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CAPITAL FLOWS IN ASIA-PACIFIC: CONTROLS, BONANZAS AND SUDDEN STOPS

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Margit Molnar is currently Head of the Competitiveness and Structural Analysis Unit at the OECD Development Centre and at the time of starting the work on capital flows was Regional Adviser in the Macroeconomic Policy and Development Division of the United Nations Economic and Social Commission for Asia and the Pacific (ESCAP) where Yusuke Tateno and Amornrut Supornsinchai were Economic Policy Officer and Senior Statistician, respectively. The authors are indebted to the participants of the MPDD seminar on 21 February 2012 for their useful comments.

PREFACE

Capital flows are a periodically recurring topic in the analysis of financing development as well as in discussions of macro-economic stability and the current crisis has prompted its revisiting. Indeed, capital flows are an important indicator of how attractive a country is in terms of investment returns and many developing countries rely on capital inflows to finance their long-term investment needs. Abrupt and large-scale moves of money, however, may have long-lasting adverse effect on the countries they transit and there is controversy whether imposing controls in response could help to avoid such effects. Furthermore, what type of controls could be effective? Should the flow of domestic or foreign capital be restricted at all?

This paper seeks to analyse the patterns of capital flow bonanzas and identify such episodes by defining them relative to global capital flows, instead of relative to past experience as is done in most of the literature. This approach therefore emphasises the relevance of the attractiveness of a country *vis-à-vis* other destinations instead of the relevance of past flows in experiencing bonanzas. In light of this research, it can be concluded that capital controls that varied over the past decades may be effective, in particular if they are targeted. Some types of controls, for instance those aiming at curbing hot money flows, appear to be effective and the empirical results favour restrictions on domestic rather than foreign entities if capital flows are to be curbed effectively.

Using a sample of 32 countries over 1980-2009, the authors identify bonanzas as flows above the global trend and define spells by country. Then capital control measures are constructed for 1995-2010 and their patterns over time are analysed. These findings suggest that an effective control of flows is possible especially if the right control measures are combined with the right environment, that is one conducive to restricting unwanted flows of capital.

This research is part of the OECD Development Centre's efforts to identify best policies regarding the introduction of capital controls, as well as their role in different models of development. I hope this paper will actively contribute to this debate and will be a catalyst for dialogue among countries.

Mario Pezzini
Director
OECD Development Centre
September 2013

RÉSUMÉ

La région Asie-Pacifique a longtemps été exposée à des flux de capitaux volatiles dont la gestion a représenté un défi pour les autorités et qui ont occasionnellement entraîné des difficultés de paiement tirant vers le bas les taux d'intérêt et se répercutant sur l'économie réelle. L'histoire s'est répétée avec la récente crise mondiale, même si la plupart des économies durement touchées par la crise financière asiatique de 1997-98 ont appris la leçon et sont maintenant mieux préparées pour faire face à des flux de capitaux volatiles.

Les pays de l'Asie et du Pacifique ont renforcé les contrôles de capitaux de 1995 à 2010, en particulier ceux ciblant les flux de portefeuille. Maintenant plus de pays imposent une certaine forme de contrôle sur les flux sortants de tous types de capitaux qu'il y a 15 ans et les contrôles sur les flux sortants sont plus stricts que sur les flux entrants. Cela étant, la plupart des économies de l'Asie-Pacifique ont connu au moins une période d'importants flux de capitaux. Pour enrayer efficacement les booms de flux entrants, les mesures doivent être ciblées. Les flux entrants de portefeuille peuvent être enrayerés en contrôlant les afflux de bons en général et dans le cas de flux de grande ampleur, en limitant les investissements collectifs entrants. Les contrôles sur les entrées de crédits apparaissent efficaces pour diminuer la probabilité des booms de prêts transfrontaliers. De plus, les mesures ciblant les résidents semblent plus efficaces pour réduire la probabilité de booms d'entrées de capitaux. Outre les mesures de contrôle, d'autres conditions semblent également avoir un impact sur la probabilité de survenance et sur la durée d'une période d'entrée de capitaux. Les flux précédents semblent être d'importants déterminants des futurs booms pour toutes les catégories d'actifs, alors que l'appétit mondial pour le risque augmente la probabilité d'afflux globaux et des booms des crédits transfrontaliers. La croissance domestique explique seulement l'apparition de booms d'investissements entrants en titres de participation. Une attitude plus indulgente envers les flux sortants pourrait réduire la durée des booms de flux entrants et donc réduire leur impact cumulatif sur l'économie.

Classification JEL: F21, F32, F34

Mots-clés: flux de capitaux, contrôles de capitaux, booms, retraits soudains

ABSTRACT

The Asia-Pacific region has long been prone to volatile capital flows that have posed a challenge for authorities to cope with and occasionally led to payment difficulties dragging down exchange rates and spilling over to the real economy. The recent global crisis repeated past history, although most economies hard hit by the 1997-1998 Asian financial crisis have learnt a lesson and are now better prepared to face volatile capital flows.

Asian and Pacific countries have strengthened capital controls over 1995-2010, in particular those targeting portfolio flows. Now more countries impose some sort of control on outflows of all types of capital than 15 years ago and controls on outflows appear more stringent than on inflows. Notwithstanding the controls, most Asia-Pacific economies experienced at least one spell of large capital flows. To effectively curb capital inflow bonanzas, the measures need to be targeted. Portfolio inflow surges can be curbed by controlling bond inflows in general and in the case of very large surges, by limiting collective investment inflows. Controls on credit inflows appear effective in reducing the probability of cross-border lending booms. Furthermore, measures targeting residents appear more effective in reducing the probability of capital inflow bonanzas. Beside control measures, other conditions also appear to have a bearing on the probability of occurrence and on the length of the capital inflow spell. Previous inflows appear to be an important determinant of future booms in all asset categories, while global risk appetite increases the probability of overall inflows and cross border credit bonanzas. Domestic growth only explains the occurrence of equity portfolio inflow booms. A more lenient stance on outflows could shorten the duration of capital inflow bonanzas and hence reduce their cumulative impact on the economy.

JEL classification: F21, F32, F34

Keywords: capital flows, capital controls, bonanzas, sudden stops

I. INTRODUCTION

Bonanzas, sudden stops and capital controls in Asia-Pacific

The Asia-Pacific region has long been prone to volatile capital flows that have posed a challenge for authorities to cope with and occasionally led to payment difficulties, dragging down exchange rates and spilling over to the real economy. The recent global crisis repeated past history, although most economies hard hit by the 1997-98 Asian financial crisis have learnt a lesson and are now better prepared to face volatile capital flows. In this context, taking stock of past large inflow episodes can provide insights.

The region appears an attractive destination for capital owing to its high growth potential and relative economic stability. Many countries need the inflows of foreign capital to finance investment in excess of their savings, however, even countries with large current account surpluses benefit from the diversification effects of financing sources. Owing largely to the diversity of regional economies in terms of their level of economic development, orientation of economic activities and depths of financial markets, there is a large variation in the size of capital flows across countries. At one extreme the region includes financial centres handling capital flows several times of their GDPs, while at the other such flows are negligible relative to the size of the economy or the financial sector. The region also exhibits a high degree of variation in terms of types of capital flows. While most economies try to attract foreign direct investment (FDI) to benefit from its relative stability and other positive effects such as employment creation and technology and knowledge spillovers, some economies register most of the flows in their financial accounts. Furthermore, some countries experience the flows primarily in their debt or equity markets while in others financial institutions and firms are heavily involved in cross-border lending/borrowing activities. To effectively deal with sudden flows of capital, it is indispensable to identify the factors driving such flows. Moreover, different types of capital may be attracted by different economic environments; thereby a disaggregated analysis is necessary. In particular, the effect of different types of flows may vary, with debt-type of flows being most harmful owing to their pro-cyclical nature.

In addition to the economic environment, the regulatory environment governing capital flows is also crucial in driving such flows. While the Asia-Pacific region has attracted worldwide attention with its introduction of capital controls to counteract sudden changes in the direction of flows and lengthen the maturity of inflows, this general perception masks large differences across countries. Some countries in the region do not impose controls virtually on any type of capital; others restrict all types of flows. The gauging of controls across countries and over time provides an important insight into the potential direction and effects of flows. It is again useful to look at capital controls by type rather than at aggregate restrictiveness on capital flows. The

evolution of the restrictiveness of capital control measures reveals that after a liberalisation wave in the early 2000s, several countries strengthened their controls on capital flows. This is reflected, for instance, in the measures aiming at controlling bond flows and also in the aggregate inflow measure.

A natural question that the introduction of capital controls in many countries raises is how effective they have been in curbing volatile capital flows. Assessing past experience of Asia-Pacific economies with such measures may be useful when considering the adoption of such measures. The purpose of this paper is twofold: *i)* to assess the degree of countries' openness to capital flows and its variation across countries and over time; and *ii)* to investigate what types of factors – including different types of controls on the flow of capital – drive sudden changes in various types of inflows and outflows.

II. CAPITAL CONTROL MEASURES IN ASIA PACIFIC

In the literature, a set of measures have been in use to capture the restrictiveness of capital flows. Although most of those measures exploit the most comprehensive available information on the restrictions on the flow of capital – i.e. the Annual Report of Exchange Arrangements and Exchange Restrictions (AREAER) published annually by the IMF – those measures are constructed with different purposes, therefore they have different strengths and weaknesses. Due to its large country coverage, long time series and annual updates, the Chinn-Ito index (often called ‘KAOPEN’) is probably the most commonly used measure of capital flow restrictiveness (Chinn and Ito, 2008). It covers 188 economies and dates back to 1970, more comprehensive in these two dimensions than any other index. Notwithstanding these attractive characteristics and easy availability, its main shortcoming is that there is only a single index for each country, hence it does not allow for the exploration of specific types of control measures. Moreover, as the index is constructed using the principal components method, it is subject to criticism related to this method, such as for instance, its tendency to put an excessive weight on outliers in the sample.

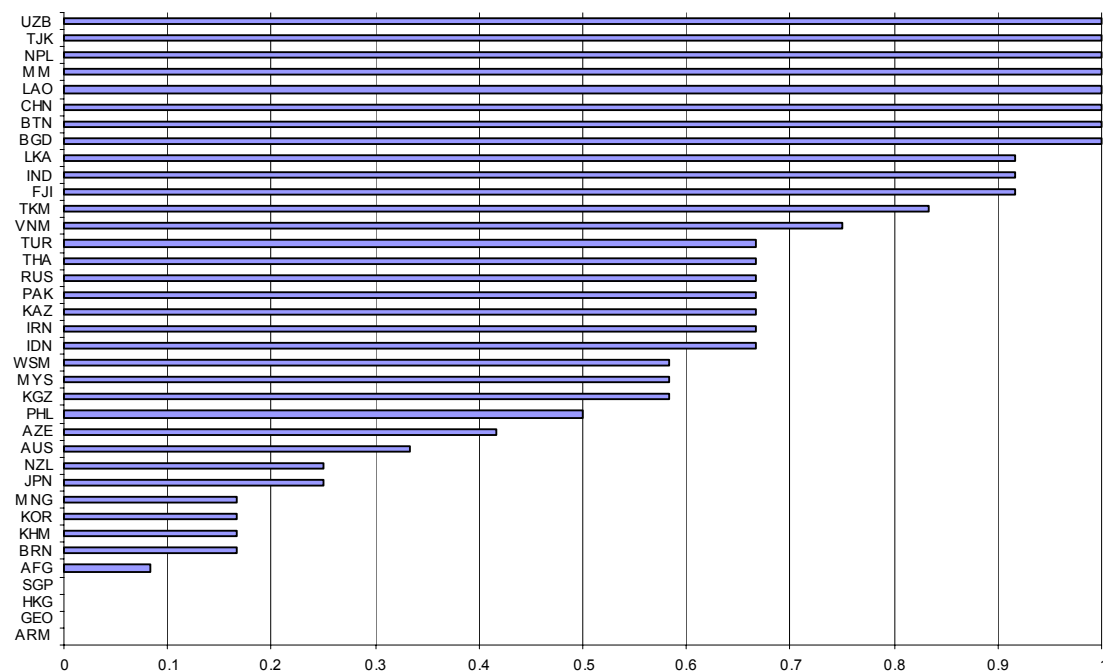
The index by Miniane (Miniane, 2006) covers 34 countries, out of which 9 are in the Asia Pacific, over 1988-2004. While the time series are much shorter and the country coverage substantially narrower than that of KAOPEN, this index can be decomposed into 13 sub-components that are aggregated to a single index by simple averaging.

Another measure, the Schindler index (Schindler, 2009) covering 91 countries of which 37 are in the Asia Pacific region, was constructed for 1995-2005 with 38 sub-indices. The types of capital flows covered by the index include FDI, portfolio equity, bond, money market instruments and collective instruments, derivatives flows as well as cross-border flows of financial credit. It does not cover restrictions related to real estate investment, personal finance and special regulations related to financial institutions. Further, the index covers both in- and outflows and disaggregates restrictions for portfolio-flow related measures into whether they target residents or non-residents. Owing to its disaggregated nature by the type of flows as well as the direction of flows and its large coverage of Asia-Pacific countries, the Schindler index was chosen for the analyses in this study. Given, however, that it was originally constructed only up to 2005, it needed updating. The updating followed the original methodology using the AREAER database of the IMF.

The index of overall restrictiveness of capital controls on **inflows** – which takes values between 0 and 1 with higher values indicating a greater extent of restrictiveness – exhibits a large degree of variation across economies (Figure 1). At one extreme, Armenia; Georgia; Hong Kong, China; and Singapore impose no controls on inflows of capital, while at the other, Uzbekistan, Tajikistan, Nepal, Myanmar, Lao PDR, China, Bhutan and Bangladesh impose some sort of control on all types of capital inflows covered by the updated Schindler index.

Figure 1. Index of overall controls of capital inflows in Asia-Pacific

2010



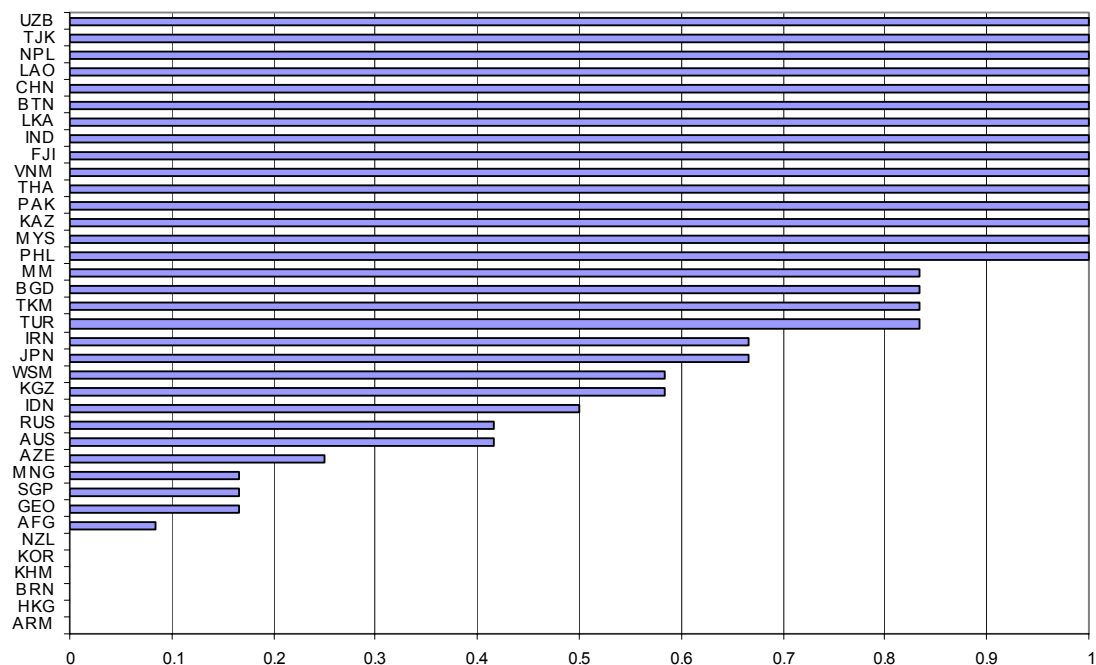
Notes: The index of capital control measures takes values between 0 and 1 with higher values indicating higher degree of restrictiveness. It covers the areas of foreign direct investment, portfolio investment and cross-border credit. It is based on the Annual Report of Exchange Arrangements and Exchange Restrictions and originally constructed by Schindler and extended by the authors till 2010.

Source: Authors' calculations following Schindler (2009).

On the **outflow** side, Armenia; Brunei; Cambodia, Hong Kong, China; Korea and New Zealand do not impose any restriction on the types of outflows captured by the index (Figure 2). Among these economies, only Armenia and Hong Kong, China appear in the inflow side with an index value of zero, the other four (Brunei, Cambodia, Korea and New Zealand) are more selective with capital inflows. At the other extreme, 15 economies impose some sort of controls on all types of outflows covered by the index, *vis-à-vis* 8 on the inflow side. Moreover, all economies – except Bangladesh and Myanmar – that impose some kind of controls on all types of inflows, also do that on all types of outflows. Stringent controls on both in- and outflows make these six economies of Bhutan, China, Laos, Nepal, Tajikistan and Uzbekistan distinct from the remaining 31 economies. Another feature of capital controls in the 37 economies in Asia-Pacific is that the number of economies imposing no controls and imposing some form of control on all capital flow types is larger for outflows than for inflows. This implies that the way of imposition of controls is rather asymmetric and country-specific. Indeed, there are only 14 economies that have the same index value for in- and outflows. Another 14 economies restrict inflows more than outflows and 9 economies that impose more stringent restrictions on outflows. Japan, Malaysia and the Philippines apply the most asymmetric measures, all the three countries restrict inflows to a greater degree than outflows. This degree of asymmetry is not observed among countries that restrict outflows more than inflows.

Figure 2. Index of overall controls of capital outflows in Asia-Pacific

2010



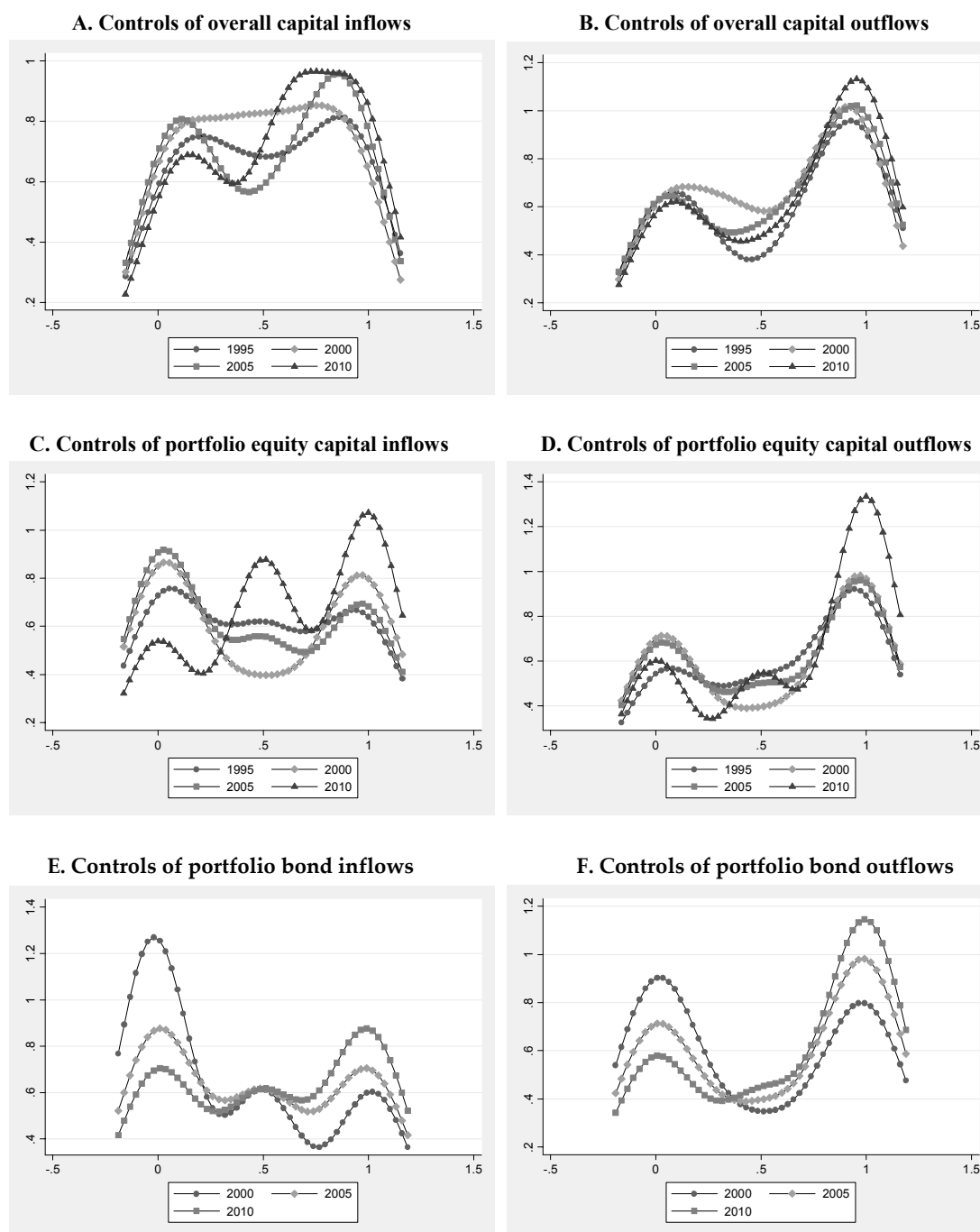
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Source: Authors' calculations following Schindler (2009).

The index of capital control measures also exhibits some variation over time. To assess the overall evolution of capital control measures in Asia-Pacific over 1995-2010, the density of index values was estimated for each year. For density, the kernel method was used, which is a non-parametric method, estimating density of the underlying data without making any parametric assumptions about the underlying distribution.¹ Over the period of 1995-2010, more countries adopted control measures and fewer countries allowed free inflow of capital (Figure 3). As for outflows, the number of countries with no restrictions has remained roughly the same, but the number of those imposing controls increased. A much larger number of countries belong to this latter group. The number of countries imposing more stringent measures on equity flows has also increased over 1995-2010, more so on the outflow than on the inflow side. Control measures on bond portfolio flows are available only since 2000, but over the past 10 years more countries appeared to impose restrictions and fewer to allow free flows in both directions.

1. The kernel method is considered superior to the traditional histogram, as there need to be sometimes arbitrary assumptions about the bin width and starting point of the bins of the histogram, while in the case of the Parzen windows of the kernel density, the bin locations are determined by the data point.

Figure 3. The evolution of capital control measures in Asia-Pacific
1995-2010



Notes: For density, the kernel density measure was applied for the sample of 37 economies in the years of 1995, 2000, 2005, and 2010. For portfolio bond flows restrictions no data were available for 1995 in the original dataset by Schindler (2009).

Source: Authors' estimations using and extending the indices by Schindler, M. (2009), "Measuring Financial Integration: A New Data Set", IMF Staff Papers 56(1).

III. WHAT DRIVES SUDDEN FLOWS OF CAPITAL IN ASIA-PACIFIC?

Broadly speaking, foreign capital enters a country to seek higher return or diversification. If the marginal return to capital is relatively high (compared to the world interest rate), foreign capital will more likely supplement domestic savings. Blanchard and Giavazzi (2002) observed that capital inflows will be attracted to finance domestic investment as long as the risk-adjusted returns are relatively high. However, as Kraay and Ventura (1999) pointed out, even if risk-adjusted returns are similar to those in other countries, foreign capital may still enter the country to seek diversification. In this latter case, when risk-adjusted domestic returns are not higher than elsewhere, foreign capital does not necessarily boost domestic investment.

Capital controls are imposed with the purpose to avoid some of the undesirable consequences of large and volatile capital flows such as large exchange rate movements or a reduced effectiveness of monetary control.

Review of the literature

The capital flows and capital controls literature dates back to several decades ago producing a large number of mainly descriptive and empirical studies on the determinants and impact of inflows and the objectives and effectiveness of control measures (Table 1). However, the theoretical literature has been lagging behind the empirical one, sometimes leading to unexplained differences between empirical results.

A recent piece of literature on the *determinants of capital flows* to emerging economies is Broto *et al.* (2011) that investigate the determinants of the volatility of flows to emerging markets looking at FDI, portfolio and bank credit flows. They found that global factors have become increasingly important in shaping cross-border flows of capital, though there are some domestic factors as well, that can have an impact on volatility.

The strand of the empirical literature focusing on the *effectiveness of capital controls* in insulating the economy from volatile capital inflows is ambiguous in its conclusions on whether controls are effective. In particular, the effect of controls on the volume of inflows seems to vary across studies. Montiel and Reinhart (1999) find no evidence of impact of control measures (which are aggregate measures ranging from 0 to 2) on the volume of inflows during 1990-1996 in a sample of 15 emerging economies. Similarly, Milesi-Ferretti and Lane (2003) do not find an independent explanatory power for capital controls (aggregate index ranging from 0 to 4) over 1978-2001 for 18 OECD countries in enhancing financial integration measured as a sum of gross foreign assets and gross foreign liabilities (scaled by GDP). In contrast, Cardarelli *et al.* (2007) found that countries implementing capital controls experienced smaller inflows. Binici *et al.* (2010) confirmed using a dataset covering 74 countries over 1995-2005 that capital controls affect

the volume of capital flows. In addition, they also found that the effect of control measures varies widely across asset categories and types of controls and by the direction of flows. Controls on debt and equity appeared to be effective for outflows, less so for inflows. Moreover, Binici et al. (2010) found that there is a difference in the effectiveness of controls across income groups: only high-income countries appeared able to effectively control debt outflows. Ostry et al. (2010) provide a broad overview of the role and effectiveness of capital controls.

Mody and Murshid (2005) examined the *impact of capital flows* on domestic investment and found that in the 1990s capital inflows stimulated less investment in emerging economies than in the previous decade. Capital inflows were instead channelled to foreign exchange reserves or offset by outflows as domestic residents diversified their portfolios. After a rigorous examination of the possible determining factors in sixty countries between 1979 and 1999, the authors concluded that it was portfolio diversification motives rather than seeking higher returns that was driving capital flows in the 1990s following the liberalisation of capital accounts in many emerging economies. Furceri et al. (2011) examine the impact of capital flow bonanzas on domestic banking and currency crises.

Magud et al. (2011) provide a portfolio balance model that sheds light on some of the issues and reconciles potentially different empirical outcomes. They showed that the effect of capital controls on the level of short-term as well as total capital flows depends on the elasticity of short-term flows to total capital flows. This implies, that, depending on this elasticity, capital control measures may induce an increase or a decrease in capital flows, or may as well have no impact on the level of either short-term or total flows. They also showed that the quantity-based capital control measures could be replaced by price-based measures (in the form of imposing taxes on the rate of return on short-term capital flows) depending on the level of short-term flows prior to the introduction of control measures.

Table 1. Selected literature on capital flows and controls

	Dependent variable	Time period	Sample	Independent variables	Method	Major findings
Binici <i>et al.</i> (2010)	Capital in/outflows by asset class	1995-2005	74 countries	Real GDP per capita (in log), institutional quality, trade openness, measures of financial development, natural resources, capital controls (by types)	LSDV	Debt and equity controls can reduce outflows but not inflows; only high-income countries can impose effective debt outflow controls; control measures influence both the volume and composition of flows
Montiel and Reinhart (1999)	Capital inflows (portfolio, short term and FDI)	1990-96	15 emerging economies	Capital controls, country fixed effects	LSDV, LSDV with instrumental variables	Control measures do not affect the volume only the composition of inflows: reduce the share of portfolio and short term capital
Forbes and Warnock (2011)	Capital inflows	1980-2009 (quarterly)	58 countries	Global risk, liquidity, growth and interest rates; regional, trade and financial contagion factors; domestic financial system, income level, capital control, debt-to-GDP ratio	SUR on 4 episode types with standard errors clustered by country	Global risk is an important determinant of episodes, but not global liquidity or interest rates; domestic macroeconomic variables do not have much explanatory power either; capital control measures have little effect
Lane and Milesi-Ferretti (2003)	Capital flows (gross)	1978-2001	18 OECD countries	Capital controls	OLS with fixed effects	Capital control does not have an independent explanatory power in driving financial integration
Mody and Murshid (2005)	Domestic investment	1979-99	60 developing countries	Capital flows (FDI, portfolio and lending), growth rate of real GDP, the real interest rate, the cyclical variation in the ratio of M2 to GDP, GDP uncertainty, change in terms of trade	GMM	Capital inflow surges associated with financial liberalisation in the 1990s were driven by diversification motives and did not lead to domestic investment increase

Source: Authors' compilation.

IV. METHODOLOGY, DATA AND FINDINGS

The major interest in examining capital flow bonanzas and sudden stops is first of all what drives such sudden changes: is it more domestic or global factors? Does international capital seek to reap benefits from growth *i.e.* targets countries with favourable growth prospects or does it target financial opportunities in liberalising economies? Can regulatory authorities influence such volatile movements by restricting the flow of capital? If so, should it be targeted and how? Are only inflow controls relevant or do controls on outflows count as well? Is it more effective to target equity flows or debt-type of flows, *i.e.* money-market instruments, bonds and cross border lending? Should all investors be targeted the same way or should institutional investors that are capable moving large amounts of funds be the focus of restrictions? Should there be a difference between controlling capital by ownership: domestic vs. foreign investors?

The empirical analyses below attempt to investigate many of the above issues in Asia and the Pacific. The empirical methods used are standard in the capital flows literature: probit analysis to examine the factors affecting the probability of bonanzas and duration analyses to test what measures influence the length of sudden flows. While the methodology applied in this paper is similar to that in previous literature, the definitions of what constitutes a bonanza episode and when measures counteracting volatile flows are considered successful, are adopted to the purposes of the paper.

Ideally, the analyses of sudden changes in capital flows and the effectiveness of capital control measures to avoid them would cover a disaggregated set of control measures to check, a large coverage in terms of the number of countries included in the analyses and long time series of such control measures as well as capital flow and other data for explanatory variables. Given, however, the availability of data and information in particular on capital control measures, most studies in the literature needed to strike a balance between the time dimension and the extent of disaggregation of capital control measures and flows data, let alone the country dimension. For the present purposes, with a given country dimension (*i.e.* Asia Pacific economies) and the importance of looking at different types of flows and possible measures at the disaggregated level to control them, the balance is tilted in favour of a large number of capital control measures and a large coverage of countries rather than long time series. This way, a panel data of 32 economies over 1980-2009 (for capital control measures over 1995-2009) was constructed.²

2. Although the Schindler index originally covered 37 economies in Asia Pacific, due to a lack of balance of payments data in sufficiently long time series for 5 economies, only data for 32 were finally used.

A major issue of interest is the definition of what constitutes a sufficiently large sudden in- or outflow to call it an “episode”. What is common in the literature is that deviation from a certain trend is applied as threshold and any inflow above this threshold is defined as an episode.³ The trend is obtained by: *i*) calculating historical averages; *ii*) moving averages; or *iii*) filtering past data, most commonly by the Hodrick-Prescott filter. The threshold is mostly set 1 or 2 standard deviations or occasionally 30% above the (HP-filtered) trend. Alternatively, the start of the episode is set at 2 standard deviations and the end at 1 standard deviation above this trend. Notwithstanding the variety of ways of filtering and of determining the distance for the threshold, all studies in the literature, to the authors’ best knowledge, calculate the distance from smoothed historical data of respective countries, smoothing out volatilities in capital flows and hence implying that countries with stable and with volatile capital flow records have the same propensity to experience a sudden surge or stop in inflows or a sudden withdrawal or flight of capital. Given the large variety of economies in the Asia Pacific with some experiencing stable and other volatile inflows, it may not be realistic to assume that both types of countries have the same propensity to experience abrupt in- or outflows. Therefore, in the analyses, the deviation from the global trend is used instead of a trend based on countries’ own historical data. This also allows for gauging to what extent countries are able to reap the benefits of global capital flows relative to other countries. To highlight differences between different magnitudes of flows, 1, 2 and 3 standard deviations above global trend are computed for all countries (Table 2). Then the episode-type of analysis is followed identifying episodes of capital inflow bonanzas.

Another choice to make is whether to use net or gross capital flow variables as it may imply very different settings. While the net flows are undoubtedly important from the point of view of *e.g.* the country’s ability to finance its current account deficit as it is the net inflows that make up for the lacking domestic savings and thereby help avoiding a balance of payment crisis, it is difficult to find policy recommendations that would directly have an impact on net flows. In addition, looking at net figures would mask: *i*) large in- and outflows experienced simultaneously as their netted value may not be large; *ii*) the difference *e.g.* between liquidating existing stock of investment or investing abroad anew; and *iii*) the investment decisions by domestic and foreign investors that may be based on different considerations. In line with the above, gross capital flow data disaggregated by asset type are used in this study.

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3. Alternatively, some studies in the literature simply designate the upper 20th percentile of inflows as inflow surges such as Reinhart and Reinhart (2008).

Table 2. The number and length of episodes of sudden surges in capital inflows
1980-2009

	Inflows 1 standard deviation above the global trend			Inflows 2 standard deviations above the global trend			Inflows 3 standard deviations above the global trend		
	No. of episodes	No. of episode years	Average length of episodes	No. of episodes	No. of episode years	Average length of episodes	No. of episodes	No. of episode years	Average length of episodes
Afghanistan	1	8	8	1	8	8	1	8	8
Armenia	1	8	8	2	7	3.5	3	4	1.33
Australia	3	7	2.33						
Azerbaijan	2	7	3.5	2	6	3	2	4	2
Bangladesh	1	1	1						
Bhutan	1	13	13	1	13	13	1	13	13
Fiji	1	3	3						
Georgia	2	2	1	1	1	1	1	1	1
Hong Kong, China	1	12	12	1	12	12	1	12	12
Indonesia	1	1	1						
Kazakhstan	3	10	3.33	1	1	1	1	1	1
Korea	1	7	7	1	1	1			
Kyrgyzstan		6		1	5	5	1	4	4
Lao PDR	2	12	6	2	4	2	2	4	2
Macau	1	6	6	1	6	6	1	6	6
Malaysia	3	12	4	2	5	2.5	1	1	1
Mongolia	5	16	3.2	3	14	4.67	2	13	6.5
Myanmar	1	2	2						
Nepal	3	5	1.67	1	1	1			
New Zealand	4	11	2.75	1	3	3	2	2	1
Pakistan	1	1	1						
Philippines	2	6	3						
Russian Federation	1	1	1						
Samoa	2	3	1.5						
Singapore	2	37	18.5	3	36	12	7	29	4.14
Sri Lanka	3	11	3.67	1	2	2			
Chinese Taipei	3	4	1.33						
Tajikistan	2	2	1	2	2	1			
Thailand	3	12	4						
Turkey	1	1	1						
Turkmenistan	1	4	4	2	3	1.5	1	2	2
Viet Nam	2	2	1						
Total	60	233	3.88	29	130	4.48	27	104	3.85

Note: An episode is defined as the time spell during which capital inflows (including foreign inflows and retrievals by domestic investors) are above a certain threshold, in this case 1, 2 and 3 standard deviations above the global trend. For the scaling of inflows, the GDP is used, both for country-specific and global variables.

Source: Authors' calculations.

To investigate what determines the bonanza episodes as well of sudden stops and retrievals, the major interest is whether capital controls play a role in triggering or preventing large and sudden changes in capital flows. For this purpose, the updated Schindler index is used at both the aggregate and disaggregated levels by types of flows as well as restrictions applying to the activities of residents or non-residents.

In addition to the capital control variables – the main variables of interest – a set of control variables are used to explain sudden and large capital flows. These include variables capturing the external economic environment such as risk appetite (from the Chicago Board Options Exchange) or global cyclical conditions (captured by the OECD output gap from the Economic Outlook database of the OECD) as well as the domestic environment such as previous capital flows (obtained from the Balance of Payments database of the IMF), stocks (using the International Investment Position data published by the IMF and the Lane and Milesi-Ferretti; 2007 database, extended by the authors) where available, and the rate of economic growth (year-on-year growth rate of gross domestic product obtained from the CEIC database). To control for time-specific determinants, year dummies were applied and where the degree of freedom constraint allows, also country-specific dummies were entered into the regression to capture characteristics specific to countries that may play a role in triggering a sudden change in capital flows.

Another issue is the scaling of the variables used in the analyses, which may again be important from the policy making point of view given that the ability of the economy to cope with large capital flows depends not only on its size (GDP) but also of its depths of financial markets, *inter alia*. To account for this, where possible, other than GDP scales were used as alternatives.

What determines the start of capital flow bonanzas?

To check the determinants of the probability of a capital inflow surge, probit analysis was applied with a binary variable indicating the start of inflow surges and with explanatory variables including domestic factors such as the growth rate of the economy, past capital inflows and changes in the exchange rate as well as foreign factors captured by the output gap in OECD countries. As capital flows themselves affect many of the economic environment factors that are included in the analysis, such variables were entered with a lag to reduce the simultaneity problem. As in Forbes and Warnock (2011), gross inflows were used, which constitute the sum of inflows in direct investment, portfolio investment, derivatives and other investment including foreign inflows and retrievals by domestic investors.

At the aggregate level, the probability of *capital inflow bonanzas* can be reduced by more stringent overall controls on inflows (Table 3), though only in the case of inflows substantially above the global trend (at least 2 standard deviations). This finding is robust to different model specifications. For the overall capital control measure or outflow measure no significant impact was found. Previous inflows and global risk appetite also weigh on the probability of an inflow surge, but foreign output gaps do not appear to have a bearing on the probability of an inflow surge in Asia Pacific. In addition, domestic conditions such as the growth rate of the economy or exchange rates appear irrelevant for the occurrence of large inflow surges. When including the stock of earlier foreign inflows (obtained from international investment position data), the major results do not change and this new variable does not appear to influence the probability of a bonanza.

Table 3. The determinants of the probability of a capital inflows surge

Probit estimate

	Inflows 1 standard deviation above the global trend		Inflows 2 standard deviations above the global trend		Inflows 3 standard deviations above the global trend	
Growth rate of economy	0.04	0.03	0.00	0.00	0.00	0.00
	[0.55]	[0.62]	[-0.01]	[0.07]	[-0.11]	[0.4]
Previous inflows (lagged change)	0.05**	0.00**	0.00**	0.00*	0.00**	0.00**
	[2.22]	[2.22]	[1.98]	[1.95]	[2.31]	[2.27]
Exchange rate (nominal effective exchange rate, lagged change)	0.00	0.00	0.00	0.00	0.00	0.00
	[0.64]	[0.71]	[0.01]	[0.1]	[-0.02]	[0.32]
Output gap in OECD countries (lagged change)	0.01		0.00		0.00	
	[0.86]		[1.27]		[1.43]	
Global risk appetite (index)		0.00*		0.00*		0.00
		[1.96]		[1.95]		[1.34]
Overall control of capital inflows	-0.02	-0.02	-0.00*	-0.00*	-0.00*	-0.00*
	[-1.16]	[-1.14]	[-1.88]	[-1.85]	[-1.91]	[-1.81]
Pseudo R-square	0.18	0.24	0.41	0.50	0.45	0.45
Observations	248	248	254	254	257	257

Note: Reported coefficients are the marginal effects (i.e. the change in probability of the left-hand side variable if the explanatory variable increases by one unit). z-statistics in brackets. Significance levels: * significant at 10%; ** significant at 5%; *** significant at 1%.

Source: Authors' estimation.

At the more disaggregated level, a *portfolio investment inflow* (including foreign inflows and retrievals by domestic investors and both equity and debt-type portfolio flows) bonanza appears less likely if restrictions on bond inflows are in place, in particular with respect to sale or issue abroad by residents (Table 4). Controls related to equity flows do not appear to be effective in general with the exception of controlling sales and issue locally by non-residents. This is not surprising considering that a larger portion of portfolio flows is of debt than equity type.

The external environment, captured by the OECD output gap does not appear to affect the probability of portfolio investment inflow surges. Domestic variables, such as the growth rate of the economy, the share of trade in GDP and the differential with the US interest rate do not seem to have a bearing on the probability of a portfolio surge, either. Past inflows are, as in other analyses, again, important factors.

In the case of large inflows, general portfolio capital control measures do not appear to be effective at all. For such inflows, controlling collective investment inflows may be more effective. In particular, controlling the sale or issue of collective investment instruments locally by non-residents appears effective. The interest rate differential matters, but only for large inflows.

Table 4. The impact of capital control measures on portfolio capital inflows
Probit estimation

	Inflows 1 standard deviation above the global trend								Inflows 2 standard deviations above the global trend					
Left-hand side variable: binary variable indicating start of portfolio inflows														
Growth rate of economy	0.02	0.00	0.04	-0.04	-0.02	-0.02	-0.02	0.00	0.08	0.06	0.04	0.07	0.06	0.09
	[0.18]	[0.01]	[0.30]	[-0.32]	[-0.15]	[-0.11]	[-0.13]	[-0.01]	[1.42]	[1.10]	[1.56]	[1.15]	[1.17]	[1.15]
Previous portfolio inflows (lagged change)	0.06***	0.06***	0.06***	0.05***	0.05***	0.08***	0.08***	0.08***	0.02**	0.02**	0.01**	0.02**	0.02**	0.02**
	[2.65]	[2.66]	[2.66]	[2.67]	[2.61]	[2.73]	[2.73]	[2.76]	[2.19]	[2.39]	[2.38]	[2.27]	[2.26]	[2.34]
Output gap in OECD countries (lagged change)	-0.02	0.03	0.03	0.03	0.03	-0.02	-0.02	-0.03	-0.01	-0.01	0.00	-0.01	-0.01	-0.01
	[-0.39]	[1.19]	[1.10]	[1.28]	[1.16]	[-0.38]	[-0.38]	[-0.41]	[-0.48]	[-0.82]	[-0.75]	[-0.56]	[-0.59]	[-0.54]
Share of trade in GDP (lagged)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	[-0.70]	[-0.57]	[-0.46]	[-0.55]	[-0.43]	[-0.62]	[-0.60]	[-0.62]	[-0.25]	[-0.41]	[-0.21]	[-0.09]	[-0.04]	[-0.03]
Interest rate differential with the US (lagged)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	[-0.14]	[-0.04]	[0.01]	[0.02]	[0.12]	[-0.05]	[-0.00]	[-0.04]	[0.41]	[0.61]	[0.60]	[0.51]	[0.52]	[0.48]
Control of sale or issue of equity by non-residents	-0.08**								-0.07**					
	[-2.23]								[-2.04]					
Control on bond flows		-0.08**								-0.04*				
		[-1.97]								[-1.88]				
Control on bond inflows			-0.08**								-0.02*			
			[-1.97]								[-1.85]			
Control of purchase of bonds abroad by residents				-0.08**										
				[-2.29]										
Control of sale or issue of bonds abroad by residents					-0.08**									
					[-2.16]									
Controls on collective investment						-0.05						-0.04*		
						[-1.27]						[-1.69]		
Controls of collective investment inflows							-0.05						-0.03*	
							[-1.27]						[-1.65]	
								-0.05						-0.05
								[-1.27]						[-1.70]
Observations	161	149	149	149	149	161	161	161	153	153	153	153	153	153

Note: Reported coefficients are the marginal effects (i.e. the change in probability of the left-hand side variable if the explanatory variable increases by one unit). z-statistics in brackets. Significance levels: * significant at 10%; ** significant at 5%; *** significant at 1%.

Source: Authors' estimation.

Further, *equity inflow* restrictions in general and the restrictions on the sale or issue of equities abroad by residents appear to be effective in reducing the probability of portfolio equity inflow surges (Table 5). Countries with larger previous inflows, smaller portfolio equity stock and higher growth rate are more likely to experience an equity inflow surge. This analysis could only be conducted for the threshold of 1 standard deviation above the global trend as for more stringent criteria (i.e. larger inflows) the number of observations was not sufficient for estimation.

In the basic analysis the GDP was used to scale the size of inflows (both at the country and at the global levels). As an alternative, equity inflows were also scaled by trading value on the stock exchange (and by the same token also at the global level when determining the global trend) to capture large inflows relative to stock market sizes in terms of trading activity. Unlike in the case of large equity portfolio capital inflows relative to countries' GDPs, large inflows relative to domestic stock market trading can be avoided by more stringent controls on collective investment instruments, in particular the sale or issue abroad by residents (not shown in the table). As another alternative, equity inflows were also scaled by total market capitalisation, but in this setting, none of the capital control variables appeared effective in avoiding surges in equity inflows. This may be related to the fact that not all stocks listed in stock markets of the region are traded, hence the large sizes of market capitalisation may not capture the extent of financial depth.

Table 5. The impact of capital control measures on equity portfolio capital inflows
Probit estimation

Left-hand side variable: binary variable indicating start of portfolio equity inflows		
Growth rate of economy	1.06**	1.05**
	[2.08]	[2.07]
Previous portfolio inflows (lagged change)	0.04*	0.03*
	[1.76]	[1.85]
Global risk index	0.00*	0.00
	[1.69]	[1.60]
Stock of portfolio equity (lagged)	-0.00*	-0.00*
	[-1.79]	[-1.69]
Trade share in GDP (lagged)	0.00	0.00
	[-0.97]	[-1.64]
Controls on equity inflows	-0.05**	
	[-2.04]	
Controls on sale or issue of equities abroad by residents		-0.42**
		[-2.08]
Observations	62	62

Notes: Reported coefficients are the marginal effects (*i.e.* the change in probability of the left-hand side variable if the explanatory variable increases by one unit). *z*-statistics in brackets. Significance levels: * significant at 10%; ** significant at 5%; *** significant at 1%. The threshold used for defining what constitutes an equity portfolio capital inflow episode is one standard deviation above the global trend. For higher thresholds (two or three standard deviations above the global trend) the number of observations was not sufficient for the probit estimation.

Source: Authors' estimation.

Debt portfolio inflow surges can be effectively avoided by restricting capital outflows in general (Table 6). This, though may sound surprising, may reflect the fact that portfolio inflows often seek short-term gains and in a lack of an easy way out of the country they may not enter in the first place even if inflow restrictions are not stringent. Controlling bond flows in general and the sale or issue of bonds locally by non-residents in particular can reduce the probability of large portfolio debt inflows. Also, restricting resident activities with regards to selling or issuing or purchasing bonds abroad appears effective.

Further, the probability of debt portfolio inflow bonanzas can be reduced by restricting collective investment instruments: their inflow and outflow, in particular activities by residents: purchase or sale or issue abroad as well as sale or issue locally by non-residents. Collective instruments are often used by large-scale institutional investors, implying the possibility of large movement of funds upon changes in investment decision.

Interestingly, the above measures no longer seem effective in curbing larger inflows (those 2 standard deviations above the global trend) except the control of residents' buying money market instruments abroad. Moreover, in the case of very large inflows (3 standard deviations above the global trend) controlling the local sale or issue by non-residents appears the only effective measure to reduce the probability of debt portfolio inflow surges.

For *bond portfolio* and *money market instruments* there does not seem to be a capital control instrument among the ones available in the extended Schindler dataset that would effectively reduce the probability of inflow bonanzas (results not reported in the paper). For bonds, earlier inflow surges seem to increase the probability of an inflow bonanza, though the stock of debt inflows does not seem to matter in most specifications. Domestic growth rate does not appear to increase the probability of large bond inflows, thereby not supporting the branch of the literature saying that domestic productivity surge raising growth potential are important drivers of capital inflows. Similarly, global risk appetite does not appear to affect inflows, either. For money market instruments,⁴ even fewer drivers of sudden inflows were identified. Only the stock of debt inflows appears to matter for inflow surges, but only for large, but not too large inflows. This may reflect the large variety of instruments included in this category and the different types of potential drivers that may not be captured by the explanatory variables used in the analyses.

4. Money market instruments are defined as securities with an original maturity of one year or less and include short-term instruments, such as certificates of deposit and bills of exchange as well as treasury bills and other government paper, bankers' acceptances, commercial paper, interbank deposits and repurchase agreements according to the AREAER.

Table 6. The impact of capital control measures on debt portfolio capital inflows
 Probit estimation

	Inflows 1 standard deviation above the global trend										Inflows 2 standard deviations above the global trend										Inflows 3 standard deviations above the global trend																		
	Left-hand side variable: binary variable indicating start of debt portfolio inflows																																						
Growth rate of economy	-0.03	0.00	-0.16	0.01	-0.01	0.00	0.03	0.02	0.01	-0.02	0.02	-0.03	-0.03	-0.16	0.00	0.01	0.00	0.03	0.02	0.00	-0.01	0.00	-0.04	-0.02	-0.02	-0.01	0.01	0.00	0.01	0.00	0.00	0.00	0.00	0.01	0.00				
Previous debt inflows (lagged change)	0.10***	0.07***	0.14***	0.09***	0.06***	0.08***	0.04***	0.05***	0.07***	0.08***	0.09***	0.07*	0.07*	0.11**	0.09**	0.02*	0.08**	0.04*	0.06**	0.05*	0.03**	0.08**	0.09**	0.04**	0.04*	0.01**	0.03**	0.00	0.02*	0.04*	0.00**	0.00**	0.03**	0.00	0.01**	0.03**			
Global risk index	2.80	2.65	2.71	3.08	2.83	3.02	2.89	2.96	2.81	2.91	2.82	3.10	1.94	1.96	2.08	2.02	1.95	1.98	1.91	1.99	1.90	2.03	1.96	2.03	2.00	1.89	2.03	1.98	1.08	1.95	1.73	2.13	1.80	1.16	1.98	2.01			
Stock of portfolio debt (lagged)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
Share of trade in GDP (lagged)	0.87	0.92	1.16	0.93	0.84	0.70	0.89	0.85	0.85	0.92	0.80	0.74	1.22	1.13	1.15	1.19	1.34	1.07	1.19	1.17	1.19	1.32	1.09	1.11	1.42	1.43	1.81	1.41	0.97	1.34	1.23	1.50	1.29	1.02	1.42	1.36			
Interest rate differential with the US (lagged change)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
Control on capital outflows	-0.07*																																						
Control on bond flows	-0.08*																																						
Control of sale or issue of bonds locally by non-residents																																							
Control of money market instrument inflows																																							
Control of the purchase of money market instruments abroad by residents																																							
Control of the sale or issue of money market instruments abroad by residents																																							
Control of collective investment																																							
Control of collective investment inflows																																							
Control of collective investment outflows																																							
Control of the purchase of collective investment instruments abroad by residents																																							
Control of the sale and issue of collective investment instruments locally by non-residents																																							
Control of the sale and issue of collective investment instruments abroad by residents																																							
Observations	109	103	103	109	109	109	109	109	109	109	109	109	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80		

Note: Reported coefficients are the marginal effects (i.e. the change in probability of the left-hand side variable if the explanatory variable increases by one unit). z-statistics in brackets. Significance levels: * significant at 10%; ** significant at 5%; *** significant at 1%.

Source: Authors' estimation.

The probability of *financial credit inflow* booms appear to be effectively reduced by more stringent regulation of credit inflows. This finding holds for inflows greater than 1 and 2 standard deviations above the global trend but not for very large inflows, that are at least 3 standard deviations above the global trend (Table 7). Earlier credit inflow surges seem to increase the probability of a bonanza, therefore cross-border credit growth rates could be a useful early warning indicator. The stock of inflows, in turn, only seems to matter for very large inflows at least 3 standard deviations above the global trend. Financial depth seems to be an important determinant of the probability of credit surges: deeper markets seem to be less prone to experience sudden inflow bonanzas. This finding is relevant from smaller inflow episodes to very large ones and has an important policy implication: deepening financial markets can be effective in counteracting volatile capital flow effects. Or, putting it the other way, removing control on cross-border credit before having deep financial markets may be hazardous.

This finding is in line with Gu and Huang (2011) that provides a theoretical argument of the growth-instability trade-off that policy makers in developing countries face. The authors argue that instability is an inevitable price to pay for higher growth related to capital account openness. Their major contribution is the proof that this trade-off can be mitigated by stronger financial systems, that is, high growth is achievable alongside openness as long as the financial system is robust.

Table 7. The impact of capital measures on financial credit inflows

	Probit estimation					
	Inflows 1 standard deviation above the global trend		Inflows 2 standard deviations above the global trend		Inflows 3 standard deviations above the global trend	
Left-hand side variable: binary variable indicating start of financial credit inflows						
Previous credit inflows (lagged change)	0.10***	0.10***	0.05***	0.05***	0.03**	0.03**
	[3.42]	[3.34]	[3.11]	[3.04]	[2.39]	[2.40]
Global risk index	0.02***	0.02***	0.00	0.00	0.00	0.00
	[4.69]	[4.68]	[1.22]	[1.28]	[0.71]	[0.66]
Stock of capital inflows (lagged)	0.00	0.00	0.00	0.00*	0.00**	0.00**
	[0.51]	[1.00]	[1.49]	[1.80]	[1.99]	[2.45]
Financial depth (domestic credit to GDP ratio, lagged)	-0.00**	-0.00*	-0.00***	-0.00***	-0.00**	-0.00**
	[-2.12]	[-1.90]	[-2.59]	[-2.66]	[-2.25]	[-2.38]
Control of credit inflows	-0.07**		-0.05*		-0.01	
	[-2.00]		[-1.73]		[-0.55]	
Control of credit outflows		0.00		-0.02		0.02
		[0.03]		[-0.74]		[0.99]
Observations	296	296	272	272	209	209

Note: Reported coefficients are the marginal effects (i.e. the change in probability of the left-hand side variable if the explanatory variable increases by one unit). z-statistics in brackets. Significance levels: * significant at 10%; ** significant at 5%; *** significant at 1%.

Source: Authors' estimation.

What drives the termination of bonanzas?

Once large inflows started in a sudden manner, another question that arises is how long they will last. To explore this issue, duration models are applied. To estimate what determines the duration of large capital flow episodes, parametric methods were used that assume a continuous parametric distribution for the probability of failure, in this case the stopping of capital flows, over time. The shape of this probability of experiencing the failure event at time t conditional on having survived to this time (called hazard rate) needs to be decided to estimate the model. Theory can provide little guidance as the shape of time dependency is conditional on the covariates in the model.⁵ The variation in terms of duration of episodes in the dataset suggests that the exponential parametric model is unlikely to be the right choice. Also, there is no reason to assume that the conditional probability of experiencing the event of stopping the episode is monotonic. Therefore, model selection methods were applied to determine the type of distribution. The generalised gamma model was estimated, which is flexible with two shape parameters and nests the exponential, the Weibull and the log-normal models as special cases. Wald tests were then used to test the values of the shape parameters that resulted in rejecting the exponential and Weibull models while the log-normal distribution could not be rejected. Estimation results assuming log-logistic distribution appeared similar and the Akaike-information criterion (AIC) also suggested the same choice. The estimated model is therefore the log-normal with the survival function of:

$$S(t) = 1 - \Phi \left\{ \frac{\ln(t) - \mu}{\delta} \right\}$$

where $S(t)$ denotes the survival function, t is time, Φ is the standard normal cumulative distribution function, δ is a shape parameter and $\mu = X\beta$, where X is the set of explanatory variables. All covariates are time-varying and lagged to reduce the simultaneity problem.

The accelerated failure time specification was used for the model, as the duration model with a log-normal distribution can only be interpreted in this format. Actually, the interpretation of the results is straightforward in this specification as the sign of the coefficient indicates how a covariate affects the logged survival times.⁶ Thus, a positive coefficient increases the logged survival time and hence the expected duration of the capital flow episode. By the same token, a negative coefficient decreases the logged survival time and hence the expected duration of an episode.

For *overall capital inflows*, in general, larger previous period inflows tend to shorten the duration of bonanzas, indicating that episodes are destined to end sooner than later. Larger stocks of capital do not seem to have a robust impact on the length of inflow bonanzas except in a few cases and for very large inflows, where they tend to lengthen the episode (Table 8). Global cyclical conditions (captured by the OECD output gap) do not appear to have a bearing on the

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5. In fact, time dependency indicates how the probability of experiencing an event at time t (conditional on surviving till time t) changes with time after conditioning on covariates.
 6. Just the other way around in proportional hazard models where the sign of the coefficient indicates how a covariate affects the hazard rate. In those models, a positive coefficient increases the hazard rate and therefore reduces the expected duration of an episode.

length of bonanzas, while higher domestic growth seems to shorten their duration, though only in the case when restrictions on bond inflows are entered in the regression and only for not too large episodes. Several control measures seem to be effective in lengthening the duration of bonanzas, including all measures related to bonds and collective instruments and restrictions on outflows of money market instruments (by either residents or non-residents). Not surprisingly, restrictions on outflows, be it bonds, money market instruments or collective instruments, by locking the funds in, lengthen the episodes. This implies, that relatively liberal policies towards outflows could effectively shorten the duration of large inflows and hence also their cumulative effect on the economy.

The determinants of the duration of *debt inflows* appear different from those of overall inflows, with both previous inflows and the debt stock in the country reducing the duration of inflows (Table 9). Unlike for overall inflows, the global economic environment seems an important determinant of the length of debt bonanzas: a downturn in OECD countries shortens such bonanzas. Domestic growth, in contrast, lengthens them, though these findings are not robust to various specifications. A number of capital control measures appear to be effective in cutting bonanzas short. Allowing the purchase of bonds, money market instruments and collective instruments abroad by residents seem to shorten the life of bonanzas, while controlling foreigners' selling of money market instruments domestically has the same effect. The length of *money market inflow* bonanzas seems to have very similar determinants to that of total debt inflows.

Table 8. Determinants of the duration of overall capital inflows
Survival analysis

	Inflow s 2 standard deviations above the global trend														Inflow s 3 standard deviations above the global trend																							
	Left-hand side variable: hazard rate of not stopping a consolidation episode																																					
Previous inflows (lagged change)	0.03**	0.03**	0.03*	0.03*	0.03**	0.03*	0.03*	0.03**	0.03**	0.03**	0.03**	0.03**	0.03**	0.03**	0.03**	0.03**	0.03**	0.03**	0.03**	0.03**	0.03**	0.03**	0.03**	0.03**	0.03**	0.03**	0.03**	0.03**	0.03**	0.03**	0.03**	0.03**	0.03**					
Total liabilities (lagged)	0.00	0.00	-0.00*	-0.00*	-0.00*	-0.00*	-0.00*	-0.00*	-0.00*	-0.00*	-0.00*	-0.00*	-0.00*	-0.00*	-0.00*	-0.00*	-0.00*	-0.00*	-0.00*	-0.00*	-0.00*	-0.00*	-0.00*	-0.00*	-0.00*	-0.00*	-0.00*	-0.00*	-0.00*	-0.00*	-0.00*	-0.00*	-0.00*	-0.00*				
Change in global output gap	-0.02	-0.02	-0.01	-0.01	-0.02	-0.01	-0.01	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02			
Growth rate (lagged)	-0.03	-0.03	-0.26*	-0.26*	-0.28*	-0.23	-0.24*	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03			
Control of overall inflows	0.14																																					
Control of overall outflows		0.09																																				
Control of bond inflows			0.14*																																			
Control of bond outflows				0.14*																																		
Control of sale and issue of bonds locally by non-residents					0.13*																																	
Control of purchase of bonds abroad by residents						0.10																																
Control of sale or issue of bonds abroad by residents							0.13*																															
Control of money market instrument outflows								0.07																														
Control of sale or issue of money market instruments locally by non-residents									0.04																													
Control of collective instrument inflows										0.11																												
Control of collective instrument outflows											0.10																											
Control of purchase of collective instruments locally by non-residents												0.07																										
Control of purchase of collective instruments abroad by residents													0.12*																									
Control of sale or issue of collective instruments locally by non-residents														0.05																								
Control of sale or issue of collective instruments abroad by residents															0.11																							
Constant	3.97***	4.01***	4.25***	4.23***	4.25***	4.22***	4.23***	4.03***	4.04***	4.01***	4.00***	4.03***	3.99***	4.03***	4.00***	3.90***	3.93***	4.01***	3.94***	3.98***	3.93***	3.96***	3.96***	3.97***	3.95***	3.91***	3.99***	3.94***	3.93***	3.94***	3.93***	3.95***	3.95***	3.95***	3.95***			
Observations	477	477	439	439	439	439	439	477	477	477	477	477	477	477	477	480	480	442	442	442	442	442	442	480	480	480	480	480	480	480	480	480	480	480	480			

Note: The lognormal distribution was assumed for the hazard function as both the AIC model-selection criterion and the nested Wald test supported the lognormal (and loglogistic) forms versus the often used Weibull, Gompertz or exponential distributions. As the lognormal distribution of the hazard function assumes an accelerated failure time form, the interpretation of the coefficients is straightforward: a unit increase in the explanatory variable is associated with an increase equivalent to the size of the respective coefficient in the log hazard rate. The results for the smallest type of episodes - defined as 1 standard deviation above the global trend - are not reported here as none of the coefficients on control measures turned out significant.

Source: Authors' estimations.

Table 9. Determinants of the duration of debt inflows

Survival analysis

	Inflows 1 standard deviation above the global trend					Inflows 2 standard deviations above the global trend					Inflows 3 standard deviations above the global trend				
Left-hand side variable: hazard rate of not stopping a bonanza episode															
Explanatory variables															
Previous inflows (lagged change)	0.00	-0.02	0.01	0.02	0.02	0.01	0.02	0.06	0.04	0.04	0.00	0.00	0.07	0.03	0.03
	[-0.07]	[-0.24]	[0.19]	[0.28]	[0.30]	[0.23]	[0.26]	[0.99]	[0.57]	[0.58]	[0.06]	[0.06]	[0.96]	[0.33]	[0.32]
Total debt liabilities (lagged)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-0.01	0.00	0.00
	[1.13]	[1.22]	[0.31]	[1.15]	[1.10]	[0.61]	[0.70]	[-0.78]	[0.42]	[0.37]	[0.27]	[0.42]	[-0.85]	[0.11]	[0.05]
Change in global output gap	-	-	-	-	-	-	-	-	-	-	-0.03*	-0.03*	-0.05**	-0.03*	-0.03*
	0.04**	0.04**	0.05***	0.05***	0.05***	0.03**	0.04**	0.04**	0.04**	0.04**	[-2.49]	[-2.54]	[-2.74]	[-2.63]	[-2.77]
	[-2.49]	[-2.54]	[-2.74]	[-2.63]	[-2.77]	[-2.05]	[-2.09]	[-2.42]	[-2.04]	[-2.10]	[-1.68]	[-1.68]	[-2.08]	[-1.68]	[-1.73]
Growth rate (lagged)	1.00**	0.99**	1.29**	1.08**	1.19**	0.52	0.65	1.05*	0.65	0.70	0.53	0.62	1.46*	0.63	0.68
	[2.04]	[2.12]	[2.41]	[2.11]	[2.36]	[1.22]	[1.32]	[1.78]	[1.31]	[1.41]	[1.05]	[1.11]	[1.77]	[1.12]	[1.20]
Control of bond outflows	0.14*					0.11					0.10				
	[1.66]					[1.44]					[1.14]				
Control of purchase of bonds abroad by residents		0.18**					0.61					0.67			
		[2.45]					[0.00]					[0.00]			
Control of sale or issue of money market instruments locally by non-residents			-0.04					-0.14*					-0.72		
			[-0.69]					[-1.69]					[-0.90]		

Table 9. Determinants of the duration of debt inflows (cont.)

Survival analysis

	Inflows 1 standard deviation above the global trend					Inflows 2 standard deviations above the global trend					Inflows 3 standard deviations above the global trend				
Left-hand side variable: hazard rate of not stopping a bonanza episode															
Explanatory variables															
Control of purchase of money market instruments abroad by residents	0.14**					0.07					0.06				
	[2.07]					[1.01]					[0.80]				
Control of purchase of collective instruments abroad by residents	0.14*					0.06					0.05				
	[1.94]					[0.87]					[0.65]				
Constant	2.68***	2.66***	2.45***	2.58***	2.47***	3.18***	3.03***	2.75***	3.08***	3.04***	3.23***	3.10***	2.93***	3.15***	3.11***
	[5.13]	[5.32]	[4.38]	[4.67]	[4.55]	[6.90]	[5.64]	[4.55]	[5.76]	[5.68]	[5.98]	[5.09]	[2.70]	[5.16]	[5.08]
Observations	222	222	235	235	235	222	222	235	235	235	222	222	235	235	235

Note: The lognormal distribution was assumed for the hazard function as both the AIC model-selection criterion and the nested Wald test supported the lognormal (and loglogistic) forms versus the often used Weibull, Gompertz or exponential distributions. As the lognormal distribution of the hazard function assumes an accelerated failure time form, the interpretation of the coefficients is straightforward: a unit increase in the explanatory variable is associated with an increase equivalent to the size of the respective coefficient in the log hazard rate. The results for the smallest type of episodes - defined as 1 standard deviation above the global trend - are not reported here as none of the coefficients on control measures turned out significant.

Source: Authors' estimations.

V. CONCLUSION AND FURTHER DIRECTIONS

The empirical analyses strengthen some of the findings in earlier literature and reveals several new aspects that may be useful for policymakers when considering the economic policy settings surrounding volatile capital flows and measures to adopt to counteract their disruptive impact.

Countries that choose foregoing the benefits of capital flows in favour of greater stability may adopt controls on the entirety of the capital account and will likely be insulated from any undesirable effect of volatile capital flows. This strategy is, however, unlikely to be the choice for most countries, at least in the long run. Instead, by identifying the type and nature of flows and their triggers, targeted controls may be more appropriate and appear effective.

Targeted controls appear effective

Capital inflow bonanzas on the **portfolio account** can best be prevented by not allowing residents to sell, issue or purchase bonds abroad or non-residents to sell or issue equity in the domestic market. Selling or issuing bonds abroad by residents is mostly in larger quantities due to the fixed costs of issuance and to economies of scale, therefore restricting this activity is clearly a way to avoid large and sudden inflows. Why purchasing bonds abroad by residents can lead to inflow bonanzas is less straightforward: it may be related to a sudden and large-scale dumping of foreign bonds by residents due to liquidity or other reasons unrelated to global cyclical condition, domestic growth or risk premia. A similar explanation may hold for foreign equities issues in the domestic market.

Portfolio flows consist of two major items of inherently different nature: equity and debt flows, therefore the effectiveness of controls to reduce the probability of inflow bonanzas in these two items was examined separately. Imposing controls on **equity inflows**, in particular restricting residents to sell or issue equities abroad appear effective in reducing the probability of equity portfolio inflow surges. This is not surprising, given that issuing shares abroad, in particular IPOs (initial public offerings), of large domestic firms may involve large and sudden equity investment inflows.

To avoid **debt portfolio inflow** bonanzas, the key is to limit inflow of money market and collective investment instruments. Among the inflow measures, it is the sale or issue abroad of money market or collective investment instruments by residents that are shown effective to avoid debt portfolio investment booms. Money market instruments not only are large in size in global financial markets, but due to their short-term maturity (below one year) they are a less stable financing instrument compared to bonds, for instance. Owing to fixed issuance costs abroad and scale economies, restricting domestic entities to sell or issue money market

instruments abroad may help shutting down that potentially large channel of inflows. Restricting the purchase of money market instruments abroad by residents also appears effective in preventing bonanzas. While this is a control of outflows, it may reduce the probability of dumping of money market instruments by residents at a later point, which would be an inflow bonanza should it be sufficiently large scale.

Collective investment instruments may be important to target for controls due to their sheer size. Restricting the listing of investment funds, mutual funds or other collective investment instruments abroad or sale of such investment schemes may therefore be effective in avoiding large inflows on the portfolio account. In addition, controls on specific outflows also appear effective: restricting residents to purchase collective investment instruments abroad can help reducing booms in debt investment inflows. Non-residents' sale or issue of collective investment instruments locally needs also to be restricted to reduce the probability of debt portfolio inflow bonanzas. Such bonanzas may be related to the divesting of local investors in such instruments. Overall, nearly all types of control measures related to collective investment instruments appear to have an independent explanatory power in explaining sudden and large inflows in the debt portfolio account, with the exception of the purchase of collective instruments locally by non-residents. This control measure may not have come out significant in explaining bonanzas owing to the small size of investment funds, mutual funds and other collective investment instruments in most economies of Asia and the Pacific. But the bottom line is that restriction on collective investment instruments in general, be it inflows or outflows may be effective to reduce the probability of undesirable volatility in capital flows.

Bonanzas related to **cross-border borrowing** can most effectively be prevented by restricting credit inflows. This holds for relatively large inflows (two standard deviations above the global trend) as well.

The survival analyses highlighted the importance of restrictions on outflows in reigning in capital inflow bonanzas. More stringent controls on outflows, be it money market instruments, bonds or collective investment instruments, tend to lengthen the duration of bonanzas and hence increase their cumulative impact on the economy.

The policy environment matters

In addition to deliberate control measures to counteract volatile flows, it is worth taking account of other circumstances surrounding bonanzas. Previous inflows of the respective type of capital have an independent explanatory power in determining inflow bonanzas. That is, increasing inflows may be a warning sign of a coming boom. Conversely, the stock of inflows appears to have a negative impact on the probability of an inflow bonanza in the case of equities and positive in the case of cross-border credit, though in this latter case only for large inflows. The stock of inflows does not appear to affect the probability of portfolio investment inflow booms. Previous growth performance of the domestic economy increases the probability of equity inflow booms, but not of other types of capital. Global risk appetite also makes inflow booms more likely in the case of overall inflows, equity portfolio investment and cross-border lending.

In the case of financial credit bonanzas, the depth of the financial system is an important determinant of bonanzas: deeper financial markets are less prone to experience volatile inflows. This finding has direct policy implications: the deepening of financial markets can reduce the probability of volatile flows. Or, without deep financial markets, it may be hazardous to open up the capital account to cross-border flows.

Controlling resident flows appears more effective

The pattern emerged from the analyses of the determinants of the probability of inflow bonanzas suggests that control measures targeting residents may be more effective than those targeting non-residents. In particular, restricting the sale or issue of equities, bonds, money market instruments and collective investment instruments abroad by residents, appeared effective in reducing the probability of inflow surges. This result is not surprising given that an overseas IPO or the tapping of international bond markets usually involves a large amount of funds owing to the critical mass rationale. In addition, limiting the purchase of bonds, money market instruments and collective investment instruments by residents also seems to effectively reduce the probability of inflow bonanzas, that is more puzzling. While the sale or purchase of such instruments is an outflow from the balance-of-payments' point of view, the restriction of purchasing such instruments may affect the probability of sudden inflows by inhibiting the ability of domestic investors to repatriate large amounts of funds previously invested in these instruments owing to, for instance, heightening of global risk aversion or urgent repatriation needs related to the domestic economic environment or business operations. In contrast, restricting flows of foreign-owned capital appears to work only in a few cases, such as controlling collective investment instruments, in particular their sale locally by non-residents and the sale and issue of bonds by non-residents.

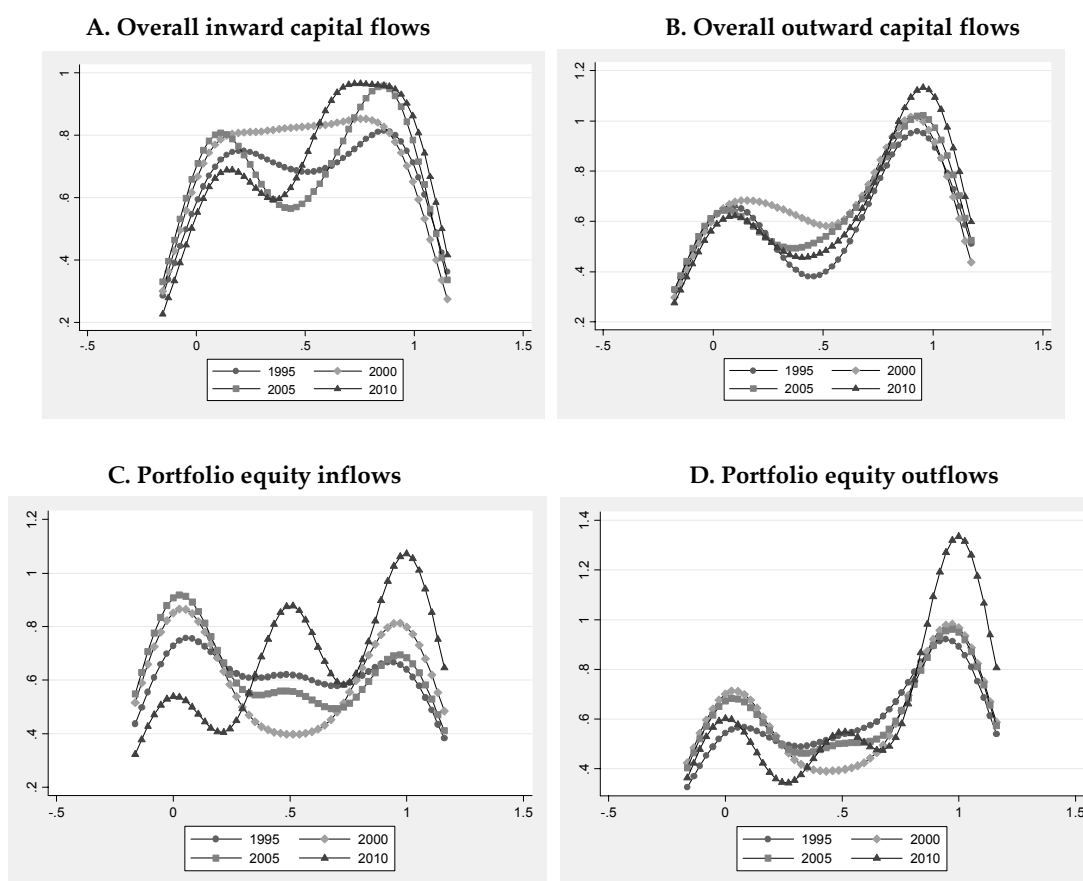
In future work, it would be worth exploring moves by domestic and foreign investors simultaneously and extending the coverage of analyses to other continents.

ANNEX 1. DENSITY ESTIMATES OF CAPITAL CONTROL MEASURES

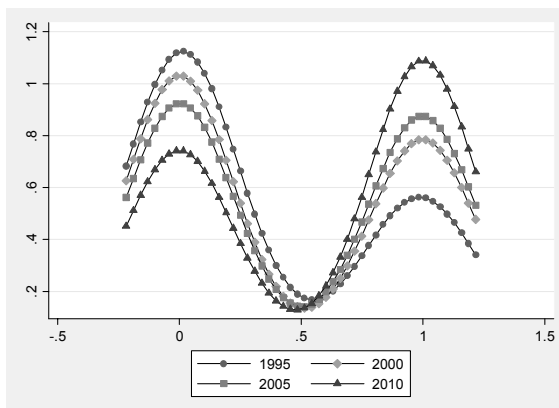
Capital control restrictiveness over the 15 years for which data are available in a highly disaggregated manner, has shown a reversal from a more liberal stance in the early 2000s towards higher degrees of restrictiveness at the end of the decade.

Figure A1. Density estimates for overall and portfolio capital control measures

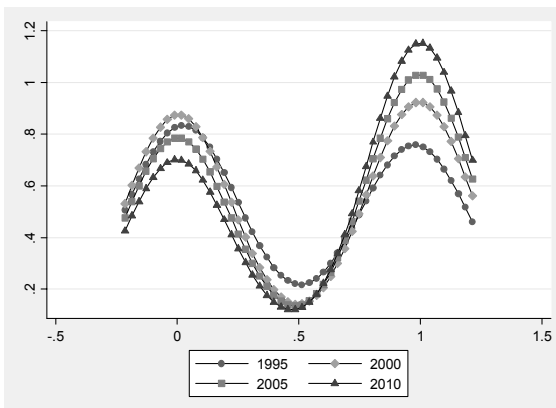
1995, 2000, 2005, 2010



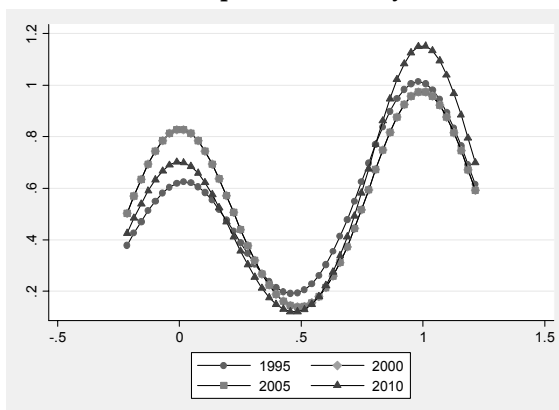
E. Purchase of equities locally by non-residents



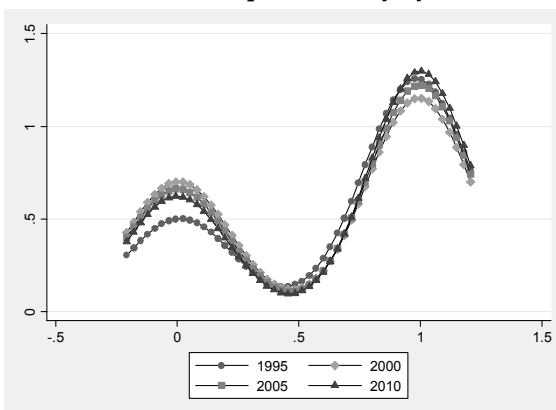
F. Purchase of equities abroad by residents



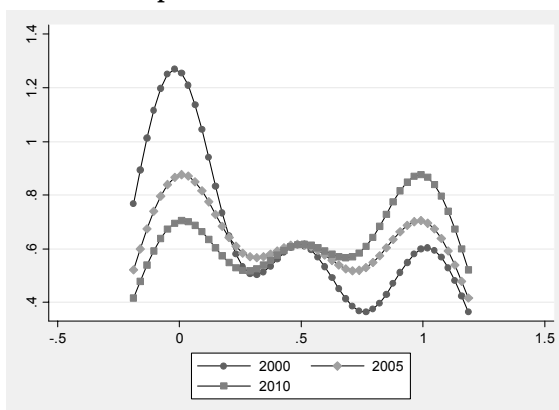
G. Sale or issues of equities abroad by residents



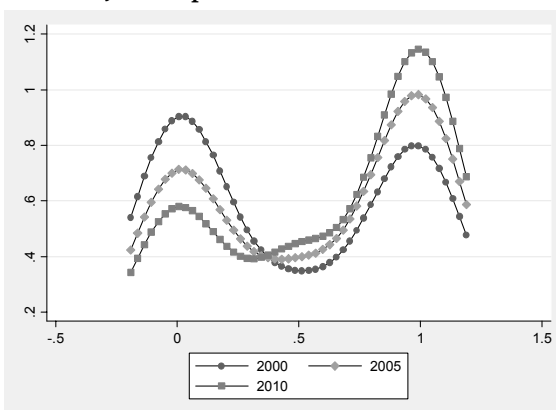
H. Sale or issue of equities locally by non-residents



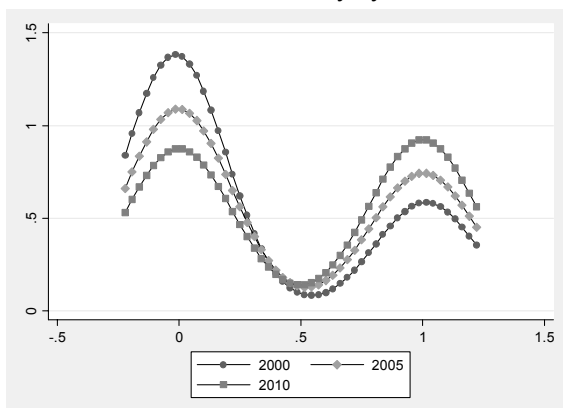
I. Bond portfolio securities inflows



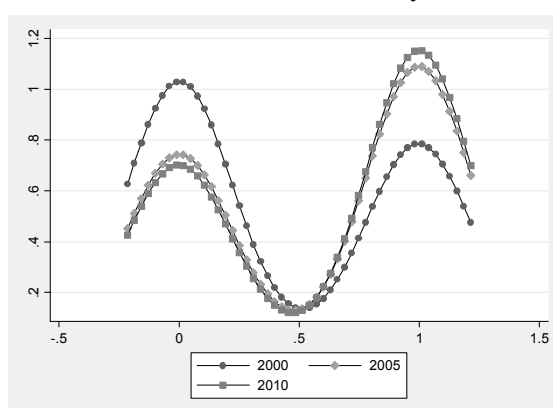
J. Bond portfolio securities outflows



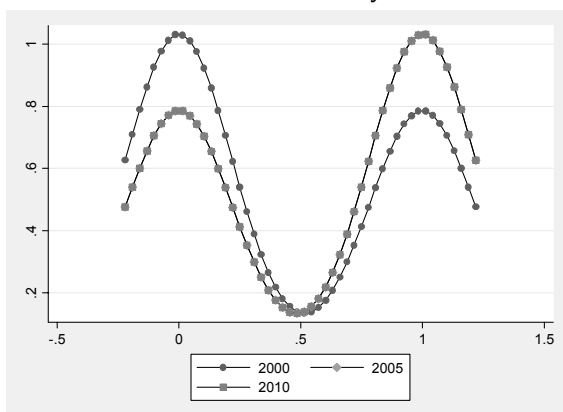
K. Purchase of bonds locally by non-residents



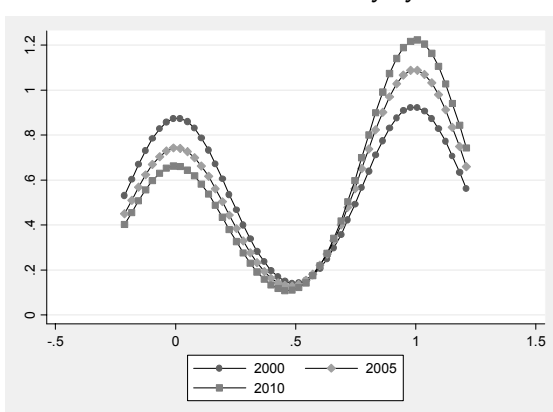
L. Purchase of bonds abroad by residents



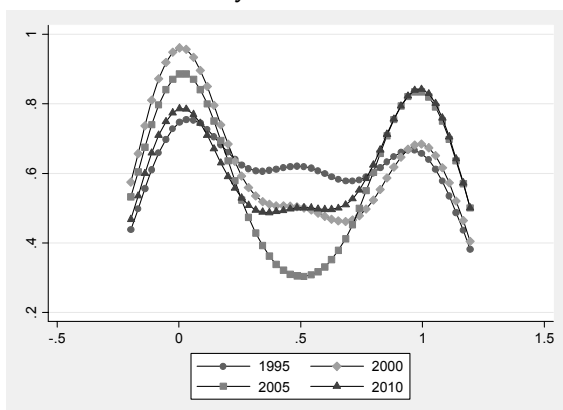
M. Sale or issue of Bonds abroad by residents



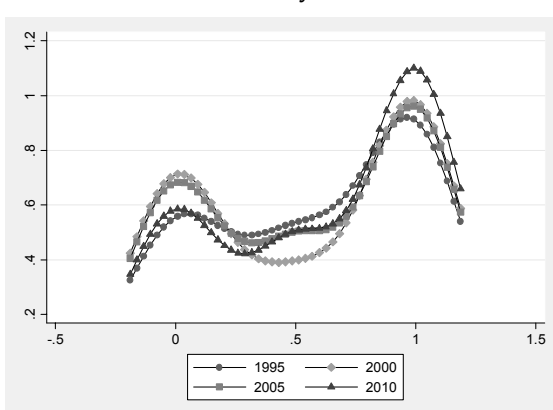
N. Sale or issue of bonds locally by non-residents



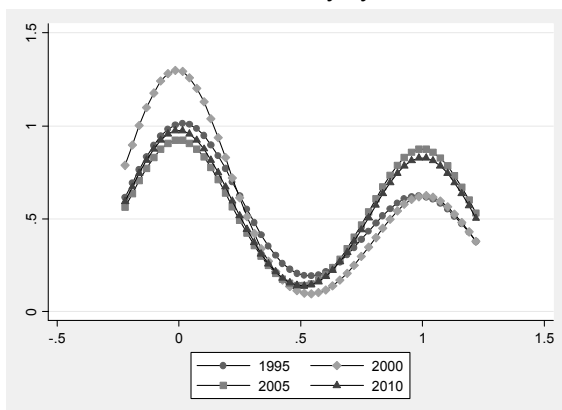
O. Inflow of money market instruments



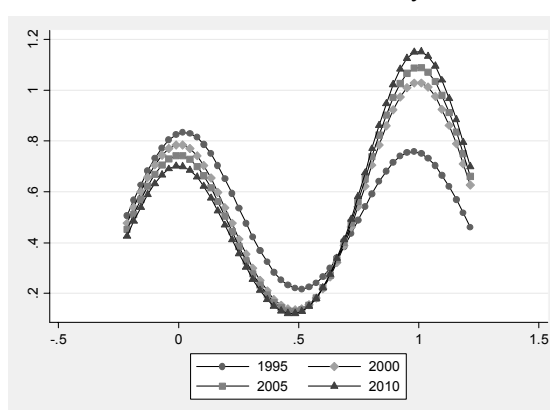
P. Outflows of money market instruments



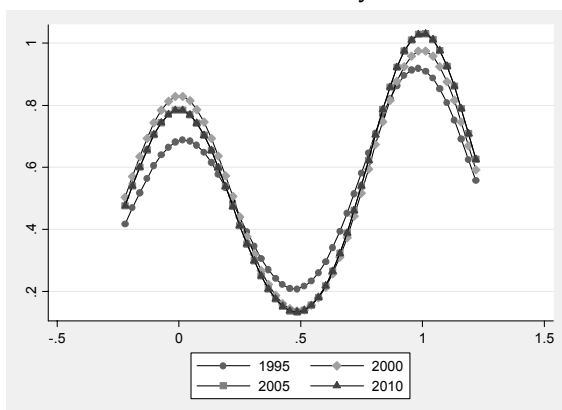
Q. Purchase of MMI locally by non-residents



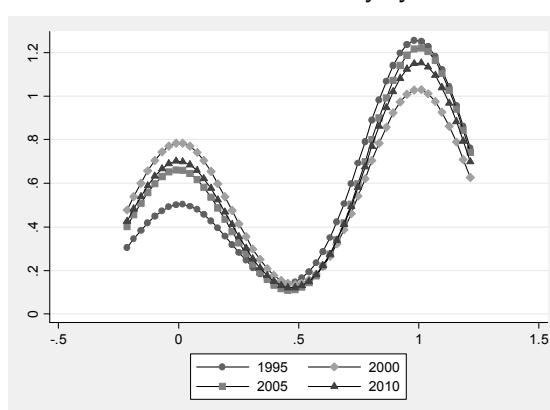
R. Purchase of MMI abroad by residents



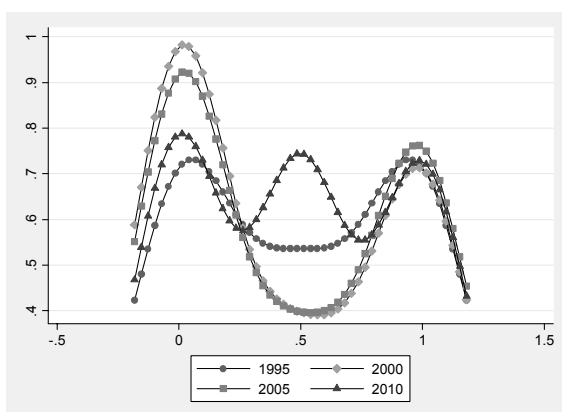
S. Sale or issue of MMI abroad by residents



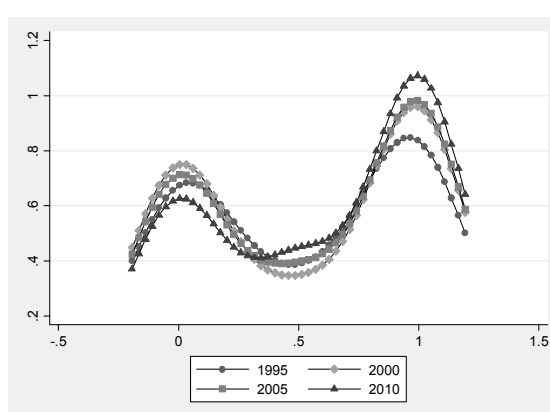
T. Sale or issue of MMI locally by non-residents

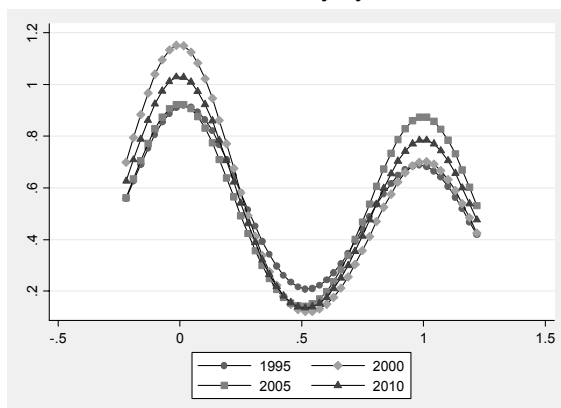
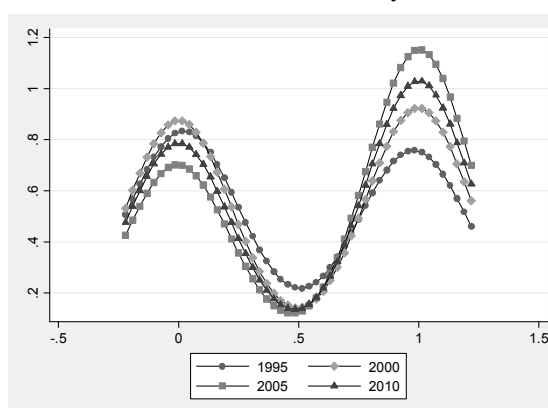
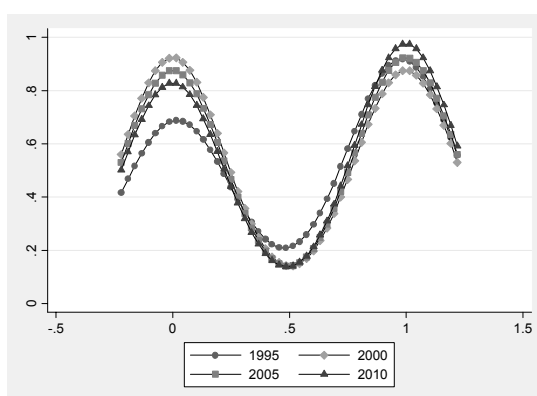
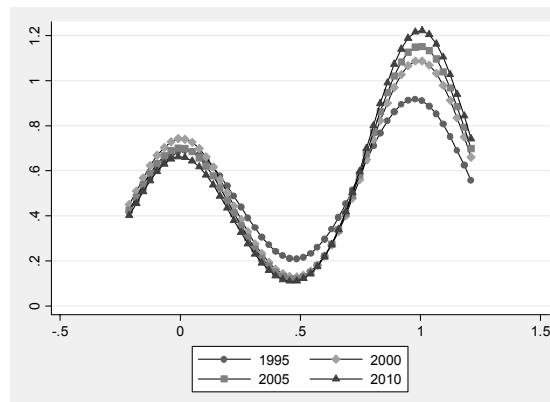


U. Collective investment inflows



V. Collective investment outflows



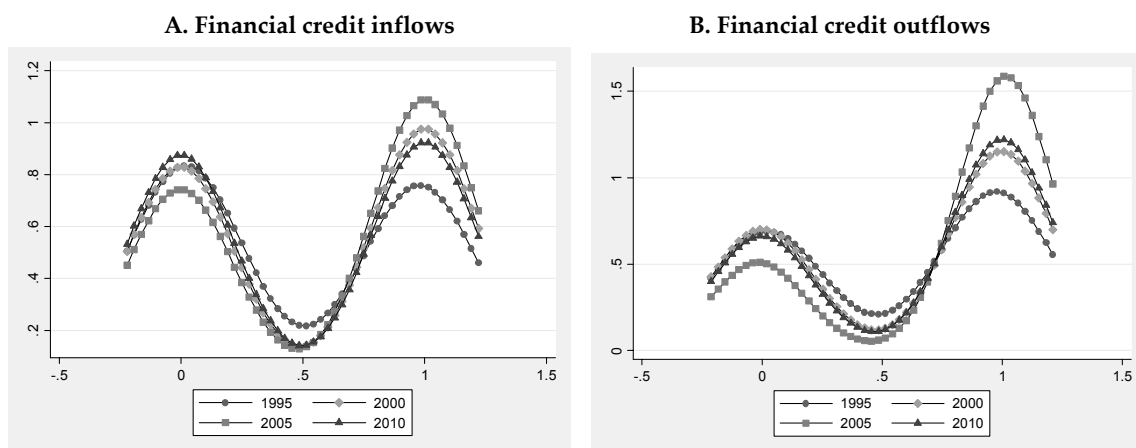
W. Purchase of CI locally by non-residents**X. Purchase of CI abroad by residents****Y. Sale or issue of CI abroad by residents****Z. Sale or issue of CI locally by non-residents**

Note: For the density estimate, the kernel density measure was applied with Gaussian distribution to a sample of 32 countries for the years 1995, 2000, 2005 and 2010. For bond portfolio inflows and their sub-components, data are not available for 1995 in the original Schindler dataset.

Source: Authors' estimations using and extending the indices by Schindler, M. (2009), "Measuring Financial Integration: A New Data Set", IMF Staff Papers 56(1).

Figure A2. Density estimates for measures controlling cross-border financial credit flows

1995, 2000, 2005, 2010

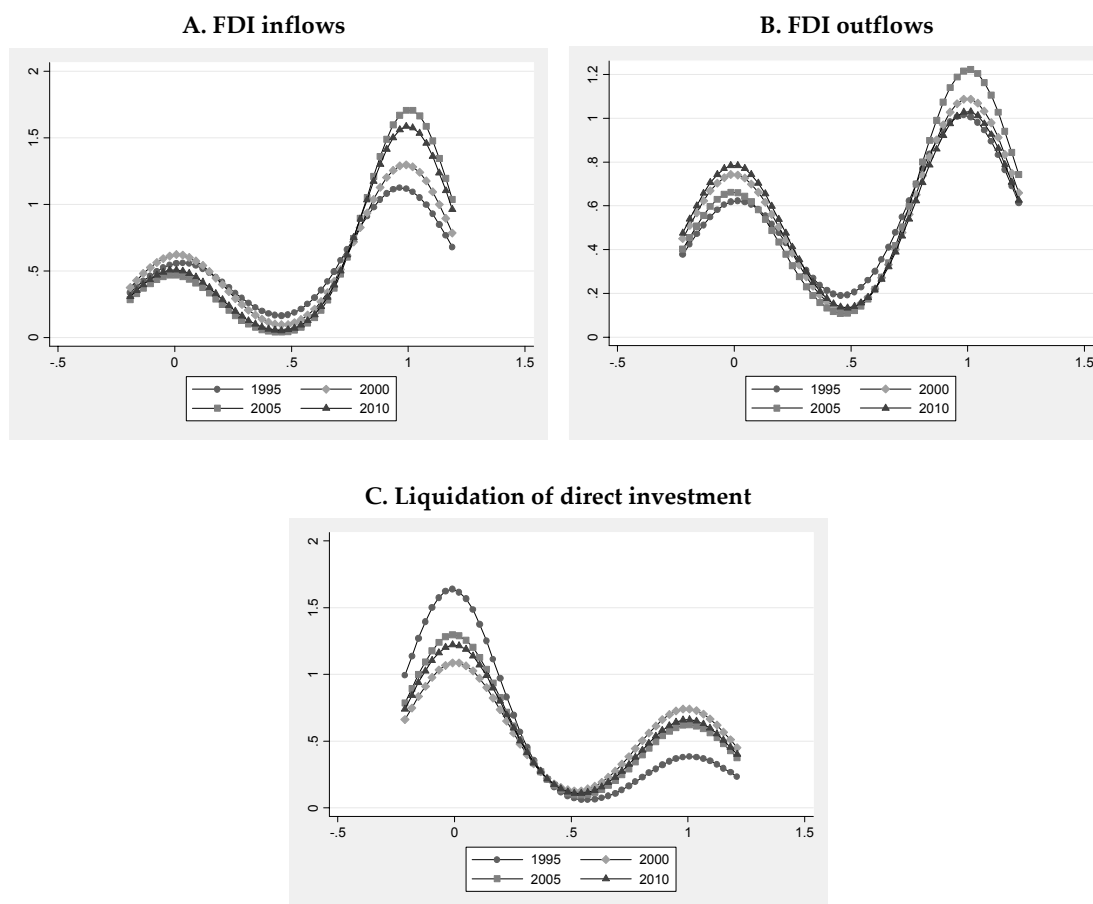


Note: For the density estimate, the kernel density measure was applied with Gaussian distribution to a sample of 32 countries for the years 1995, 2000, 2005 and 2010.

Source: Authors' estimations using and extending the indices by Schindler, M. (2009), "Measuring Financial Integration: A New Data Set", IMF Staff Papers 56(1).

Figure A3. Density estimates for foreign direct investment flow controls

1995, 2000, 2005, 2010



Note: For the density estimate, the kernel density measure was applied with Gaussian distribution to a sample of 32 countries for the years 1995, 2000, 2005 and 2010.

Source: Authors' estimations using the Schindler dataset extended by the authors.

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