V shows the limitation of this study and future research area; and Section VI is conclusion.

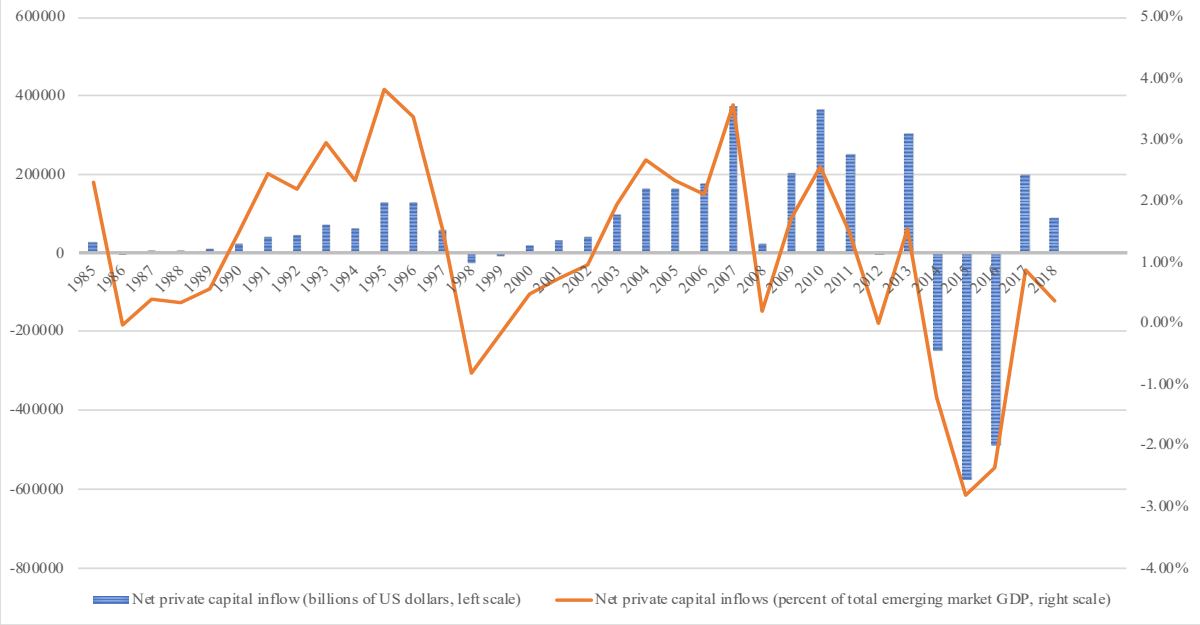
II. Net private capital inflow episodes

This study collects data that cover 28 countries -- 24 emerging countries and 4 nordic countries over 1985 to 2018 (list of countries in **Appendix**). Most data are collected through sources of IMF BOP (Balance of Payments), IFS (International financial Statistics), WEO (World Economic Outlook), GFS (Government Financial Statistics) and specific study papers (list of data source in **Data Source Table**).

The inflows studied here are private capital inflows, and the main indicator is net private capital to GDP ratio to allow comparison across time and countries. To construct this indicator, for each country selected, 1) under the Financial Account of Balance of Payment, subtract items under central banks and general government in Portfolio Investment and Other investment category, also subtract special drawing rights, to get the private flows; 2) sum the private flows in portfolio investment and other investment, together with (net) foreign direct investment, to get total net private capital flows for each country; 3) divide the flows to GDP so the results are comparable across countries; 4) multiply the result by -1 since the negative financial flows are net outflow of capital, thus to get net private capital inflow to GDP ratio series. As shown from **Figure 1**, five inflow periods are 1990-1997, 2001-2007, 2009-2011, 2013, and 2017-ongoing.

The first inflow period (1990-1997) had high relative capital ratios to GDP, and though most recent periods, i.e. 2009-2011, 2013, and 2017-ongoing inflow periods have large net private inflows in dollar value, the ratios to GDP are rather low. Also worth notice is that over 2014-2017 there were large net private capital outflows from emerging countries, this is the first large outflow periods over last three decades and it also had a very high ratio to GDP. This reflects that during 2014 to 2017 emerging countries were investing much more abroad than being invested, potential reason could be that with the development of selected emerging markets over time, their economic strength and accumulated capital allow them to diversity investment abroad and expanding business overseas. Further reasons could be an interesting topic for future study.

Figure 1. Net private capital inflows to emerging Asian and Europe markets



Source: BoP, WEO, and author's calculation.

In order to compare policy changes before, during and after large capital inflows, exceptional large inflow periods need to be identified. Two criteria are implemented to identify large ratios: first is country-specific criteria, to find ratios that are significantly larger than historical trend, second is region-specific criteria, to find ratios that are larger than regional threshold (Roberto et al., 2009). For each country, any year that meets one of the criteria is considered to be surge year, and continuous surge years made up an episode.

To plot out historical trend, Hodrick-Prescott (HP) filter is applied to net private capital inflow to GDP ratio series of each country, the smoothing parameter of 100 is used for annual data. Then ratio whose absolute difference from the trend is one standard deviation larger than history and itself larger than one percentage is considered out of line from the trend. For the regional dimension, an 80th percentile of threshold is applied here to both generate enough large ratio years and have enough years between two episodes. It happens that there be one gap year between two episodes, for those situations if the year in the middle has positive private capital to GDP ratio, then two episodes are combined to generate one single episode, but if the year in the middle has negative ratio, then the episodes whose cumulative size is smaller is abandoned. Using the methodology above, a total of 70 episodes are identified for sample countries between 1987 and 2018, see **Table 1**. The results are compared with Ghost et al. (2016), and found lot of overlapping for same countries.

An illustration is shown in **Figure 2**. For Bulgaria, year 1993 and 2007-2008 had ratio larger than one standard deviation of trend difference, while year 1993, 2000, and 2002-2008 had ratios larger than 80th of regional threshold. Year 2001 is in the middle of two episodes (2000 and 2002-2008) and has positive ratio, so those two episodes are combined for one 2000-2008 episode. Then for Bulgaria, two episodes are identified over last three decades, i.e. 1993 and 2000-2008. Compare the result with Ghost et al. (2016) surge episodes, they found Bulgaria surged in 1992-1993 and 2000-2008 over 1980 to 2014, which is similar to my finding.

An important outcome of episode is whether to have hard landing[1] or abrupt ending. Episodes are considered to end abruptly if the net private capital inflow to GDP ratio difference between the year after the episode end and the last year of the episode is larger than 5 percent (Mauro and Becker, 2005) or the end year is coincident with currency crisis for the specific country. The currency crisis for each country are identified using Luc and Fabian's Systemic banking crisis revisited (2018) dataset. A statistic summary of the episodes and ending outcomes are shown in **Table 2**.

From **Table 2** we can see that most private capital inflow episodes happened in the first two decades (54 out of 70), and episodes in the second decade (2001 to 2009) had the highest average cumulative size (31% of GDP), while the average size for all is 24%. Episodes happened during the first decade had longest duration (3 years), and median duration of all episodes is 2 years. Episodes happened during 2001 to 2009 are most likely to end abruptly, indicating the severity of global financial crisis and its quick effect of capital withdrawing out from emerging countries. In total 36 episodes ended abruptly, that is over half of all episodes, which suggests the quick reversal of inflow in face of undesired global condition and the vulnerability of capital inflow in this nature.

[1] A term is in pair with soft landing, originally from aviation, meaning sharp/smooth ending after rapid growth of economy.

III. Policy responses

After identifying large net private inflow episodes, the policy responses towards inflows over time and across country would be measured. To prevent the potential reversal of capital inflows, limit the extend of exchange rate appreciation, constraint domestic overheating and inflation, in general five tools are applied in emerging markets after large inflows: monetary (interest rate) policy, fiscal policy, exchange rate policy, prudential measures, and capital controls (Ghosh et al. 2017). And here exchange rate policy, sterilization, fiscal policy, and capital controls are studied.

A. Exchange rate policy

Large private capital inflows into a country often put appreciation pressure on its exchange rate, when facing such situation, the policy makers can choose a range of policies from flexible exchange rate (free floating) to intervention in foreign currency markets.

In impossible trinity theory, it's not possible to have all three political goals been met at the same time: a fixed exchange rate, free capital movement, and an independent monetary policy (Mundell 1968). So countries choose either to have fixed exchange rate but controls on capital movements (or dependent interest rate policy), or flexible exchange rate with free capital movements and independent monetary policy. How a country choose among goals varies in time and depends on its government ideology, recent study finds that exchange rate stability and monetary independence varies between developed and developing countries, and left-leaning governments seem to favour exchange rate stability over monetary independence in case of a negative output gap (Joscha Beckmann et al. 2017).

To find out the degree to which government resist exchange rate appreciation, an index of resistance is developed based on exchange market pressure index. Exchange market pressure (EMP) index is first created by Girton and Roper (1977), with a large literature defining different ways to calculate it, see Patnail et al. (2017). The basic idea is that the large foreign exchange came through capital inflows could be treated ranging from complete offset by accumulating reserves, to allow market moving freely leading currency appreciation. The EMP index consists of two parts, change in exchange rate and change in reserves.

1. Change in exchange rate

To calculate change in exchange rates for each country, first obtain the monthly exchange rate data from 1985 to 2018 through IFS (International Financial Statistics) database. Note that some of the emerging European countries studied here joined Eurozone and their exchange rates would change into Euro to USD rates after entry[2]. Also some emerging European countries start reporting from 1993 since newly establishment[3].

Second use monthly data, the year-over-year percentage change of nominal bilateral exchange rate of national currency to USD for country *i* in year *t* ($\Delta\%er_{i,t}$) is calculated as:

$$\Delta\%er_{i,t} = \frac{er_{i,t} - er_{i,t-1}}{er_{i,t}}$$

By using monthly data, here I mean for each year, there are 12 year-over-year bilateral exchange rate percentage changes regarding different months for each country. This is to ensure that in the next step, both denominator and numerator are using data from year-over-year changes.

Thirdly for each year *t*, calculate the standard deviation of year-over-year exchange rate change for all countries within each region *j* ($\sigma_{\Delta\%er_{j,t}}$), this is to prevent when some countries have very small standard deviations to inflate EMP index later. That is, for each year, all the 12 year-over-year percentage change of exchange rates of all countries within one region are gathered to get the regional deviation $\sigma_{\Delta\%er_{j,t}}$.

In this way the first component of exchange market pressure $\frac{1}{\sigma_{\Delta\%er_{j,t}}}\Delta\%er_{i,t}$, country *i* belongs to region *j*, is obtained.

[2] These include Finland from 1999, Slovenia from 2007, Slovak from 2009, Estonia from 2011, Latvia from 2014, Lithuania from 2015.

[3] Estonia, Latvia, Lithuania, Russia, and Ukraine are post Soviet Union countries; Czech and Slovak are post Czechoslovak countries; and Slovenia and Croatia are post Yugoslavia. They all report data from 1993.

2. Change in reserves

Similar method is adopted to calculate change in reserves. The year-over-year foreign reserves change $\Delta res_{i,t}$ for country *i* in year *t* is defined as (IMF, 2007):

$$\Delta res_{i,t} = \frac{NFA_{i,t} - NFA_{i,t-1}}{MB_{i,t-1}}$$

where NFA stands for net foreign assets, and MB stands for monetary base.

A main difficulty when calculating this indicator is that the data source IMF IFS Monetary Statistics Presentation had changed reporting method around 2009. So for countries and periods where new presentation (standardized reporting forms SRFs) is available (that is, most non-European countries after 2009), net foreign assets data is collected from line 11n (Monetary and financial accounts, Central banks, Net foreign assets)[4], and monetary base data is collected from line 14 (Monetary and financial accounts, Central banks, Monetary base). For countries within Euro Area, the two data series are collected under Euro Area reports[5].

For countries and periods when only old presentation (non-standardized reporting forms) is available, net foreign assets are calculated as Foreign assets minus Foreign liabilities. Foreign assets (line 11) and Foreign liabilities (line 14) are collected under monetary authorities reports, and monetary base are using Reverse money (line 16c) data also from Monetary Authorities section[6].

So for each of the two series (net foreign assets and monetary base), the monthly data from 1985 to 2018 are combined through the three sources, note that in overlapping years when more than one source data are available, the data are not quite in consistence, but since old presentation doesn't report after 2009, the data had to be collected from new presentation for the whole analysing vintage. The months when countries change into new presentation

[4] India miss net foreign assets data since Oct 2016, and "net foreign exchange assets of the banking sector" data is used taken from Reserve Bank of India.

[5] For monetary base only the euro area-wide-residency criteria data is available.

[6] Finland doesn't have reserve money data from monetary authorities but have data in foreign assets and foreign liabilities, so the three components under reserve money (i.e. Bankers deposits, Private sector deposits, and Currency outside banking institutions) is summed up together to use as reserve money series.

data is recorded in Table 3. Note that for periods when only quarterly or half-yearly NFA or MB data is reported, the monthly data is filled using linear method[7].

Apply the same method as change in exchange rate, for each year *t*, the regional standard deviation $\sigma_{\Delta res_{j,t}}$ for region *j* is calculated using all countries' year-to-year change in reserves values in one region. Thus, the change in reserves part $\frac{1}{\sigma_{\Delta res_{j,t}}}\Delta res_{i,t}$, country *i* belongs to region *j*, is obtained.

3. EMP and index of resistance

Combining the two components of EMP, the index is defined as (IMF, 2007):

$$EMP_{i,t} = \frac{1}{\sigma_{\Delta\%er_{j,t}}}\Delta\%er_{i,t} + \frac{1}{\sigma_{\Delta res_{j,t}}}\Delta res_{i,t}$$

where country *i* belongs to region *j*. The idea is that for a free float, no intervention is applied by authorities, and that all exchange market pressures are reflected from exchange rate change. And for a peg, the exchange rate wouldn't change, and exchange market pressure is reflected entirely by cumulation of reserves.

The EMP index for three regions is shown in **Figure 3**. Among the three regions, emerging Asia has the highest exchange market pressure, this region remains strong reserves throughout time which offset negative change in exchange rate. Emerging Europe has less reserves and its EMP fluctuates more with change in exchange rate, especially during second decide of episode period, the negative change in exchange rate couldn't be offset and resulted in negative EMP, also the ratio of change in reserve grew much smaller in the latest decade. For Nordic region, EMP fluctuates mainly with change in exchange rate.

Following Roberto et al. (2009), to measure the degree to which authorities resist the currency appreciation pressure, the index of resistance to EMP is calculated as:

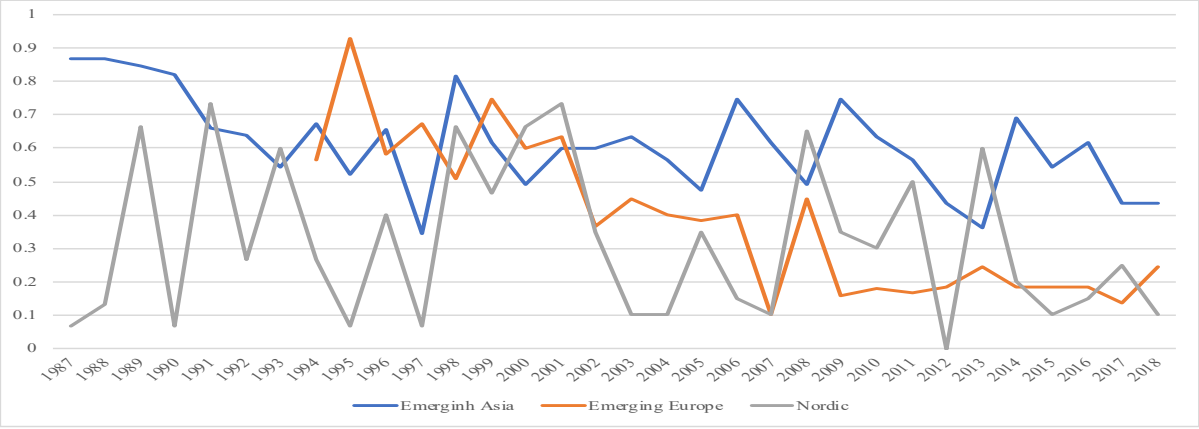
$$Resistance\ Index_{i,t} = \left[\left(\frac{\Delta res_{i,t}}{\sigma_{\Delta res_{j,t}}}\right)/EMP_{i,t}\right]$$

[7] Those includes China from Dec 1985 to May 1999, Hong Kong from Dec 1991 to Nov 1996, Poland from Dec 1985 to Aug 1989, Bulgaria from Jan 1992 to Nov 1993, Vietnam from Jul 1999 to Nov 2000, Hungary from Dec 1985 to Nov 1999, China and Singapore for Dec 2012, Estonia from Jan 1992 to Jun 1992, Romania from Jan 1992 to Sep 1993, and Slovenia from Jul to Oct 2006.

By dividing change in reserves by EMP index, the resistance index represents the proportion of exchange market pressure that are resisted through intervention. Then the resistance index is standardized to have values between 0 and 1[8]. Thus, when resistance index has value of 0, no exchange market pressure is resisted, and when resistance index has value of 1, it means full effort of resistance is taken to prevent exchange rate from moving undesirably. In cases when authorities intervened too much that lead exchange rate move in the opposite direction, the raw resistance index would have value larger than 1 before standardizing.

The resistance index for three regions is shown in **Figure 4**. Emerging Asia generally have higher resistance to exchange market pressure throughout the analyzing period, showing their stronger desire of maintain low exchange rate. Emerging Europe initially had high resistance towards exchange market pressure during 1990s, but loose the intervention quickly from 2001 to 2007, partly because many of them joined the Eurozone and adopted single currency. Since 2008, emerging Europe countries had the lowest exchange rate intervention among three regions. Nordic countries have rather fluctuate resistance index, partly because they adopt different exchange rate policy: Finland joined EU and adopted euro, Denmark pegged the Danish kroner to euro at fixed rate, while Sweden and Norway use flexible exchange rate combined with inflation targeting (Theo Schewe, 2015).

Figure 4. Index of resistance



Source: IFS, WEO, and author's calculations.

Note: Unweighted averages of indicator for all countries in each region.

[8] The rule for standardizing is: for raw resistance index value <= 0, assign the standardized value 0; for 0 < raw index <= 0.25, assign the standardized value 0.2; for 0.25 < raw index <= 0.5, assign the standardized value 0.4; for 0.5 < raw index <= 0.75, assign the standardized value 0.6; for 0.75 < raw index < 1, assign the standardized value 0.8; and for raw index >=1, assign the standardized value 1.

B. Sterilization policy

Sterilization is the policy monetary authorities take to insulate a country's domestic money supply and internal balance against foreign exchange intervention (RA Mundell, 1963). The classical practice is when authority purchase a foreign currency in open market (NFA decreased) using its domestic currency, the currency appreciation is depressed, but the increased domestic currency (monetary base increased) in open market can lead to drop in interest rate and inflation, so authority issue government bonds (NDA increased) to absorb those domestic currency (Craig and Humpage, 2001), such practice is also called sterilized intervention. The way to measure sterilization policy here is to find the degree to which the increase in net foreign assets is offset by decreasing net domestic assets.

Using monthly data obtained from previous section, the net domestic assets (NDA) is computed as:

$$NDA = MB - NFA$$

This is because in a central bank's balance sheet, the asset side consists of net foreign assets and net domestic assets, while the liability side is monetary base. The absolute monthly changes of net foreign assets and net domestic assets of central banks for country *i* and year *t* is calculated and denoted as $\Delta NFA_{i,t}$ and $\Delta NDA_{i,t}$.

Then for each year, the following linear regression (IMF, 2007) is run on the twelve months' observations for each country,

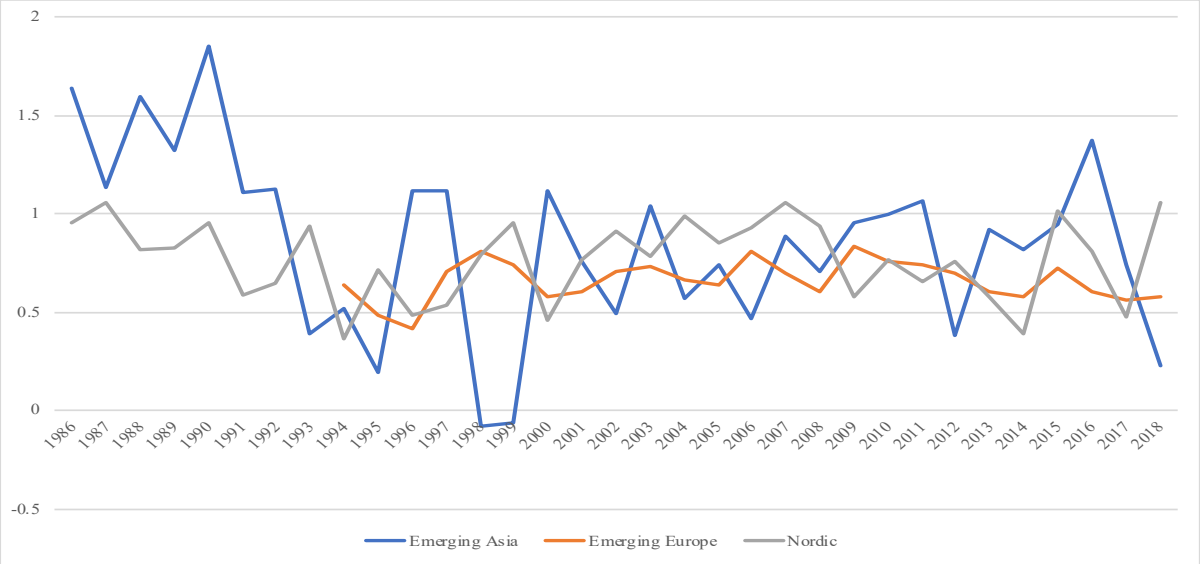
$$\Delta NDA_{i,t} = \alpha_{i,t} + \beta_{i,t}\Delta NFA_{i,t} + u_{i,t}$$

here the coefficient $\beta_{i,t}$ represented the degree to which net foreign assets are offset and is the sterilization index needed. When $\beta_{i,t}$ is zero, no part of foreign assets is offset and there are no sterilization policies taken by authorities, when $\beta_{i,t}$ is -1, total sterilization effort is taken, and when $\beta_{i,t}$is smaller than -1, over sterilization measures are taken. To make it easier for study later, the coefficients are all taken the opposite value, so 0 represents no sterilization effort and 1 represents maximum sterilization.

The sterilization index for three regions is shown in **Figure 5**, the indexes for three regions tend to convergent over the first decade to same range (0.5 to 1) during the second decade, but then divergent again in the third decade. Also, sterilization index variate strongest for emerging Asia, while emerging Europe have the least volatile sterilization degree. This

suggests that emerging Asian countries authorities react quickly with sterilization together when foreign exchange intervene happened, while emerging Europe countries don't have much exchange intervene thus don't need much change in sterilization policy.

Figure 5. Sterilization index



Source: IFS, WEO, and author's calculations.

Note: Unweighted averages of indicator for all countries in each region.

C. Fiscal policy

Countercyclical fiscal policy also helps prevent overheating and exchange rate appreciation during large capital inflow period. An anti-cyclical fiscal policy greatly facilitates a broad-based prudential regulation of booms, the counterpart of the resources accumulated in fiscal stabilization funds during booms would be increased foreign exchange reserves and reduced currency appreciation (JA Ocampo, 2002). To measure the cyclicity of fiscal policy, following Calderon and Schmidt-Hebbel (2003), the real noninterest government expenditure growth series is used.

First deduct government interest expense from general government expenditure[9]. For countries and vintages lacking this data, the sum of subset expenditures is calculated using data collected from Government Finance Statistics (GFS),

[9] The general total government expenditure series are collected from World Economic Outlook (WEO) dataset.

$$General\ government$$
$$= Local\ government$$
$$+ Central\ government\ (incl.\ social\ security\ funds)$$

Government interest expense series are collected from GFS, and for vintages missing value, also sum up the subset expenses as previously.

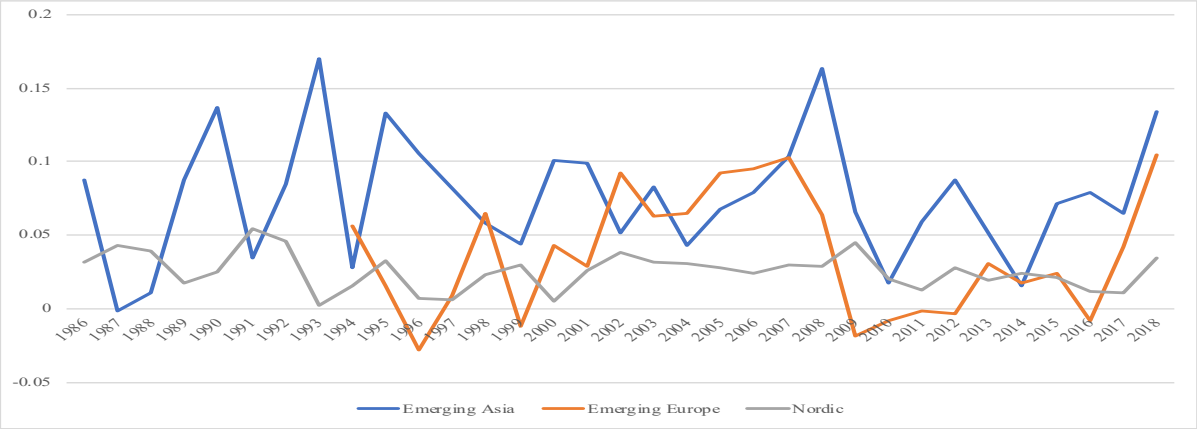
Then scaled by CPI[10], real noninterest government expenditure for country i and year t is calculated as (Calderon and Schmidt-Hebbel, 2003):

$$Real\ noninterest\ government\ expenditure_{i,t} = \frac{General\ governemnt\ expenditure_{i,t} - Interest\ expense_{i,t}}{CPI_{i,t} \times 100}$$

The last step is to take the growth value from series obtained above. The deviation from growth trend, using Hodrick-Prescott filter, is also calculated for policy response study.

The real noninterest government expenditure growth for three regions is shown in **Figure 6**. Among the three regions, emerging Asia countries have the highest growth in government spending while Nordic countries have the lowest over time, maintaining roughly within 0 to 5 percent. Emerging Europe had pretty high government spending growth in early 2000s (2002-2007) and is the only region with negative government spending growth, which happened in 1996-1997, 1999, 2009-2012 and 2016.

Figure 6. Real noninterest government expenditure growth



Source: WEO, GFS, and author's calculations.

Note: Unweighted averages of indicator for all countries in each region.

[10] Inflation, average consumer prices data from WEO.

D. Capital controls

Capital controls are policy measures taken by authorities to control capital flows in and out from a country. The measures include transaction taxes, caps, tariffs, complete prohibitions, and other market-based controls. The literature and political view of capital controls has evolved over time. While such measure is prevalent globally in Bretton Woods era, capital controls were abolished greatly since 1970s as free market became endorsed by major strong economies such as US, Canada, Germany and Switzerland (Roberts and Richard, 1999). Partly in fear of bad reputation, as autocratic governments became more restrictive in terms of capital account openness, democratic governments subsequently became more liberal (Ghosh and Mahvash, 2016). After the 2008 global financial crisis, as macroprudential policy gained popularity, so did capital controls.

Most measurements of capital controls are taken from IMF's AREAER (Annual report on exchange arrangements and exchange restrictions). In this thesis the new dataset from Fernandez et al. (2016) is used[11], where the average capital control is classified for ten asset classes, i.e. equity, bonds, money market, collective investment, financial credit, foreign direct investment, derivatives, commercial credit, financial guarantees, and real estate, and the average of all classes is calculated. The dataset also distinguishes between inflows and outflows. Since AREAER started distinguishing between inflows and outflows controls from 1995, the data about capital control cover from 1995 to 2017.

The result is report in **Figure 7**, emerging Asia countries have the highest capital control over both inflows and outflows, which is significantly higher than other two regions. The control over inflows is around 0.6 (1 as maximum), and control over outflows is higher, at around 0.7, with some trend of decreasing since 2012. This indicates the authorities' rather welcome of investments but fear of sudden reversal of capital inflows.

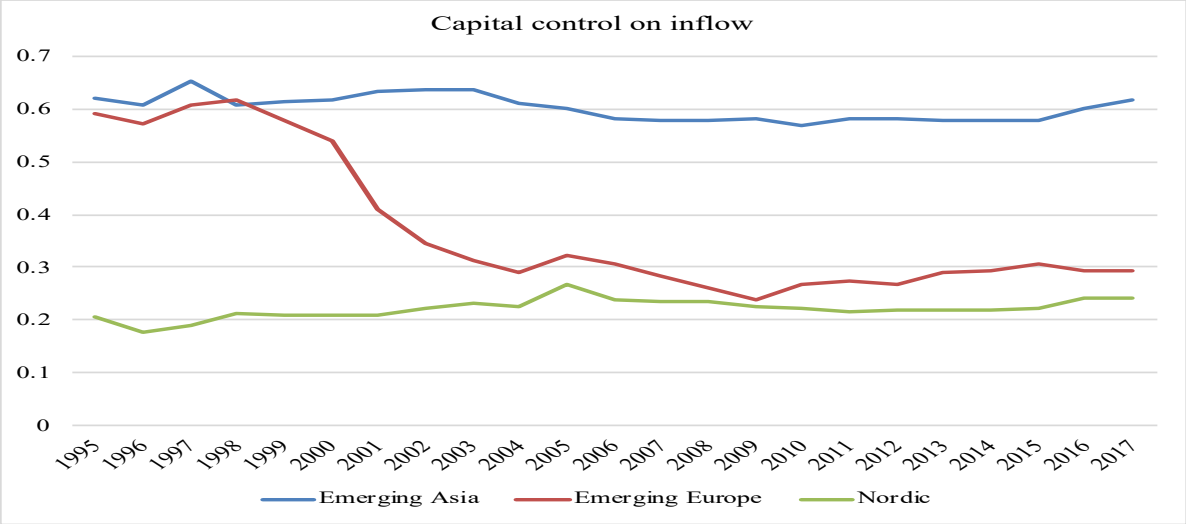
Emerging Europe countries originally had high controls before 2000 (0.6 for inflows and 0.7 for outflows) but loosened control rapidly over 2000 to 2004, which was the large inflow period before global financial crisis, then maintained low controls (around 0.3) ever since.

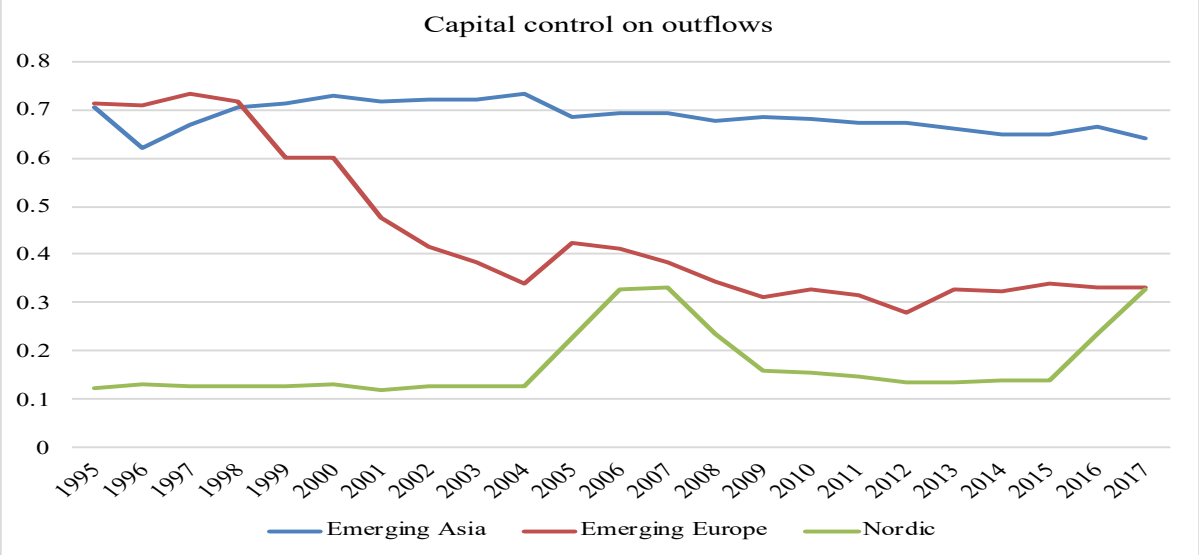
[11] Note that Croatia, Estonia, Lithuania, and Slovak are not included in this dataset and they are all emerging Europe countries, which may lead to result not fully representative for emerging Europe pattern.

This pattern of evolvement is similar to resistance of EMP index, and suggests that emerging Europe countries had changed from high government intervention to free market practice.

Nordic countries have the lowest control over capital throughout the last three decades (around 0.2 for capital inflows and 0.1 to 0.3 for capital outflows), but their control over outflow had jumped quickly right before global financial crisis (2005-2008) and also recently (2016 to ongoing), which might reflect a more prudent practice when authorities think the market is too hot.

Figure 7. Capital controls





Source: Fernandez et al. 2016.

Note: Unweighted averages of indicator for all countries in each region. Emerging Europe here exclude data from Croatia, Estonia, Lithuania, and Slovak.

IV. **Linking episodes outcome and policy responses**

To compare the policy response changes for each episode, three averages for each of the policy indicator is calculated and compared, they are the average of indicators two years before episode start, the average of indicators during episodes, and average of indicators two years after episodes end. Then in order to compare over time, the median of all countries in each decade is taken and Mood's Median test is applied to see whether the change in policies before and during episodes is robust at 10 percent level or better, see **Figure 8**.

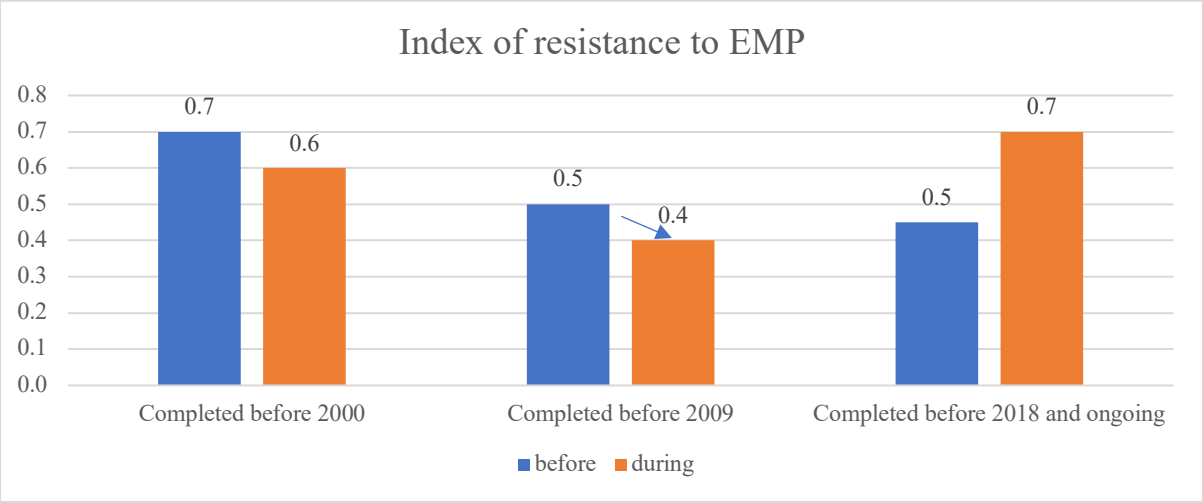
First, for episodes completed in 1990s and 2000s, the index of resistance to EMP tend to decrease after large inflow happens, especially for episodes completed before 2000s, but episodes in last decade see increase of resistance towards EMP after large capital inflow happens (**Figure 8** first graph).

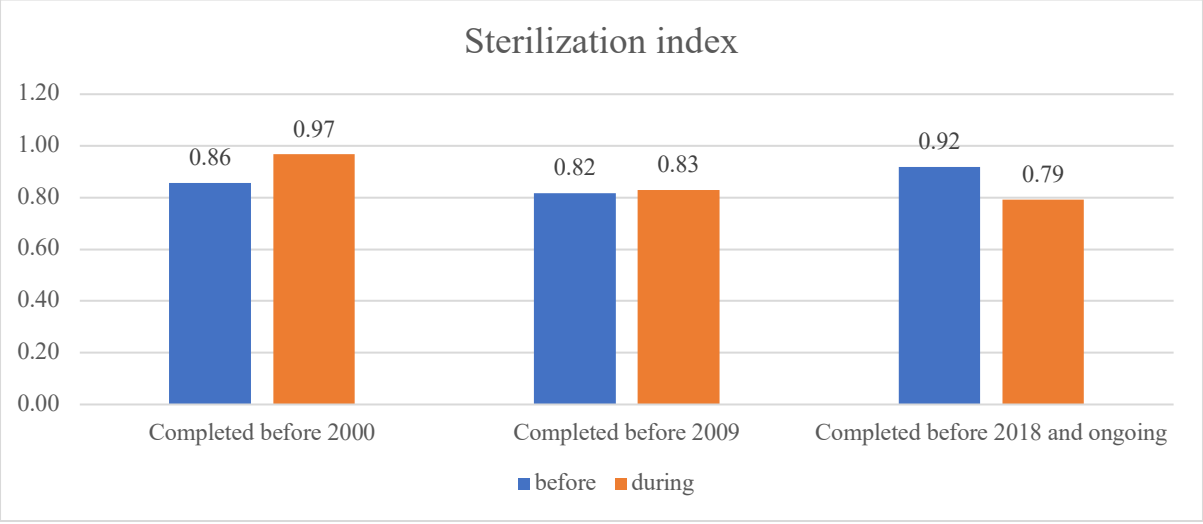
Second, sterilization index tends to increase for when large capital flows in for episodes completed in 1990s, but remains unchanged for episodes completed in 2000s. For recent episodes, the sterilization tends to decrease when large inflow happens (**Figure 8** second graph). This could suggest that authorities used to react with stronger sterilized invention when large foreign capital flows into their economy, but the cost of sterilized intervention have increased over time when interest rate of foreign assets keeps dropping, so the cost of selling domestic government bonds, which have higher interest rates, for foreign assets (whose interest rate keeps decreasing) became more unaffordable. Emerging markets, in react to such change, had sought alternative ways to sterilize domestic money supply, such as adjust the maturity structure of the central bank bills (CP Chung et al., 2014) and raise reverse requirements for large banks (C Jones, 2011).

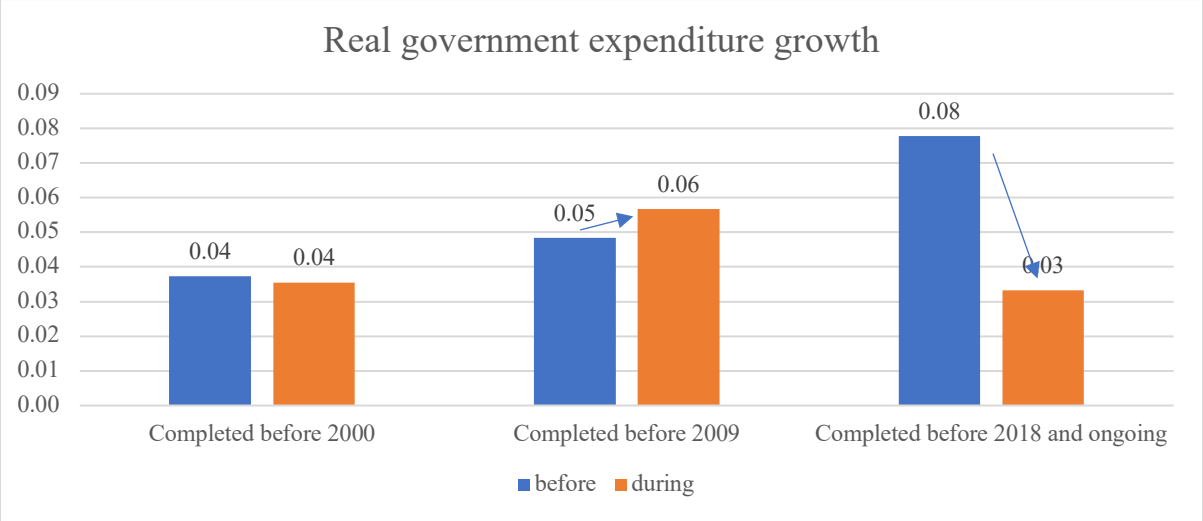
Third, for government spending, episodes completed during 1990s remain similar growth in government spending after large capital flows in. But for episodes completed during 2000s, the growth of government spending significantly increased after large capital inflow, suggesting procyclical fiscal policy taken (**Figure 8** third graph). Then episodes in recent decade saw significant sharp decrease in government spending growth, perhaps because authorities learned from previous financial crisis and taken on countercyclical fiscal policy facing large inflows.

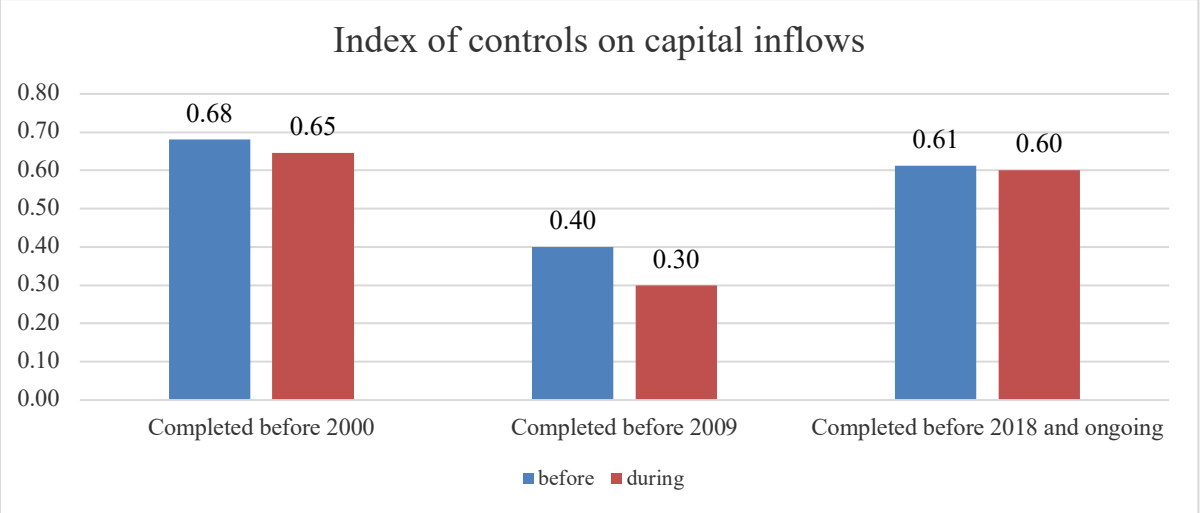
Fourth, both inflow and outflow capital controls loosened when large capital flowed in for episodes completed in 1990s and 2000s, but for episodes happened during last decade, controls remained similar (**Figure 8** last two graphs), suggesting that authorities kept stricter controls during surge recently. Another finding is that capital controls were tremendously lower for episodes completed in 2000s, but after financial crisis, the capital control degree levelled up back to pre-2000 degree.

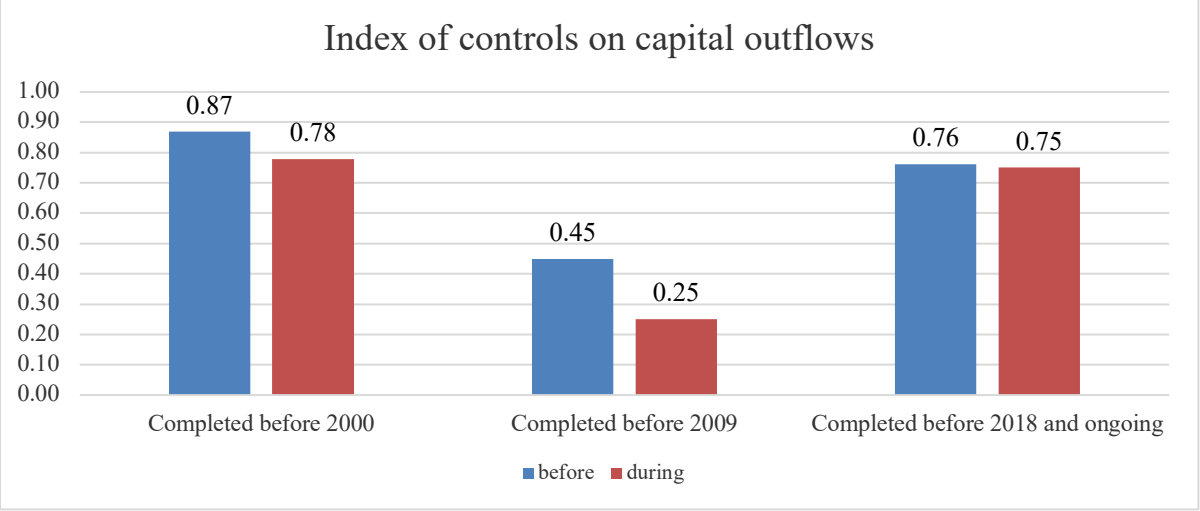
Figure 8. Policy indicators in three decades











Source: IFS, WEO, Fernandez et al. 2016, and author's calculations.

Note: Unweighted average for indicators of all episodes completed within each period.

Arrows indicate that medians are significantly different across two groups at 10 percent level or better.

From the four policy changes another feature shown is that episodes completed in 1990s and 2000s share similar policy responses facing large capital inflow, but after the global financial crisis, monetary authorities deployed different responses in face of capital inflow, partly because they learned from the crisis and took on more intervention, stronger control, and more stringent spending policy to avoid crisis, which is in line with the rise of macroprudential policies and growing consensus over the effectiveness of capital control during crisis period (A Blundell-Wignall, 2014).

Note that the policy responses in my study is not in consistent with Roberto et al. (2009) work, one reason could be that their work was comparing policy responses only for episodes ended in certain years, i.e. 1997-1998 for the first decade but I put all episodes ended in 1990s together, which enlarge the sample to not only emerging Asia episodes completed during Asian Financial Crisis. Another reason is that the sample of their 2000s episodes are separated into between 1999-2006 and 2007-2008, which blurred the before and during indicator averages for episodes ended with 2008-2009 global financial crisis, i.e. episodes completed in second decade in my sample.

In the following part the policy responses are connected with macroeconomic outcome to find out whether certain policy helps in a better-off episode ending.

A. Avoid hard landings

One important measure of whether an episode had a sour outcome is whether it ends with a soft or hard landing. A soft landing is when market shift from overheating or high growth to slow growth gradually while a hard landing is a sudden and sharp shift due to monetary policy. Hard landings often happen when market couldn't adjust to the political manipulation and resulting in higher unemployment and other undesired economic outcomes. To compare whether policy responses are different for episodes end with soft landing and hard landing, episodes are divided into two groups based on the median of all episodes' post-inflow GDP growth[12]. The medians of policy indicators of two groups are tested using Mood's Median Test[13] to see whether the differences are significant at 10 percent level or better, the test is

[12] GDP growth is the percentage change of each year's GDP (in US dollar) for each country.

[13] A nonparametric test to test the null hypothesis that the medians of the populations from which two or more samples are drawn are identical.

based on medians because this statistic is more robust across episodes and won't be affected by extreme values.

The result is shown in **Figure 9**[14], episodes with hard landings have higher capital controls during surge years on both inflows and outflows, lower sterilization intervention and resistance to exchange pressure, more decrease in interest rate, and significant increase in government spending. Among them controls on capital outflows and real government expenditure growth are significant influencers for how episodes end. Higher controls on capital outflow doesn't help with a slower reversal of economy growth, which seems counterintuitive, but a restraint in government spending helps. One possible explanation is selection effect, that countries with weaker economic conditions tend to deploy tighter outflow controls but couldn't avoid hard landing in the end.

However, when taking multivariant correlation analysis[15] (see **Table 4**), neither capital control on outflows nor the real government expenditure are significantly associated with post-inflow GDP growth. The global factor -- post-inflow world output growth, and the duration of episodes, reflected by the cumulative size of capital inflows, are significantly related to post-inflow GDP outcome, even after controlling for other possible factors. This may indicate that global conditions have greater positive impact on the growth of emerging markets' GDP than specific policy deployed by a single market, as economies are getting more integrated. The cumulative size of capital is negatively related with post-inflow growth, so containing the size of single-year inflow or shorten the duration could help prevent surges go beyond control.

[14] Nominal interest rate data is taken from two datasets in IFS, Interest rates (lending 1970-2016) and Financial interest rates (lending 1969-2019), to cover all countries and vintages.

[15] In this regression, real US Fed effective fund rate is taken from FRED (federal reserve economic dataset) of Federal Reserve Bank of St. Louis. Each year's end of period data, i.e. December 1st rate is used to present the yearly rate. Effective Fed funds rate is the weighted average of actual interest rate charged between banks for reserve balance. Terms of trade (TOT) is the relative price of exports to imports of an economy, this data is taken from Bertrand and Suhaib (2019).

Table 4. Post-inflows GDP growth regressions

Dependent variable: post-inflow GDP growth	(1)	(2)	(3)	(4)	(5)
Cumulative size of capital inflow	-0.249	-0.187	-0.192	-0.185	-0.122
	(0.000)***	(0.000)***	(0.001)***	(0.003)***	(0.018)**
Post-inflow world output growth		0.033	0.036	0.036	0.029
		(0.012)**	(0.010)***	(0.030)**	(0.022)**
Real government expenditure			0.385	0.379	0.087
			(0.173)	(0.216)	(0.737)
Real Fed fund rate				0.001	-0.010
				(0.960)	(0.366)
Terms of trade growth				0.116	-1.545
				(0.951)	(0.326)
Sterilization index				0.020	-0.010
				(0.730)	(0.814)
Capital control on outflows					0.020
					(0.749)
Index of resistance to EMP					-0.018
					(0.797)
Constant	0.027	0.012	0.021	0.003	-0.002
	(0.337)	(0.661)	(0.475)	(0.962)	(0.976)
Observations	69	69	64	58	47
Adjusted R-square	0.291	0.346	0.358	0.364	0.352

Source: IFS, WEO, GFS, Fernandez et al. 2016, FRED, and author's calculations.

Note: P values in parenthesis, *** is significant at 1 percent level, ** is significant at 5 percent level, and * is significant at 10 percent level.

The result is similar to Roberto et al. (2009) finding but not totally same, as they found that real government expenditure growth, index of resistance to EMP, and post-inflow world output growth are significantly related with post-inflow GDP growth. This could be because the surge episodes identified in my work are different[16], and the method to calculate capital control index is different[17].

[16] One of the criteria, for example, when defining episodes with large capital flow to GDP ratio, is be above regional threshold, and my study takes 80th threshold for period over 32 years, while Roberto et al. (2009) work took 75th threshold over 20 years.

[17] Roberto et al. (2009) took the average of AREAER over different asset classes than my data source, what they included are controls on capital and money market instruments, credit operations, derivatives and other instruments, direct investment, personal capital movements, real estate transactions, provisions specific to commercial banks and other credit institutions, institutional investors, and surrender requirements.

B. Contain real exchange rate appreciation

Another comparison taken is between episodes with high real effective exchange rate appreciation and low real exchange rate appreciation to see which policies are helpful in limiting currency appreciation. Real effective exchange rate (REER) is the weighted average of one currency relative to a basket of other major currencies, and the REER data here are from Darvas and Zsolt (2012) latest update. Episodes are divided into two groups based on medians of cumulative real exchange rate appreciation during surge period. Here only episodes during which inflation[18] increased during episode are taken into sample, because appreciation in such cases are more likely to be driven by exogenous shocks to capital inflows than exchange rate-based stabilization programs (Roberto et al. 2009).

Figure 10 reports the results, only index of resistance to EMP is significantly different for the two groups of episodes. Episodes with higher cumulative exchange rate appreciation during surge years tend to have higher capital control over both inflows and outflows, slightly higher sterilization index, significantly lower resistance to EMP, more decrease in interest rate, similar real government expenditure growth from trend, and less decrease in inflation. The higher resistance to EMP index for episodes with lower appreciation suggests that exchange rate intervention policy is effective in limiting appreciation during inflow period, regardless of taking together with sterilization policy or not.

A multivariant regression is conducted to address when controlling for other independent variables, would resistance index to EMP be significant. However, as shown from **Table 5**, only cumulative size of capital inflow is significantly and positively related to exchange rate appreciation. Though government expenditure growth and index of resistance to EMP index are negatively related to exchange rate appreciation, their significance aren't enough. This result suggests that lower cumulation of capital during inflow during relate to lower real exchange rate appreciation.

[18] Inflation data is taken from WEO, end of period series.

Table 5. Real exchange rate regressions

Dependent variable: real effective exchange rate appreciation	(1)	(2)	(3)	(4)
Cumulative size of capital inflow	0.119	0.141	0.129	0.131
	(0.005)***	(0.000)***	(0.001)***	(0.001)***
Real government expenditure growth from trend		-0.270	-0.303	-0.304
		(0.186)	(0.158)	(0.161)
Index of resistance to EMP		-0.072	-0.073	-0.073
		(0.158)	(0.170)	(0.173)
World output growth			0.008	0.008
			(0.625)	(0.637)
Real Fed fund rate			0.004	0.004
			(0.587)	(0.596)
Terms of trade growth			0.107	0.088
			(0.963)	(0.970)
Sterilization index				0.005
				(0.894)
Constant	0.037	0.051	0.014	0.011
	(0.135)	(0.133)	(0.819)	(0.873)
Observations	69	60	60	60
Adjusted R-square	0.099	0.241	0.210	0.195

Source: IFS, WEO, GFS, Fernandez et al. 2016, FRED, OECD, and author's calculations.

Note: P values in parenthesis, *** is significant at 1 percent level, ** is significant at 5 percent level, and * is significant at 10 percent level.

To further test the robustness, a smaller sample with output gap[19] data available is studied shown in **Table 6**. Output gap is the difference between a country's real GDP (output) and potential GDP (production capacity). This indicator measures the degree of inflation pressure in the economy, and ideal output gap for authorities is zero when neither overworking nor spare capacity is in place (Sarwat and Ahmed, 2013). As shown from **Table 6**, real government expenditure growth is the only variable significantly correlate with exchange rate appreciation for the smaller sample, but this couldn't hold when more independent variables are controlled (column 5). And lower government spending growth helps in lower exchange rate appreciation.

The result in **Table 6** is similar to findings from Roberto et al. 2009 work, where the real government expenditure is positively related to appreciation while resistance to EMP is

[19] Here only 11 countries' output gap data are found in OECD database (Czech, Denmark, Estonia, Finland, Hungary, Korea, Latvia, Norway, Poland, Slovak and Slovenia).

nonsignificant, but their result also couldn't hold when more independent variables are controlled. But the finding in **Table 5** for cumulative size of capital is robust across regressions.

C. Role for capital control

Capital control is a rather debating policy tool that economists argue over its efficacy. As the last step the test for macroeconomic outcome regarding capital controls is conducted. Two tests are separately deployed for inflows and outflows control[20].

Shown from **Figure 11** (upper panel), capital control on inflows had significant effect on the average size of private inflow as well as inflation. Episodes with higher inflows control tend to have less net foreign direct investment, slight lower average net private inflow size (0.05 percent versus 0.08 percent for low inflow control episodes), slightly higher real exchange rate appreciation, more deficit on current account balance, a higher inflation, and similar post-inflow GDP growth. The result shows that capital control on inflows is effective in limiting the value and size of private inflow capital, but can't help in lowering inflation rate. Episodes with high capital inflow control averagely inflate 4.9 percent during surge years while low inflow control episodes inflate 2.8 percent.

Capital controls on outflows, in comparison, have significant impact on more economic outcomes (**Figure 11**, lower panel), i.e. net foreign direct investment, average net private capital flow size, current account balance and inflation. Same as inflow control, episodes with higher outflows control tend to have less foreign indirect investment (3 percent compared with 5.8 percent for low outflow control episodes), slightly lower average private flow size (0.06 percent versus 0.07 percent for low outflow control episodes), more current account deficit (3.8 percent deficit versus 1.3 percent surplus for low outflow control group), and higher inflation during surge years (5.8 percent compared with 2.3 percent). The result shows that capital outflow control is also effective in limiting the value and size of FDI and private capital inflows but doesn't help with inflation.

[20] In the test, current account as percent of GDP data is from WEO, and Net FDI as percent of GDP data is taken from World Bank.

Note that episodes with high outflow controls have median current account deficit, while low outflow control episodes run current account surplus. A country's current account run deficit when the value of its import exceeds the value of its export, such country often needs to borrow from abroad. A lower control on capital outflow allow more capital outflow lending and investing, such role often fit when the country run current account surplus. More detailed mechanism of how this trade indicator being related to capital outflow control degree could be an interesting future study topic.

The work of Roberto et al. 2009 only analyzed economic outcome for capital inflow controls, they found that episodes with higher inflow control were significant in higher inflation, narrower current account deficit, and lower average net inflow size. Only finding over current account balance is not in consistent with mine, where I find it nonsignificant and is wider in deficit when inflow control is high. But as mentioned before, our surge episodes identified are not comparable since I only took sample from two emerging regions while their work include four emerging regions.

D. Summary table

A summary table (**Table 7**) of previous findings and their comparison with literature is shown below. Instead of real government spending being the most significant factor from previous studies, the cumulative size of capital inflow has an impact on both avoiding hard landing and limit currency appreciation, while global condition after surge episodes strongly influence landing result. Discipline in government spending and less control over outflows seem to work with better ending, and intervention in foreign exchange is useful in limiting currency appreciation.

In order to limit the cumulative size of capital inflow during surge periods, a smaller average size of capital or a shorter duration is helpful. And capital control on both inflows and outflows seem to limit the average size of capital flow, while inflation issue could come as a side effect.

The reason that results are not fully consistent with previous literature study is that the sample region and sample years are different. Policy responses towards large inflows

changed a lot since the global financial crisis, and previous suggestion haven't been tested by crisis situation.

Table 7. Summary table for policy efficacy

	Significant factor using median test	Significant factor using regression	Significant factor in previous study
Avoid hard landing	Decrease in real government expenditure; Lower capital control on outflows	Lower cumulative size of capital inflow; Larger post-inflow world output growth	Smaller real government expenditure growth; Lower index of resistance to EMP; Higher post-inflow world output growth
Limit real exchange rate appreciation	Higher index of resistance to EMP	Lower cumulative size of capital inflow; Lower real government expenditure growth (for small sample)	Lower real government expenditure growth
Capital control on inflows	Lower average net private capital flow; Higher inflation		Lower average net private capital flow; Higher inflation; Narrower current account deficit;
Capital control on outflows	Lower net foreign direct investment; Lower average net private capital flow; Current account deficit; Higher inflation		

Source: findings in section A, B, C previously

V. Limitation and future study

As mentioned before, one limitation of the empirical setup is that the multivariant cross-section regression didn't control for endogeneity, so can only show correlation but not causal relationship. Another limitation is the median test is done to only two groups for each indicator. To make a better comparison, episodes can be divided into four quarters based on their medians and test the difference between the first and fourth groups median significance. Such test requires more episodes in total sample, so more countries or years need to be analyzed.

Another issue with this study is when data cannot be found from a single source and need to be combined (such as monetary base, net foreign assets, and nominal interest rate). Since this work compares policy before, during and after each episode, the results are sensitive to the consistence of data (though taking medians across episodes help relieving the issue). A leap of indicator caused by sources' difference rather than policy change could affect result.

Future studies could consider more sophisticated models or measures to control endogeneity, and also take more countries from each region or include more regions for a comprehensive study. Since countries defined as emerging market are changing throughout time, it could also be a direction to study the policy changes and effects for different time by using data from that period's emerging countries.

VI. Conclusion

This work studies the policy responses to large net private capital inflow to emerging Asia and Europe market through 1985 to 2018 in order to see policy changes and their efficacy, Nordic countries are included as sample for small and open economies. Four policies analyzed here are exchange rate policy, sterilization policy, fiscal policy and capital controls on inflows and outflows.

Regions show different patterns in policy evolvement: Emerging Asia have high intervention in exchange market, which is accompanied by quick react in sterilization policy, they also have the highest growth in government spending and highest control over both capital inflows and outflows; emerging Europe originally also have high intervention in exchange market and high capital controls, but such policies loosened quickly over the early years in 2000s, partly because some of them joined EU, their sterilization policy is more stable as the flexible exchange rate policy is adopted, their government spending growth is high during early 2000s but is the only region with years of negative growth; nordic countries have fluctuate exchange resistance as they remained their central bank's autonomy and own currencies (except Finland), but they have the lowest government spending growth and lowest capital controls as open economies.

When comparing policy changes before and during an episode, significant changes are that the resistance to EMP decreased for episodes completed in 2000s, and real government spending growth increased for 2000s episodes but decreased for 2010s episodes, partly because of the overheating of global market during early 2000 made it difficult to resist exchange appreciation and encouraged government with procyclical fiscal spending, but the crisis and studies made government realize the importance of counter-cyclical fiscal practice. Another feature is that polies show similar tendency for episodes completed in 1990s and 2000s, but changed opposite after global financial crisis, the reason could also be that countries learn from crisis and adjust their methodologies.

To see the efficacy of policy in limit the issues come with large private inflows, median test and multivariate regression test are done. Cumulative size of capital inflow has an impact on both avoiding hard landing and limit currency appreciation, while global condition after surge episodes strongly influence landing result. Discipline in government spending and less

control over outflows seem to work with better ending, and intervention in foreign exchange is useful in limiting currency appreciation. In order to limit the cumulative size of capital inflow during surge periods, a smaller average size of capital or a shorter duration is helpful. And capital control on both inflows and outflows seem to limit the average size of capital flow, while inflation issue could come as a side effect.

Table 1. List of net private capital inflow episodes

Country	Duration	Cumulative size (% of GDP)	Country	Duration	Cumulative size (% of GDP)
China	1993-1996	0.17	Estonia	2002-2008	0.99
China	2004-2005	0.09	Hungary	1995-2000	0.55
China	2010	0.05	Hungary	2004-2005	0.18
China	2013	0.04	Hungary	2008	0.09
Hong Kong SAR	2009	0.28	Latvia	1995-1998	0.32
Hong Kong SAR	2012	0.06	Latvia	2001-2007	1.02
Hong Kong SAR	2017	0.07	Lithuania	1997-1998	0.21
India	2006-2007	0.11	Lithuania	2003	0.08
India	2010-2012	0.11	Lithuania	2006-2008	0.36
India	2016	0.01	Poland	1987	0.10
Indonesia	1995-1996	0.08	Poland	1998	0.08
Indonesia	2014	0.04	Poland	2008	0.10
Korea	1996	0.04	Romania	2004-2008	0.69
Korea	2009	0.04	Russia	2006-2007	0.10
Malaysia	1989-1996	0.74	Slovak Republic	1996	0.09
Pakistan	1993-1996	0.10	Slovak Republic	2002-2007	0.68
Pakistan	2006-2007	0.09	Slovenia	2002	0.09
Philippines	1991	0.05	Slovenia	2008	0.06
Philippines	1994-1997	0.36	Ukraine	2005-2007	0.21
Philippines	2010	0.03	Ukraine	2013	0.08
Singapore	1988-1991	0.23	Denmark	1994	0.06
Singapore	2017	0.07	Denmark	1998-1999	0.10
Thailand	1988-1996	0.87	Denmark	2002-2003	0.07
Thailand	2005	0.04	Denmark	2009	0.13
Thailand	2008	0.06	Norway	1987	0.04
Vietnam	1996-1998	0.26	Norway	1993	0.04
Vietnam	2002-2012	0.85	Norway	1996	0.04
Vietnam	2016-2017	0.11	Norway	2007	0.11
Bulgaria	1993	0.12	Sweden	1989-1990	0.12
Bulgaria	2000-2008	1.78	Sweden	2000-2001	0.11
Croatia	1997-2008	1.05	Sweden	2009	0.02
Czech Republic	1995-1997	0.24	Sweden	2016	0.03
Czech Republic	2002	0.11	Finland	1987-1990	0.21
Czech Republic	2017-ongoing	0.18	Finland	2005-2012	0.52
Estonia	1996-1999	0.46	Finland	2016-ongoing	0.28

Source: IFS, and author's calculations.

Note: Cumulative size is the cumulative net private capital inflows to GDP ratios during each episode.

Table 2. Summary statistics of net private capital inflow episodes

	Completed before 2000	Completed before 2009	Completed before 2018 and ongoing	All Episodes
Number of episodes	26	28	16	70
Median size (percentage of GDP)	0.12	0.11	0.07	0.11
	(0.22)	(0.31)	(0.16)	(0.24)
Median duration (years)	3	2	1	2
	(2.92)	(2.82)	(2.44)	(2.76)
Ended abruptly	10	18	8	36

Source: IFS, WEO, Luc and Fabian (2018), and author's calculations.

Note: Value in parentheses are averages.

Table 3. Months when countries using new presentation data

Bulgaria	Sep 2009	Malaysia	May 2009
Croatia	Sep 2009	Norway	May 2010
Czech Republic	Sep 2009	Pakistan	Aug 2008
Denmark	Sep 2009	Philippines	Jan 2009
Estonia	Jan 2011	Poland	Aug 2009
Finland	Jan 2002	Romania	Sep 2009
Hong Kong	Nov 2018	Russian Federation	Jan 2001
Hungary	Sep 2009	Slovak Republic	Jan 2009
Indonesia	Oct 2009	Slovenia	Feb 2004
Korea, Republic of	Feb 2013	Sweden	Sep 2009
Latvia	Oct 2010	Thailand	Oct 2009
Lithuania	Jul 2010	Ukraine	Oct 2009

Source: IFS new and old presentation.

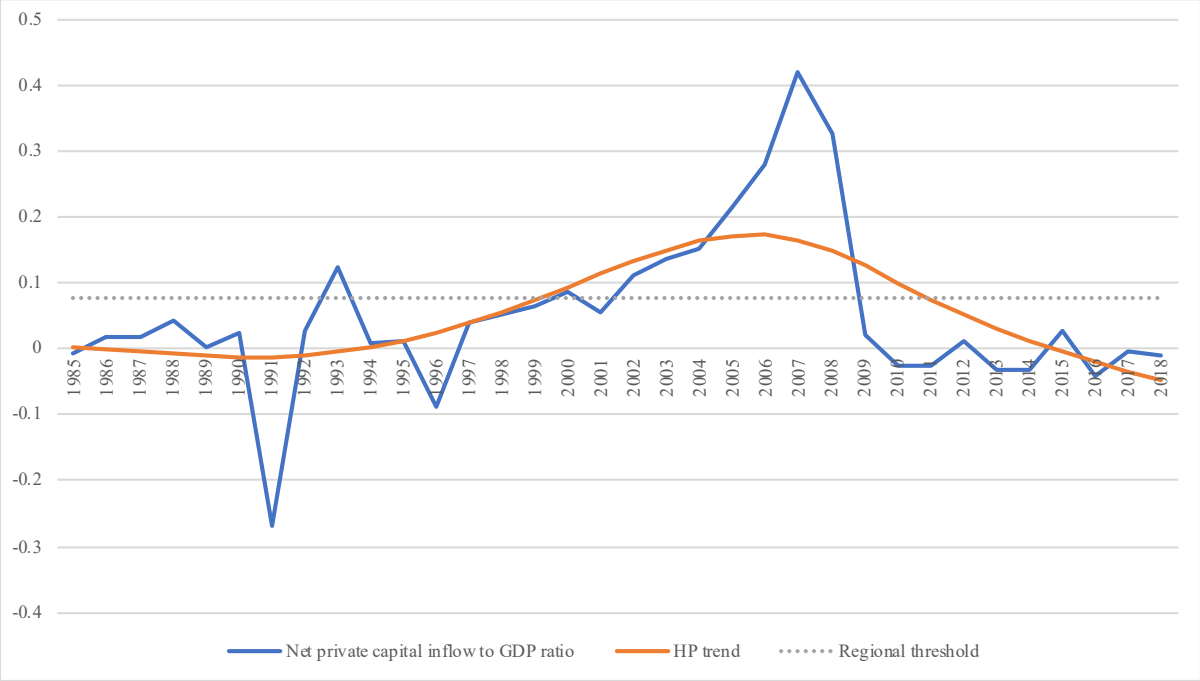
Table 6. Real exchange rate regressions with output gap

Dependent variable: real effective exchange rate appreciation	(1)	(2)	(3)	(4)	(5)
Real government expenditure growth from trend	1.140	1.380	1.608	1.697	-0.300
	(0.065)*	(0.031)**	(0.011)**	(0.028)**	(0.732)
Cumulative size of capital inflow		-0.077	-0.114	-0.116	0.037
		(0.164)	(0.047)**	(0.164)	(0.659)
Terms of trade growth			-4.595	-4.975	-1.817
			(0.099)*	(0.159)	(0.561)
Real Fed fund rate			0.016	0.011	0.021
			(0.146)	(0.539)	(0.194)
Sterilization index				0.039	-0.018
				(0.640)	(0.817)
World output growth				0.007	-0.021
				(0.848)	(0.570)
Output gap				-0.001	0.002
				(0.908)	(0.813)
Index of resistance to EMP					-0.049
					(0.695)
Constant	0.048	0.066	0.026	-0.015	0.082
	(0.082)*	(0.031)**	(0.546)	(0.898)	(0.533)
Observations	27	27	27	25	24
Adjusted R-square	0.095	0.132	0.222	0.080	-0.264

Source: Author's calculations.

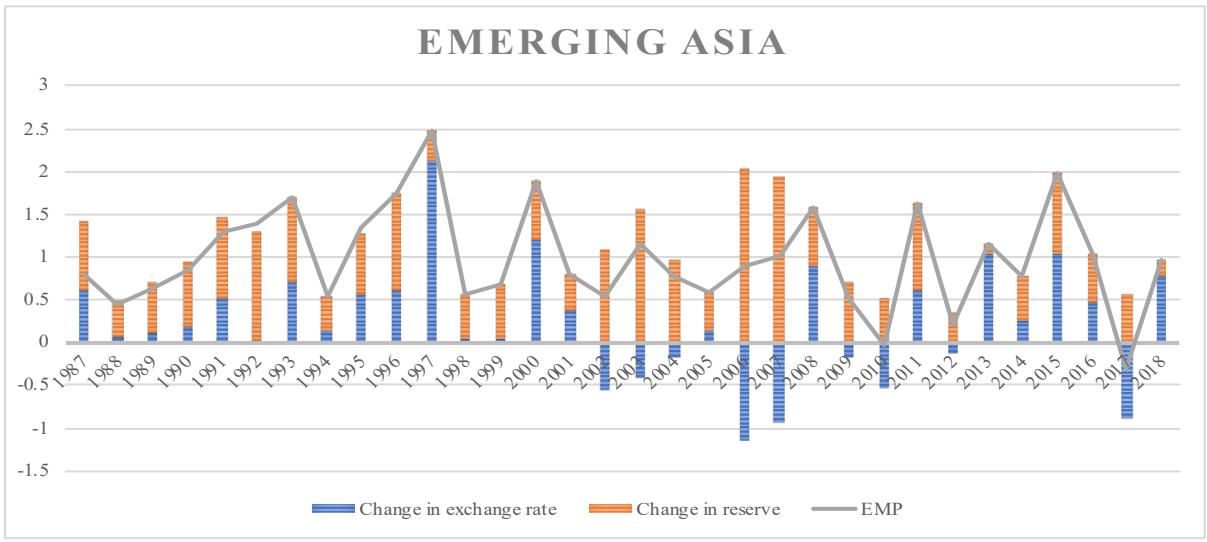
Note: P values in parenthesis, *** is significant at 1 percent level, ** is significant at 5 percent level, and * is significant at 10 percent level.

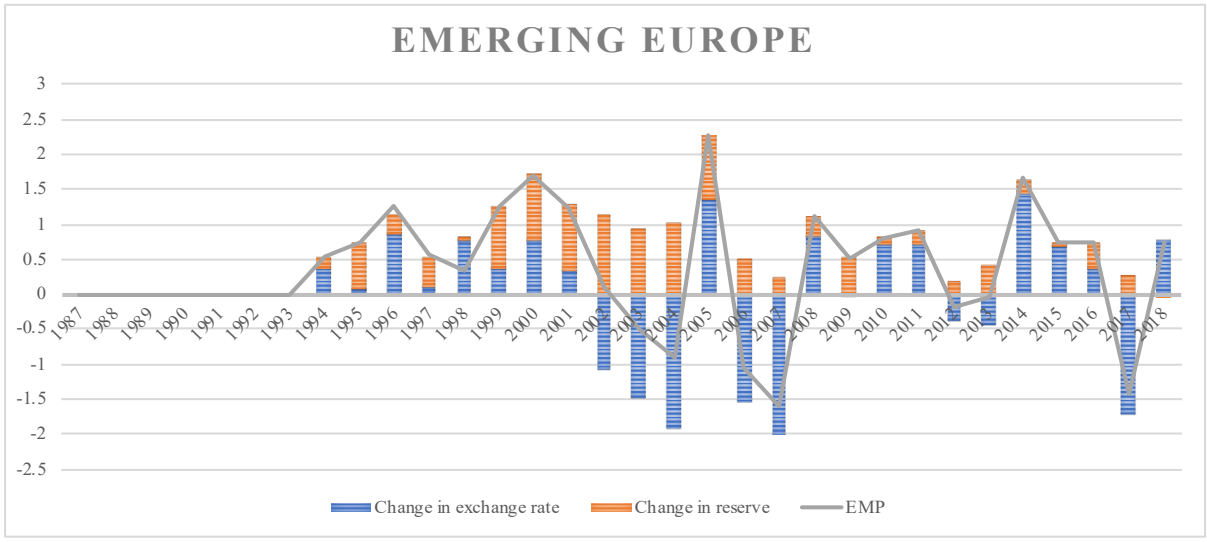
Figure 2. Identify surge years in Bulgaria

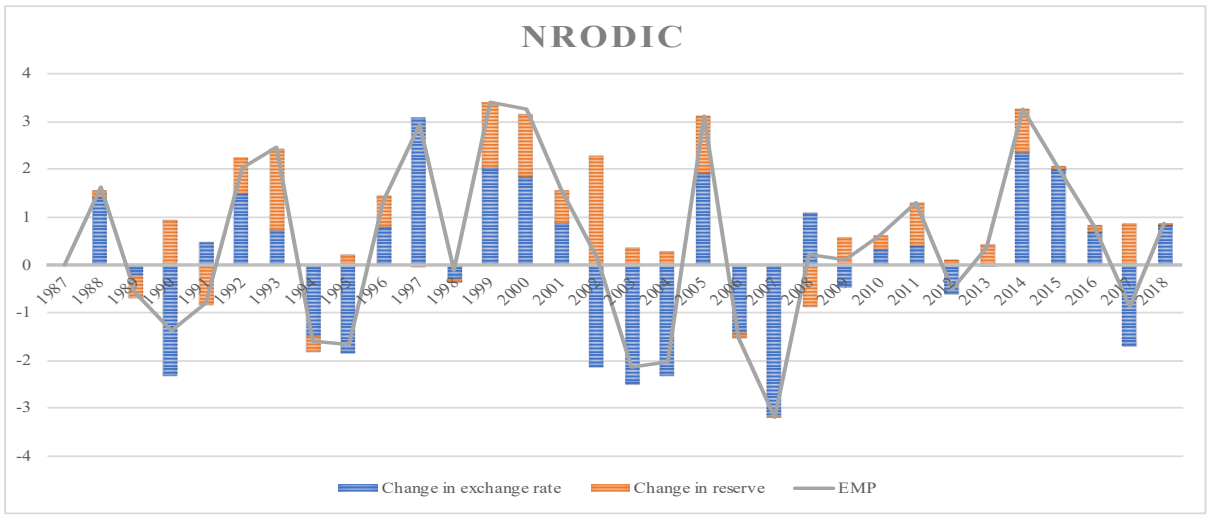


Source: IFS, WEO, and author's calculations.

Figure 3. Exchange market pressure

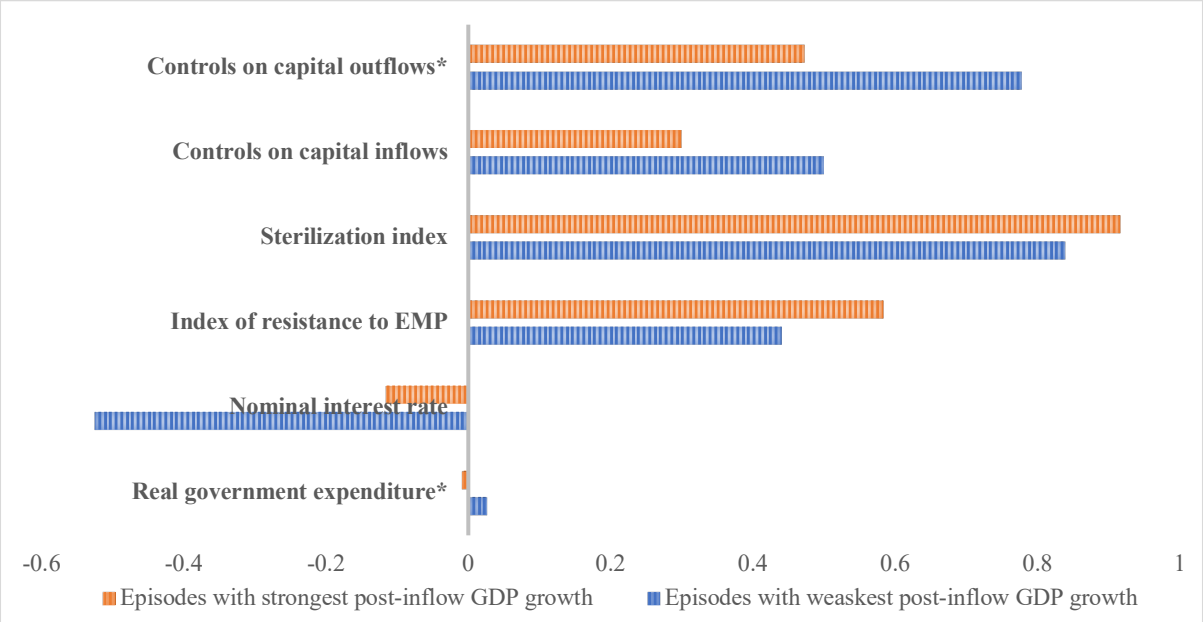






Source: IFS, and author's calculations.

Figure 9. Policy indicators for episodes with strongest/weakest post-inflow GDP growth

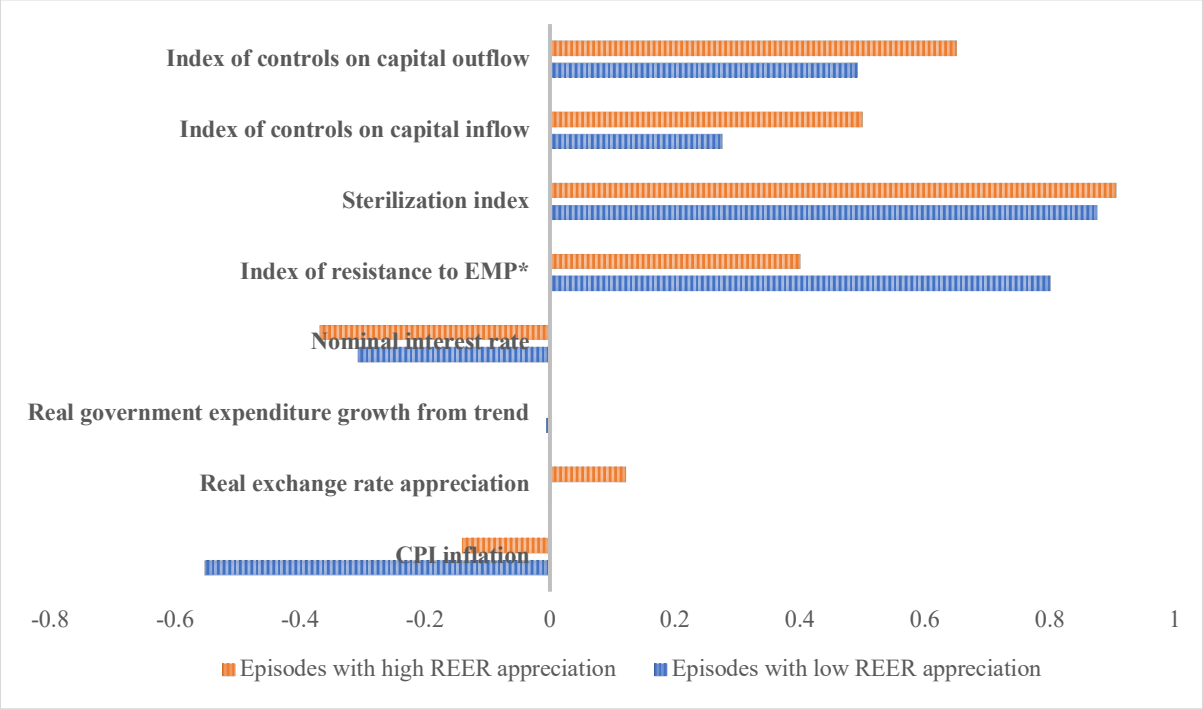


Source: IFS, WEO, BOP, GFS, Fernandez et al. 2016, and author's calculations.

Note: Star indicates the medians are significantly different for the two groups at 10 percent level or better. Episodes with strongest/weakest post-inflow GDP growth are episodes with above/below median of all episodes' post-inflow GDP growth, i.e. the average of GDP growth two years after episode minus the average of GDP growth during episode.

Controls on capital inflows/outflows, sterilization index, and index of resistance to EMP are policy indicators' averages during episode; Nominal interest rate is in percent, the average of interest rate during episodes minus the average of interest rate two years before the episodes; Real government expenditure is in percent, the average of deviations from the real government expenditure growth trend during episodes minus the average of deviation two years before the episodes.

Figure 10. Policy indicators for episodes with high/low real exchange rate appreciation when inflation increased



Source: IFS, WEO, GFS, Fernandez et al. 2016, FRED, and author's calculations.

Note: Star indicates the medians are significantly different for the two groups at 10 percent level or better.

Episodes with high/low REER appreciation are episodes with above/below median of sample episodes' cumulative REER appreciation, the sample episodes here are those with positive inflation during surge periods.

Index of controls on capital inflows/outflows, sterilization index, and index of resistance to EMP are policy indicators' averages during episode;

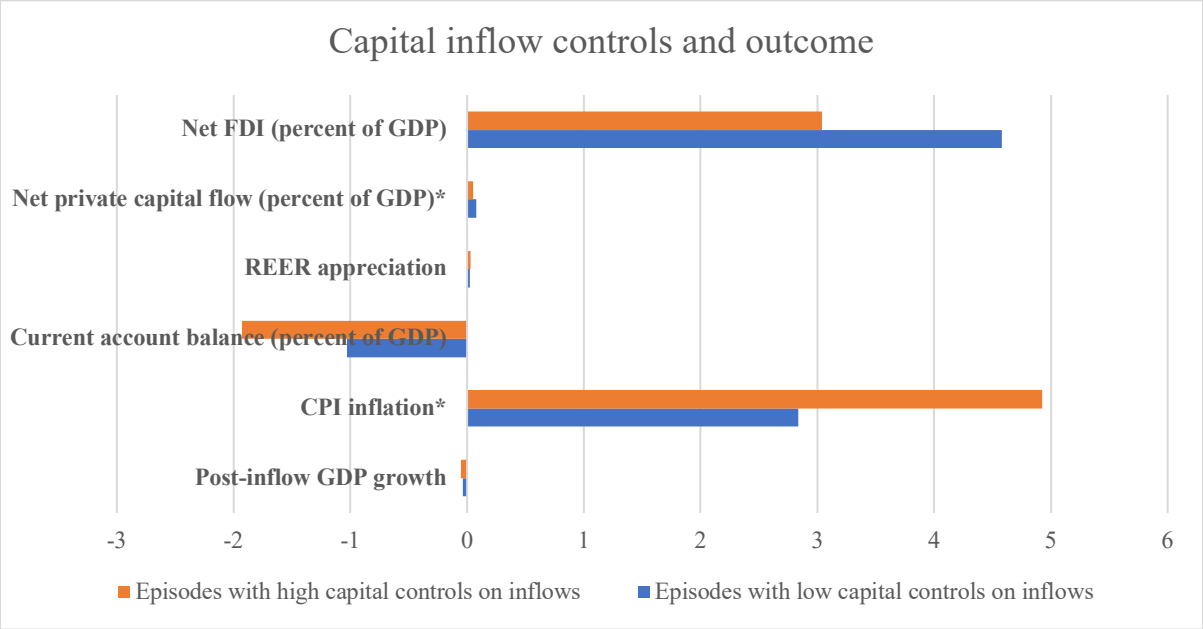
Nominal interest rate is in percent, the average during episodes minus the average in two years of the episodes;

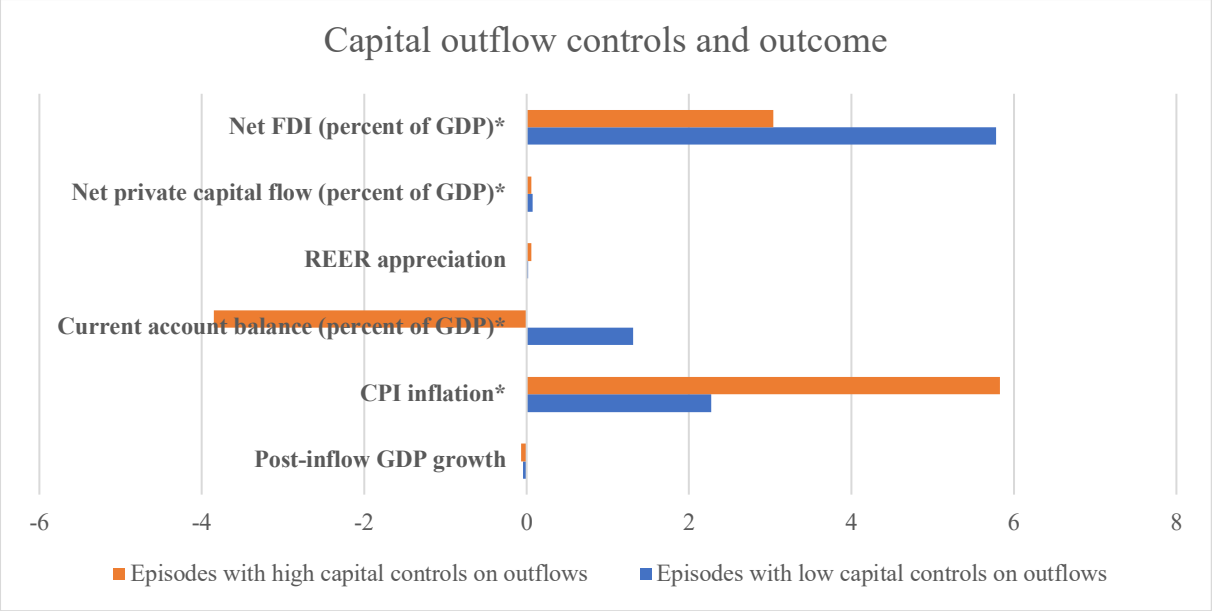
Real government expenditure is in percent, the average of deviations from the real government expenditure growth trend during episodes minus the average of deviation from trend two years before episodes;

Real exchange rate appreciation is the cumulative exchange rate appreciation during episodes;

CPI inflation is in percent, the averages of inflation growth during episodes minus the average of growth two years before episodes.

Figure 11. Capital controls and macroeconomic outcome





Source: IFS, WEO, World Bank, Fernandez et al. 2016, FRED, and author's calculations.

Note: Star indicates the medians are significantly different for the two groups at 10 percent level or better. The two groups are episodes whose capital control on inflows/outflows is above/below the median of all episodes with valid capital inflow/outflow control index.

Post-inflow GDP growth is the average of GDP growth two years after episodes minus the average of GDP growth during episodes; CPI inflation is the average of CPI percent change during episodes; Current account balance as percent of GDP is the average of current account to GDP ratio during episodes; REER appreciation is the cumulative real exchange rate appreciation during episodes; Net private capital flow as percent of GDP is the average of net private capital flow to GDP ratio during episode; Net FDI as percent of GDP is the average of net FDI to GDP ratio during episodes.

Appendix

Countries included in each region are:

Emerging Asia: China, Hong Kong SAR, India, Indonesia, Korea, Malaysia, Pakistan, Philippines, Singapore, Thailand, and Vietnam.

Emerging Europe: Bulgaria, Croatia, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Russia, Slovak Republic, Slovenia, and Ukraine.

Nordic: Denmark, Finland, Norway, and Sweden.

Data source table

Variable	Source and unit (when applicable)
Net private capital flows	IMF Balance of Payment
GDP	IMF World Economic Outlook
Currency crisis	Luc and Fabian, Systemic banking crisis revisited
Exchange rate	IMF International Financial Statistics, end-of-period, national currency per US dollar
Net foreign assets	IMF IFS
Monetary base	IMF IFS
Capital control index	Fernandez et al. (2016) "Capital control measures: A new dataset"
Nominal interest rate	IMF IFS
World output	IMF WEO
Real US Fed rate	FRED, Federal Reserve Bank of St. Louis, year-end, percent
Terms of trade	Bertrand and Suhaib (2019) "Commodity Terms of Trade: A New Database", terms of trade index weighted by GDP deflation
REER	Darvas and Zsolt (2012), "'Real effective exchange rates for 178 countries: A new database"
Inflation	IMF WEO, percent change, end of period
Output gap	OECD, output gap in percent of potential GDP
Current account, percent of GDP	WEO
Net FDI, percent of GDP	World Bank, net inflows

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