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Do capital controls and macroeconomic policies influence the volume and composition of capital flows? Evidence from the 1990s

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Abstract

In the early 1990s capital inflows to Asia were primarily foreign direct investment (FDI). Latin America was attracting little FDI and much more 'hot money'. This fed the view that Latin America was more vulnerable to reversals of capital flows than Asia. Yet, regional differences were eroding—the 1997 crises revealed Asia's exposure to short-term capital. We present evidence that capital controls influence the composition of flows, not their volume while sterilized intervention influences volume and composition, skewing flows to short maturities. We conclude that Asia's increasing reliance on 'hot money' was largely due to the policy response to the surge in capital inflows. © 1999 Elsevier Science Ltd. All rights reserved.

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1. Introduction

During most of the 1990s policymakers in many parts of the emerging world have been confronted by the challenges posed by surges in capital inflows. In recent years,

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however, this renewed flow of capital towards emerging market economies has been subject to dramatic reversals. The first of these was associated with the Mexican currency crisis in late 1994, and affected several Latin American countries. The second, and much more severe, reversal came after Thailand's fall from grace in the summer of 1997. The Thai crisis turned out to be only the first among several in Asia. Russia's default in August of 1998 led to an international flight to quality that paralyzed financing to emerging markets. Capital inflows into emerging economies have since shrunk dramatically, and international financial markets remain skittish. As a result, at the time of this writing, the least of the problems facing emerging market economies is the management of capital inflows. But since today's dramatic outflows may not be unrelated to the factors—including domestic policies—that drove yesterday's large inflows, analysing the forces that generated such inflows remains vital if emerging market economies wish to avoid in the future some of their past mistakes in capital flow management.

There is a large and growing literature on capital flows to emerging markets. One strand of this literature debated whether external factors, such as international interest rates, or domestic factors, such as structural reforms, were mainly responsible for the increase in financial flows to the emerging world (see, for instance, Calvo et al., 1993, 1994a; Claessens et al., 1993; Fernandez-Arias, 1996; Calvo and Reinhart, 1996). Another strand focused on describing the macroeconomic 'countercyclical' policy response to the rising inflows, by considering the relative merits of alternative policies (see Calvo et al., 1994b; Corbo and Hernandez, 1996; Montiel, 1996). Yet, very little has been done to link these two strands of analysis—specifically, to investigate how the policy responses to the early waves of capital inflows may eventually have influenced both the level and the composition of subsequent cross-border capital movements. That the role of the policy response may have been important is suggested by the fact that regional differences in the composition of the capital account did not remain constant over time. This implies that such differences are unlikely to be due to structural factors. Hence, it would appear reasonable to investigate the extent to which the countercyclical macroeconomic policies of the capital-importing countries were responsible for shaping the volume and composition of capital inflows, particularly in the latter stages of the cycle.

This paper addresses this issue. In particular, we assess the extent to which two broad types of policies—longer-run policies designed to promote the development of the financial system and shorter-run polices more specifically focused on macroeconomic stabilization in the face of inflows—have systematically influenced the nature and dynamics of capital flows. Regarding the first, we look at the possible link between the volume and share of portfolio flows and the characteristics of the domestic equity market, most notably its depth. With respect to the second, we examine the effects of direct intervention in the capital account (such as measures to control capital inflows) as well as of the stance of domestic monetary policy (in the form of sterilized intervention).

The remainder of the paper is divided into four sections. Section 2 reviews the literature that has investigated the potential causes of the surge in capital inflows. Because much of this literature was focused on the early years of the inflow episode,

Section 3 sketches the cross-section and time series characteristics of flows leading up to the period of the Asian crises. In Section 4, the issue of whether the volume and composition of capital flows is shaped by macroeconomic policies in the recipient country is investigated; the role of equity markets in influencing these parameters is also analysed. Section 5 summarizes our results.

2. Causes of the inflows: a review

Because the interpretation of the welfare consequences of capital inflows, as well as their likely sustainability, are both related to the nature of the shocks that generate such flows, early research initially focused on identifying the factors that drove the surge in inflows to a wide number of developing countries in the 1990s. This section takes a retrospective look at factors that are frequently cited in explaining the recent capital inflows. The objective is to present a synthesis of the key findings of the empirical literature on this topic and to take stock of where we stand on this issue.

2.1. Conceptual issues

Since the direction and magnitude of capital flows between emerging and industrial-country markets depend on the relative attractiveness of placing funds in emerging markets vis-a-vis industrial-country markets, as well as on the ease with which such transactions can be carried out, it may be useful to classify such factors into three categories: 'pull' and 'push' factors, and changes in the degree of financial integration.

'Pull' factors are those that operate through improvements in the risk-return characteristics of assets issued by developing-country debtors, such as would result from productivity-enhancing economic reforms. 'Push' factors, on the other hand, operate by reducing the attractiveness of lending to industrial-country borrowers. Deterioration in the risk-return characteristics of assets issued by industrial-country debtors is the most widely cited phenomenon in this context. However, the increased role of institutional lenders such as mutual and pension funds as financial intermediaries, as well as the increased importance of securitization, may also represent a 'push' factor in the form of a secular change which favors lending to emerging markets for portfolio diversification reasons. Finally, the resurgence of capital flows may reflect increased financial integration due to the removal of barriers impeding cross-border capital flows. Such barriers may arise either as the result of policy choices or of technological conditions affecting, for example, information costs.[1]

[1] The welfare implications of these alternative factors driving capital flows to emerging markets are discussed in Fernandez-Arias and Montiel (1996).

2.2. Empirical evidence

A substantial amount of research has documented empirically the importance of specific factors in driving the current capital inflow episode. However, no general consensus has emerged concerning the *relative* roles that various factors may have played at different times. Much of the systematic empirical work on the issue of causation has instead focused on identifying whether the changes that triggered the recent capital-inflow episodes originated in the creditor or debtor countries.

In a series of papers, for example, Calvo et al. (1993, 1994a, b), hence CLR have argued that, while domestic factors were undoubtedly important in attracting inflows, the substantial co-movement among key macroeconomic variables such as the real exchange rate and reserve flows in Latin America during the early 1990s suggested the influence of a common variable. They showed that movements of US interest rates tended to explain much of this common variation, and concluded that external variables have been dominant in driving capital inflows to the region. On the other hand, Chuhan et al. (1996) found that, while domestic and external variables were equally important in explaining portfolio bond and equity flows to Latin America, domestic variables tended to be much more important than external variables as determinants of bond and equity flows to Asia. However, their set of domestic variables included country creditworthiness, as indicated by the price of debt on secondary markets, a variable that, as Fernandez-Arias (1996) pointed out, is itself heavily dependent on external factors. Fernandez-Arias (1996) found that, when account is taken of the role of external interest rates in determining the secondary-market debt price, fully 86% of the surge in inflows can be attributed to movements in external interest rates. Similarly, Dooley et al. (1996), using the price of commercial-bank debt as a proxy for capital inflows, found that essentially all of the increase in this price after 1989 could be accounted for by reductions in the face value of debt and international interest rates, leaving almost nothing to be explained by improvements in the domestic environment.

While this work strongly supports the role of external factors, it tends not to incorporate a careful specification of domestic factors, making it difficult to assess the extent to which these may have exerted an independent influence on capital inflows. Hernandez and Rudolph (1995) addressed this problem by estimating capital-flow equations for long-term flows as a function of a broad set of domestic creditworthiness indicators in a group of Asian and Latin American countries. In contrast to the literature reviewed above, they found a statistically significant (albeit not very precisely estimated) role for the domestic creditworthiness indicators, but no role for the external interest rate.

All of the evidence in this early literature pertains to the initial years of the recent capital inflow episode—i.e. 1989–93. More recently, the World Bank (1997) has suggested that the factors driving inflows have been changing over time, and in particular that domestic factors may have played a more prominent role during 1994–95 than previously. Adopting the CLR methodology, the Bank found that quarterly portfolio flows from the United States to 12 emerging markets in East Asia and Latin America were characterized by a substantial amount of comovement (measured by

the proportion of the variation captured by the first principal component) during 1990–93, and that the first principal component of these series was highly negatively correlated with the first principal component of a set of representative US asset returns. Both of these findings are consistent with the original findings of CLR for this period, as described above. However, over the years 1993–95, co-movements among portfolio flows became much weaker (the contribution of the first principal component drops to 45%, from 75% of the variance), and the correlation with US asset returns reversed signs and became much weaker. The implication is that idiosyncratic country factors may have played a much larger role in recent years than they did in the early years of the inflow episode. Or else, that external factors, such as the sharp decline in Japanese interest rates over that period were not properly accounted for.

2.3. An assessment

The formal evidence thus appears to provide fairly strong support for the 'push' view that external factors have been important in driving capital inflows to emerging markets.[2] However, two considerations suggest that this picture may be incomplete. First, the apparent importance of 'push' factors need not preclude the relevance of 'pull' phenomena. While 'push' factors may help to explain the *timing and magnitude* of the new capital inflows, 'pull' factors may be necessary to explain the *geographic distribution* of flows during this time. Differences in capital inflow levels, across countries and within countries across time, point to the importance of specific country (or period) characteristics for foreign capital absorption. Such characteristics may include both institutional features of the economy as well as macroeconomic policies. Second, the existing literature has not drawn a sharp distinction between changes in the degree of financial integration and changes in relative *ex ante* rates of return.[3] In short, this assessment suggests that our empirical work in the process of reconsidering the forces that drive capital flows during the 1990s should feature each of the following:

1. It should capture both the time series and the cross-section variation in flows, to allow scope for differences in the relative effectiveness of 'push' and 'pull' factors in influencing flows along these two dimensions.
2. It should specify the 'pull' factors more precisely. In particular, given the growing importance of portfolio flows in recent years, the 'pull' factors should also include

[2] In our view, the seemingly contrary evidence provided by Hernandez and Rudolph (1995) is not necessarily inconsistent with the role of 'push' factors, despite the poor performance of the US interest rate in their capital-flow regressions. Specifically, their focus on long-term capital flows and the weight given to the 1980–86 period in their data suggest that their results may primarily apply to FDI flows and are not necessarily applicable to other types of capital flows, such as portfolio or short-term flows. This evidence is also at odds with the results of Calvo and Reinhart (1996), who find that the US interest rate is also significant over longer sample periods (1970–93 in their case) in explaining capital flows to a panel of 11 Latin American countries.

[3] An important exception is World Bank (1997).

descriptive features of the existing structure of capital markets in the capital-importing countries (a factor largely ignored in the recent literature) as well as the stance of domestic monetary policy.
3. It should specifically consider the effects of measures that may affect the degree of capital market integration (such as capital controls), rather than simply relative rates of return.

3. The size and composition of capital inflows

The conventional wisdom has tended to stress important differences in the composition of flows among emerging market regions, associating the Asian countries with foreign direct investment while short-term flows are associated with the Latin American countries. In identifying such patterns geographically, there is an implicit suggestion that structural characteristics of the individual economies may be responsible for such differences. In fact, however, those regional differences have narrowed considerably over time, suggesting that the factors underlying the structure of the inflows are far from permanent. The aim of this section is to reassess to what extent the conventional wisdom oversimplifies the dynamics of capital flows during the present decade.

To update the record on patterns of capital flows to emerging markets during the current decade we have constructed a sample of 15 such markets in Asia (Indonesia, Malaysia, the Philippines, Sri Lanka, and Thailand), Latin America (Argentina, Brazil, Chile, Colombia, Costa Rica, and Mexico), as well as other regions (Czech Republic, Egypt, Kenya, and Uganda). With the exception of China, this list includes most of the developing major capital importers in their respective regions. We have examined the capital-inflow experience of these countries, based on data from the IMF's *World Economic Outlook* data set, to extract a set of 'stylized facts' applicable to flows during this decade. Capital flows in this data set are classified into five categories: portfolio flows (bonds and equity); short-term flows; FDI; other long-term flows; and errors and omissions. The capital-inflow experience is described in Table 1. Three observations stand out regarding the regional averages over the 1990–96 period. First, the magnitude of total flows (relative to GDP) was substantially larger for Asian countries than for the Latin American countries. On average, capital inflows in the former amounted to over 7% of GDP, while in the latter they fell short of 4% of GDP. Second, and contrary to the received wisdom, the magnitude of short-term flows was also larger in Asia than in Latin America: 2.8 and 1.3% of GDP, respectively. Third, the difference in magnitude of short-term flows was also larger than that for the overall capital account, implying that Asian countries actually registered a slightly larger share of short-term flows in total capital inflows (39 versus 32%). Of course, these observations must be tempered by the fact that other types of capital inflows, notably portfolio investment, which is classified separately from short-term flows, may also be of a highly short-term and volatile nature, as was the case for Mexico's external bond debt. As Table 1 highlights, portfolio flows have

Table 1
Capital flows as a percentage of GDP

	1990	1991	1992	1993	1994	1995	1996
Asia							
Total	6.2	8.1	6.5	8.9	5.8	7.3	6.6
Portfolio	0.6	0.2	0.7	1.8	0.6	1.2	1.0
Short-term	3.0	3.4	3.6	3.0	1.4	2.6	2.6
Latin America							
Total	3.1	2.1	4.6	5.4	4.2	3.5	4.5
Portfolio	0.2	0.8	1.5	3.5	2.1	−0.5	1.5
Short-term	0.6	0.2	2.6	2.0	1.3	1.1	1.0
Other regions							
Total	−4.0	−0.7	2.5	4.8	5.0	6.5	3.6
Portfolio	0.0	0.0	0.0	1.3	0.6	0.8	0.7
Short-term	1.9	0.7	−1.8	−0.3	0.4	1.6	−0.7

Source: International Monetary Fund, *World Economic Outlook*, various issues.

played a more substantial role in most of the Latin American countries in our sample than in other regions. As to the variability over time in regional capital inflows, two observations stand out in Table 2. First, measured by the coefficient of variation, capital inflows have been more volatile during the 1990s in Latin America than in Asia—this greater volatility/instability is also evident in a broad variety of macroeconomic and financial variables (see Kaminsky and Reinhart, 1998). Second, short-term capital has been more volatile than all other types of capital flows (defined residually) in both regions.[4] While the difference in the coefficient of variation

Table 2
Capital flows, 1990–1996: descriptive statistics

	Asia	Latin America
Volume as a percentage of GDP of:		
Total inflows	7.1	3.9
Short-term inflows	2.8	1.3
Share of short-term inflows in total inflows	0.39	0.32
Coefficient of variation of:		
Total inflows	0.24	0.66
Short-term inflows	0.21	0.22

Source: International Monetary Fund, *World Economic Outlook*, various issues and the authors.
Note: The Asian countries include Indonesia, Malaysia, the Philippines, Sri Lanka, and Thailand; the Latin American group consists of Argentina, Brazil, Chile, Colombia, Costa Rica, and Mexico.

[4] This is in line with the 'received wisdom' about the vulnerabilities associated with short-term flows (see Sarno and Taylor, 1999). However, it would appear to be at odds with the conclusions in Claessens et al. (1993).

between short-term and other types of capital flows is quite small in Asia, it was substantial in Latin America, differing by a factor of three. Indeed, the volatility of overall capital inflows between the two regions is entirely accounted for by the volatility of short-term capital in Latin America. The coefficients of variation of both short-term and long-term flows in Asia, as well as that of all other types of flows in Latin America are in the neighborhood of 20%, while that of short-term flows in Latin America approaches 70%.

Thus, at least during the current decade, it does not appear to have been the case that Latin America has received proportionately larger amounts of short-term capital than have Asian countries. The issue, instead, appears to be that short-term capital has tended to be more skittish in Latin America (at least up until 1997). Indeed, the latter observation may extend to portfolio flows, as evidenced by their abrupt reversal during the Mexican crisis—from an inflow of about 6% of GDP in 1993 to an outflow of about 5% in 1995. Latin America's comparatively poor macro policy track record and shakier credibility may account for this greater instability.

Regarding how regional patterns have evolved over time, in the case of Asia short-term flows were already important by 1990, so these are not a new phenomenon to the region. By 1993, Malaysia had replaced Indonesia as the leading importer of short-term capital among our group of countries. Not surprisingly, in January 1994 Malaysia allowed domestic short-term interest rates to fall substantially and adopted a series of capital control measures, all of which were designed to curb the short-term inflows that were flooding the banking system. This issue will be taken up in Section 4. As regards the Latin American, there are some 'stylized facts' to consider. First, other types of flows (besides short-term), appear to have been stable over time. This is not only reflected in a lower variance, but also in a more modest uptrend in recent years. Second, in contrast to Asia where short-term flows were comparatively important prior to 1990, these only became important in the more recent period. Third, unlike in Asia, capital flows to the region fell in 1994. This could be evidence of either a stronger role for 'push' factors than in Asia (US interest rates rose in February of 1994) or it could be consistent with contagion effects in the wake of the Mexican crisis of 1994.

4. Did domestic policies influence the volume and composition of flows?

The two previous sections have indicated both that the factors driving capital flows have tended to change over time and that the composition of flows has also evolved. The evidence reviewed in Section 2 suggested that idiosyncratic, country-specific factors may have played a larger role in recent years than they did during the initial surge. Furthermore, in Section 3 we saw that short-term flows—the most volatile component of the capital account in our data—have been consistently important in Asian emerging markets during the 1990s. These observations, together with the standard view that short-term capital flows respond to arbitrage opportunities, lead to the plausible interpretation that the volume and composition of flows became more sensitive to changes in the short-run domestic macroeconomic policy environment

in capital-importing countries. Hence, the potential link between the policy response to the initial surge in capital inflows and the volume and composition of subsequent capital flows moves to center stage.

4.1. Countercyclical policies and the composition of flows

In principle, we would expect the volume and composition of capital inflows to respond to the policy stance adopted by the recipient countries. In some instances, domestic policies may have been designed precisely to shape the volume and/or composition of inflows. This has been so, for example, when restrictions on capital movements have been implemented, as in Brazil, Chile, Colombia, the Czech Republic, Malaysia, and more recently, Thailand. However, it remains controversial in such cases whether the intent to influence the volume or composition of flows has been successful. But even when policies are not explicitly targeted at the volume and/or composition of capital flows they may nevertheless have an effect. For example, the monetary-exchange rate policy mix adopted to restrain an expansion in aggregate demand in response to capital inflows under officially determined exchange rates (or heavily managed floats) may itself feed back to influence the volume and composition of inflows. When the policy mix involves tight money in the form of sterilized intervention (particularly if fiscal policy remains loose), domestic interest rates will tend to be high—possibly encouraging additional short-term and/or portfolio flows, which respond to attractive arbitrage opportunities.[5]

While these propositions are well known, they have not been subjected to formal empirical testing with cross-country data. Our objective in this subsection is to conduct some preliminary but suggestive tests of the impact of capital account restrictions, as well as the extent of sterilized intervention, on the volume and composition of capital inflows. As in the earlier literature, we also control for the effects of international interest rates.[6]

For this purpose, we have assembled a panel data set drawn from the IMF's *World Economic Outlook* database containing annual observations on the volume and composition of capital inflows for 15 emerging markets over the 1990–96 period. The countries in our sample are those discussed in Section 3. In what follows, we focus on three types of capital flows: portfolio flows; short-term flows; and FDI. We also examine the capital account balance.

Based on the country-specific information in Montiel (1996); Reinhart and Reinhart (1998, 1999); Reinhart and Smith (1998) we have constructed indices to measure the incidence and intensity of capital account restrictions as well as sterilized intervention. The latter provides a measure of efforts to maintain a tight monetary policy in the presence of the capital inflows. Our policy indices range from 0 to 2 in both cases. Countries are assigned a value of 0 in a given year if for most of that year

[5] In Section 4.2 we consider how the structure of the financial sector can also effect the composition and volume of capital flows.

[6] We also controlled for equity market returns in the US and Japan, but found these to have a more limited role in explaining cross-border capital movements.

no restrictions or taxes were imposed on capital inflows, and no restrictions on the domestic indebtedness of domestic financial institutions were in place that appeared to be in excess of commonly used prudential measures. A value of 1 was assigned if capital account restrictions took the form of overzealous prudential regulations (such as strict limits on the foreign exchange exposure of banks). A value of 2 indicated the existence of explicit measures, such as prohibitions, deposit requirements, or financial transaction taxes, designed to limit capital flows. For sterilization, a value of 0 implied limited contraction in domestic credit (typically associated with limited sales of either public sector or central bank securities) during the course of the year. A value of 1 was assigned to more strenuous efforts to sterilize foreign exchange purchases through open market sales of government paper. If the open market operations were very large in scale or were accompanied by increases in banks' reserve requirements or the transfer of government deposits from commercial banks to the central bank, the index was assigned a value of 2. These indices are reported in Tables 3–6.

Our approach was to estimate a set of fixed-effect panel regressions explaining the volume and composition of various types of capital inflows as a function of the intensity of sterilization, the severity of capital account restrictions, international interest rates—here measured as the yield on 3-month US Treasury bills and the comparable Japanese interest rate, and a proxy for capital market depth, which will

Table 3
Capital control proxy

Year	Argentina	Brazil	Chile	Colombia	Costa Rica	Czech Republic	Egypt	Indonesia	Kenya
1990	0	0	0	0	0	0	0	0	0
1991	0	0	2	1	0	0	0	0	0
1992	0	0	2	1	0	0	0	0	0
1993	0	0	2	2	0	0	0	0	0
1994	0	0	2	2	0	0	0	0	0
1995	0	2	2	2	0	2	0	0	0
1996	0	2	2	2	0	2	0	0	0

Source: From the authors. For detailed description and chronology of these and other measures see Reinhart and Reinhart (1998, 1999); Reinhart and Smith (1998). An alternative index which assigned milder forms of controls, such as prudential regulations, a value of 1 was also constructed. It is not reported in these tables but is available from the authors. All the empirical results reported in this paper were based on the index reported here. Countries are assigned a value of 0 in a given year if for most of that year no restrictions or taxes were imposed on capital inflows, and no restrictions on the domestic indebtedness of domestic financial institutions were in place that appeared to be in excess of commonly used prudential measure. A value of 1 was assigned if restrictions took the form of overzealous prudential regulations (such as strict limits on the foreign exchange exposure of banks). A value of 2 indicated the existence of explicit measures, such as prohibitions, deposit requirements, or financial transaction taxes, designed to limit capital flows.

Table 4
Capital control proxy

Year	Malaysia	Mexico	Philippines	Sri Lanka	Thailand	Uganda
1990	0	0	0	0	0	0
1991	0	0	0	0	0	0
1992	0	0	0	0	0	0
1993	0	0	0	0	0	0
1994	2	0	0	0	0	0
1995	0	0	0	0	0	0
1996	0	0	0	0	0	0

See notes to Table 3.

Table 5
The sterilization index

Year	Argentina	Brazil	Chile	Colombia	Costa Rica	Czech Republic	Egypt	Indonesia	Kenya
1990	0	0	2	0	0	0	0	0	0
1991	0	0	0	2	0	0	2	2	0
1992	0	1	1	0	2	0	2	2	0
1993	0	1	1	0	0	2	1	1	1
1994	0	2	1	0	0	2	1	0	2
1995	0	2	1	0	0	0	0	0	0
1996	0	2	1	0	0	0	0	0	0

Source: The authors. For detailed description and chronology of these and other measures see Reinhart and Reinhart (1998, 1999); Reinhart and Smith (1998). A value of 0 implied limited contraction in domestic credit (typically associated with limited sales of either public sector of central bank securities) during the course of the year, while a value of 1 was assigned to more strenuous efforts to sterilize foreign exchange purchases through open market sales of government paper. If the open market operations were very large in scale or were accompanied by increases in banks' reserve requirements of the transfer of government deposits from commercial banks to the central bank, the index was assigned a value of 2.

Table 6
The sterilization index

Year	Malaysia	Mexico	Philippines	Sri Lanka	Thailand	Uganda
1990	0	1	0	0	2	0
1991	1	1	0	2	2	0
1992	2	1	0	2	0	0
1993	2	1	0	2	0	1
1994	0	0	1	1	0	1
1995	1	0	0	0	2	0
1996	1	0	0	0	0	0

See notes to Table 5.

be discussed at length below.[7] Stock returns for the S&P 500 and the Nikkei were also considered in the vector of external returns, but these turned out to be statistically insignificant in most of the specifications.[8] Standard tests revealed the presence of heteroskedastic disturbances and, hence, a correction was necessary.[9] Since the policy response to the inflows is potentially an endogenous variable, as Cardoso and Goldfajn (1998) argued for the case of Brazil, we also report estimates obtained from instrumental variables estimation.[10]

Consider first the effects of sterilized intervention. The first column of Tables 7 and 8 report the coefficients of the sterilization proxy in each of the regressions (*t*-statistics are reported in parentheses below the coefficients). The bottom rows of both tables report the effects of the policy action on the composition of flows while the top rows report the effects on the volume of flows as a share of GDP. The evidence suggests that an intensification in the degree of monetary sterilization is associated with an increase in the volume of aggregate capital flows, irrespective of the estimation technique employed. Interestingly, this increased volume of capital flows is in the form of short-term capital, as the sterilization proxy was not statistically significant in either the FDI or the portfolio regressions. Episodic evidence also confirms these patterns. During periods of aggressive sterilization efforts, such as that of Malaysia during 1993, interest rates on short-term bank deposits were driven up substantially, attracting a large volume of non-resident short-term bank deposits.[11] These flows turn up in our short-term classification, which exhibits the most systematic sensitivity to our sterilization index. As the bottom rows highlight, the tight-money policy is associated with a substantial change in the composition of inflows away from FDI and towards short-term flows. Thus, there is indeed evidence that the macroeconomic policy mix matters in shaping the volume and composition of capital inflows.

Based on this evidence, however, we can be relatively less confident that the volume of capital flows can be altered by the types of capital account restrictions employed in our sample. The coefficients on the capital control proxy, listed in the

[7] It may be worth emphasizing that testing the effectiveness of capital account restrictions requires controlling for the changes in the degree of sterilization, because a loosening of monetary policy accompanying an intensification of capital account restrictions (the cases of Chile and Malaysia) could mistakenly attribute any changes in the volume and composition of capital flows to the change in restrictions, rather than to the change in monetary policy. Conversely, a tightening in monetary policy at the time when the taxes or controls are introduced (Brazil) could undermine the effectiveness of the controls by raising domestic interest rates to levels where either domestic assets remain attractive even on an after-tax basis or by providing an incentive to circumvent the new controls.

[8] Also, a time trend and year dummies were considered but being insignificant at standard confidence levels these were dropped from the analysis.

[9] The presence of heteroskedasticy was anticipated in Table 2, which shows that the magnitude of the underlying shocks are not uniform across our sample countries, with Latin American countries registering a higher degree of volatility in capital flows.

[10] The results from the Hausman simultaneity test did not show a potential endogeneity problem. However, we feel that this may be due to the rather poor quality of the instruments. For that reason, we nonetheless report both sets of estimates.

[11] See Reinhart and Reinhart (1998) for a description of several of these episodes.

Table 7
Fixed effects estimates: 1990–1996 (15 country panel)

Dependent variable	Sterilization index	Capital control proxy	US interest rate	Japanese interest rate	Number of listed stocks
Capital account as a % of GDP	1.512	−0.164	−0.242	−0.375	0.004
	(2.717)	(−0.899)	(−1.863)	(−2.118)	(3.003)
Portfolio flows as a % of GDP	0.275	−0.188	−0.280	−0.061	0.015
	(1.264)	(−0.775)	(−2.048)	(−0.827)	(2.023)
Short-term flows as a % of GDP	0.630	−0.251	−0.148	−0.006	0.001
	(2.036)	(−0.582)	(−0.818)	(0.063)	(1.012)
Portfolio plus short-term flows	0.770	−0.720	−0.150	−0.074	0.009
as a % of GDP	(2.085)	(−1.209)	(−0.717)	(−0.630)	(1.984)
FDI flows as a % of GDP	0.612	1.345	−0.329	−0.074	−0.002
	(1.096)	(1.092)	(−1.232)	(−0.986)	(−0.324)
Portfolio plus short-term flows	43.633	−24.894	−26.216	8.013	NA
as a % of total flows	(2.367)	(−2.184)	(−1.036)	(0.615)	
FDI flows as a share of total	−26.917	52.093	48.561	−14.802	NA
flows	(−2.436)	(0.868)	(1.442)	(−0.819)	

Note: The countries in the sample are Argentina, Brazil, Chile, Colombia, Costa Rica, Czech Republic, Egypt, Indonesia, Kenya, Malaysia, Mexico, Philippines, Sri Lanka, Thailand, and Uganda. *t*-statistics are reported in parentheses. Standard errors have been corrected for general forms of heteroskedasticity. NA, not applicable.

Table 8
Fixed effects estimates, instrumental variables: 1990–1996 (15 country panel)

Dependent variable	Sterilization index	Capital control proxy	US interest rate	Japanese interest rate	Number of listed stocks
Capital account as a % of GDP	1.762	−0.716	−0.224	−0.425	0.006
	(2.927)	(−1.092)	(−1.931)	(−2.311)	(2.653)
Portfolio flows as a % of GDP	0.374	−0.238	−0.313	−0.161	0.017
	(1.064)	(−0.976)	(−3.046)	(−1.025)	(2.826)
Short-term flows as a % of GDP	0.902	−0.451	−0.048	−0.136	0.001
	(2.335)	(−1.081)	(−0.518)	(0.883)	(0.612)
Portfolio plus short-term flows	0.870	−0.642	−0.210	−0.070	0.009
as a % of GDP	(2.344)	(−1.302)	(−1.116)	(−0.822)	(2.184)
FDI flows as a % of GDP	0.913	1.785	−0.149	−0.122	−0.001
	(1.145)	(0.792)	(−1.032)	(−1.116)	(−0.024)
Portfolio plus short-term flows	34.709	−32.856	−30.913	13.051	NA
as a% of total flows	(1.986)	(−2.233)	(−1.321)	(1.225)	
FDI flows as a share of total	−18.900	43.753	32.776	−9.976	NA
flows	(−1.936)	(1.894)	(1.672)	(−1.018)	

Note: The countries in the sample are Argentina, Brazil, Chile, Colombia, Costa Rica, Czech Republic, Egypt, Indonesia, Kenya, Malaysia, Mexico, Philippines, Sri Lanka, Thailand, and Uganda. *t*-statistics are reported in parentheses. Standard errors have been corrected for general forms of heteroskedasticity. NA, not applicable.

second column of Tables 7 and 8, are consistently of the right sign—all but FDI flows (which have been exempt from these measures) are negative. However, all the coefficients are measured with a relatively low level of precision. As to how capital controls potentially alter the composition of flows, the bottom rows of both tables suggest that the controls are associated with a significantly (albeit at the 90% confidence level when instrumental variables are not used) lower share of short-term flows and portfolio flows—the two components of the capital account targeted by the measures in our sample countries—and a higher share of FDI. Hence, we conclude that explicit capital inflow restrictions, and 'prudential measures' seem to be more effective in altering the composition of capital inflows rather than reducing their magnitude.

International interest rates significantly influenced the overall volume of flows. The estimated coefficient is negative, as expected, and its magnitude is in line with several other studies. US interest rates have the most significant effect on bond and equity portfolio flows—an increasingly important component of capital flows in the 1990s and one associated with Wall Street investors. Japanese interest rates appear to be an important driving force behind other types of flows (see top row, capital account balance). While the lack of statistical significance of the interest rate coefficient in the FDI equations is not surprising, in light of the importance 'pull' factors are thought to play (see Hernandez and Rudolph, 1995), the insensitivity of short-term flows, which respond primarily to sterilization policies, is surprising. However, foreign interest rates are a significant determinant in explaining errors and omissions, which are thought to include a large short-term flow component.[12] Foreign interest rates would also appear to have a significant effect on the composition of flows (see bottom rows), as rising foreign interest rates would tend to skew the composition of flows away from portfolio and short-term flows towards FDI flows.

4.2. Capital market structure and capital flows

Unlike the surge in capital inflows to developing countries in the late 1970s and early 1980s, which was almost exclusively owing to commercial bank lending, capital inflows of the 1990s have been associated with a sharp rise in bond and equity portfolio flows. However, much of those portfolio flows have gravitated to the larger emerging equity markets, bypassing many countries altogether. A frequent explanation has been that to attract portfolio flows, domestic capital markets must possess some *minimum* set of requirements, regarding market size, trading practices, such as accounting standards and disclosure requirements, and liquidity (see World Bank, 1997).

To examine whether there is a systematic link between capital inflows and the structure of the domestic capital market, we include in the set of explanatory variables a proxy for the size and depth of the domestic capital market: the number of

[12] These results are not reported, but are available from the authors.

listed companies in the stock edxchange.[13] While this variable pertains directly only to the equity market, it is also likely to proxy indirectly for the size of the banking sector, as typically countries with undeveloped capital markets also tend to have a smaller financial sector.[14] Because it has sometimes been argued that capital inflows may themselves lead to an expansion in the domestic banking sector and/or a deepening of the capital market, we treat the equity market indicator as endogenous.[15]

We report the results in the last columns of Tables 7 and 8. For total capital flows, the number of listed stocks is significant at all standard confidence levels and has the anticipated sign—the larger the number of listings the higher the capital inflow. The sign and magnitudes of the coefficients and statistical significance of remaining explanatory variables in the regression are in line with those reported in the previous subsection. Portfolio flows, not surprisingly, appear to have the closest link to the stock market variable. By contrast, the stock market variable was not statistically significant in the regressions explaining short-term portfolio flows.

5. Conclusions

We have argued that there were sound theoretical reasons why one would expect capital flows to respond to the countercyclical policies adopted by countries faced with surges in capital inflows. In this paper we have focused on two such policies, sterilized intervention and capital controls (or related 'prudential' measures), which, most often, targeted short-term or portfolio flows. We find broad evidence that capital flows, some types more than others, do indeed respond to the short-run macroeconomic policies of the capital-importing country. Specifically, we find that: sterilized intervention increases the volume of total capital flows, through short-term capital; portfolio flows and FDI do not appear to be responsive to the intensity of sterilization; sterilized intervention significantly alters the composition of capital flows, reducing the share of FDI in total flows and increasing the share of short-term and portfolio flows.

Although the signs of the estimates are negative, capital controls appear to have no statistically significant effect on reducing the overall volume of flows. The volume of short-term and portfolio flows does not seem to have been systematically reduced by these measures. Capital controls, however, do appear to alter the composition of capital flows in the direction usually intended by these measures, reducing the share of short-term and portfolio flows while increasing that of FDI.

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[13] The data are from the International Finance Corporation (1997). We also considered alternative proxies, including market capitalization and trading value (in US dollars). These are likely to be inferior proxies for market depth, however, and yielded less satisfactory results. They are available from the authors on request.

[14] Of course, in developing countries the bulk of the financing is done through the banking sector rather than the equity or bond market.

[15] We had also considered market capitalization and trading value, but these were not statistically significant in most specifications.

As in most of the earlier literature on this subject, foreign interest rates appear to have a significant effect on both the volume and composition of flows. Specifically, total capital flows, and especially portfolio flows, respond systematically to changes in US and Japanese interest rates in the direction suggested by theory—even after controlling for some of the domestic policy fundamentals and some of the characteristics of the capital market. Surprisingly, short-term flows do not seem to respond to changes in international interest rates. Furthermore, international interest rates also appear to significantly alter the composition of capital flows—rising US interest rates would tend to reduce the share of short-term and portfolio flows.

As to the role that capital market structure has played in determining the volume and the types of capital that a country imports, the principal conclusion is that portfolio flows indeed appear to be responsive to the depth of the equity market—as measured by the number of listed companies in the stock exchange—suggesting that bond and equity flows gravitate to those countries that have the more developed markets. While total flows are also positively linked with this indicator of capital market breadth, short-term flows do not appear to be similarly affected.

While capital may not return in substantial force to emerging markets over the near term, history teaches that the ebb and flow of the capital flow cycle tends to repeat itself. In such an event, policymakers can extract some valuable lessons from the management of these flows in the 1990s. The evidence presented here suggests that the combination of limited exchange rate flexibility, heavy sterilized intervention, and relatively few impediments to short term capital movements may have acted as a lure for short-term capital inflows to emerging Asia. By providing a combination of an implicit exchange rate guarantee and high domestic interest rates on short-term assets vis-a-vis comparable international interest rates, sterilization policies may have served to create the short-term liabilities that later proved so problematic in the region. Our evidence indicates that such policies are indeed capable of increasing the volume of flows and skewing their composition away from FDI to short-maturity components of the capital account. Future work could extend the lessons drawn here by undertaking a broader account of other potential ‘pull’ factors, such as the role played by fiscal policy and financial liberalization. A richer modelling of the financial sector could also potentially serve to extend this analysis in a number of important directions.

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