

Private Capital Flows in the 1970s and 1990s: Is there any evidence of Contagion?

by

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Abstract

The wave of private capital flows toward developing countries in the early 1990s resembles to a great extent the earlier episode of the late 1970s. Despite some important differences in inflow composition, both episodes were characterized by a high concentration of flows in a relatively small number of countries, mainly in Latin America and East Asia. Also, both episodes ended in a major financial crisis which tended to be regional, the first one –the debt crisis– in Latin America and the most recent one in Asia. Moreover, both crises started in one country, Mexico and Thailand, respectively, and spread quickly to the rest. These similarities across regions suggests the possibility of contagion in capital inflows. This paper studies the determinants of private capital flows to developing countries during these two episodes, and analyzes the possibility of contagion effects among countries during the different phases of the flow cycle—the surge and the ebb. Similar to the recent literature that studies contagion during specific crisis episodes, in this paper we attempt to identify specific channels through which the shocks were transmitted across countries. In particular, we test for *discriminating contagion*, which occurs because of herd behavior based on countries' observable similarities. We find no evidence of the latter neither during the 1970s nor during the 1990s. However, consistent with related studies we do find evidence of regional contagion during the 1990s.

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1. Introduction

The Mexican crisis of December 1994, the Asian crises of 1997, and the crises in Russia and Brazil the following year, have led to a surge of empirical research on the issue of contagion. This literature has focused on the transmission of shocks from one country –the country triggering the crisis¹– or a group of countries in crisis, to other economies. The main aim of this research has been to identify the channels through which these shocks are transmitted; that is, whether contagion occurs because of real sector linkages², financial sector linkages³, or due to an unidentified common shock. The most robust conclusion that has emerged from this research is that contagion occurs mainly through trade linkages, and also that most of the times it is limited to a specific region–in other words, contagion is more likely to occur among countries within the same geographical region than across different regions⁴.

The contagion hypothesis arose from observing that currency crises are not evenly spread through time. Rather, they tend to come in clusters, like in 1982 in Latin America at the outset of the debt crisis, in 1992 in Europe during the ERM crisis, and in the second-half of 1997 during the Asia crisis. This empirical regularity is precisely what has led researchers to focus on the possibility of contagion; that is, that a shock to one particular country can lead to crises in other economies that are directly or indirectly related to the former.

But clustering is not limited to currency crises. In fact, a similar pattern was observed in the early 1990s, when private capital flows returned to the developing countries in large amounts only a few years after the debt crisis. Indeed, these flows were not evenly spread among developing countries or even regions; rather, they were directed mostly to the emerging economies in East Asia and Latin America–in the case of the latter region, the flows started much earlier than originally expected considering the losses suffered by investors from the debt crisis.

¹ This is called the ground zero country; i.e., Mexico in 1994, Thailand in 1997, and Russia in 1998.

² These refer to trade links; i.e., a country's currency is more likely to be attacked if the country's main trade partners depreciated their currencies, mainly because of loss of competitiveness.

³ These refer to cross border investments or competition in world capital markets; i.e., a shock in one emerging economy may force international investors to reduce their exposure in other emerging economies because of their need to remain liquid.

⁴ Note that the strong regional link can be due to uncovered real or financial links that occur within a region, but which have not been properly controlled for in the empirical exercise.

Surprisingly, although several authors attempted to explain the new surge in private capital flows toward the developing countries in the years following the start of the inflows⁵, little attention was paid at that time to the fact that these flows were not evenly distributed (this fact was acknowledged but not formally investigated). Further, no attention was paid to the fact that a similar pattern had been observed in the prior episode of large private capital inflows (during the late 1970s and early 1980s). In fact, only 18 countries accounted for about 85 percent of the total inflows in both episodes. Further, 10 of the 16 largest recipients are the same in both periods.

The clustering of flows in the two most recent episodes of large private capital flows toward developing countries suggests that some form of contagion—for instance, because of herd behavior on the part of foreign investors—could have occurred, at least within the regions that received the bulk of the inflows. This phenomenon remains to a large extent unexplored, however. In fact, Calvo and Reinhart (1996) is the only paper that we are aware of that studies the possibility of contagion during capital inflow episodes, but its conclusions are based on a smaller sample of countries than the one used here. After controlling for other determinants of capital inflows, Calvo and Reinhart find that during 1970-93, and specially during 1979-93, there was a positive spillover effect (contagion) from the flows received by the large recipients in Latin America (mainly Mexico) and the flows received by 5 other small economies in the same region (Costa Rica, Dominican Republic, Ecuador, El Salvador and Uruguay).

This paper attempts to merge the above two lines of research; that is, the one that focuses on the contagion of negative shocks during specific (currency) crisis periods, and the one that tries to explain the timing of surges in inflows and the allocation of flows among developing countries. This merge seems a natural thing to do given that the same underlying forces that explain contagion during difficult times may also operate in relatively good times. For instance, when private capital starts flowing into a specific—ground zero—country, financing a larger current account deficit and a period of bonanza, agents could foresee a positive effect on neighboring and trade related countries which will start exporting more to the ground zero economy. The latter effect will, in turn, improve the prospects of

⁵ This research, which started with the seminal paper by Calvo, Leiderman and Reinhart (1993), is known as “*pull and push*”, since the factors that explain the flows can be grouped into those that relate to developments in the recipient countries (*pull*), and those related to developments in the investor countries (*push*).

these other economies, making them more creditworthy and good candidates to start receiving inflows—this would be a case of positive contagion based on real linkages. Similarly, the fact that one particular country starts receiving inflows from a well informed investor (market leader) could induce others (i.e., the not well informed or market followers) to think that other economies with similar observable characteristics are also good candidates to invest, leading them to allocate more capital to them—this would be a case of contagion based on herd behavior.

This paper investigates the existence of contagion during capital inflow episodes using the same methodology that has been developed to analyze contagion during crisis periods. For this reason we test whether there is co-movement in capital inflows among countries with similar observable characteristics, above and beyond the direct effect that macro-fundamentals and other variables may have on attracting capital flows (after controlling for *pull* factors).

The structure of the paper is as follows. The next section briefly summarizes the relevant literature, while section three presents the model to be estimated and discusses the variables and data sources used in the empirical exercises. Section four presents and discusses the results with regards to the determinants of capital inflows (the *pull* and *push* factors) and with regards to contagion. The paper closes in section 5 with a brief summary and a discussion on related topics for future research.

2. A brief review of the literature

(A) Determinants of private capital flows

Capital inflows began to be analyzed in the early 1990s, shortly after private capital returned to the developing countries in large amounts. This was justified because the return of private capital occurred much earlier than expected and only a few years after the debt crisis was over. In fact the flow started when some countries—specially those most affected by the debt crisis—were still facing serious macroeconomic imbalances and implementing important structural reforms.

The first paper on the subject, by Calvo, Leiderman, and Reinhart (1993), contended that this “positive” development had to be taken cautiously, mainly because the new surge in inflows to a large extent was a temporary phenomenon related to economic cyclical fluctuations in the developed world. In fact, Calvo et. al. argued in their paper that the surge in private flows was mainly caused by poor

investment opportunities in industrial countries, the latter being reflected in low yields and a slowdown in economic activity. Therefore, the most likely scenario was that the flows would reverse in the future as the economic conditions in the major industrial countries would improve. The paper by Calvo et. al., despite some minor flaws in its empirical part⁶, was highly influential and, most important, served as a warning to capital recipient countries of the potential risk that the surge in inflows could be followed by large outflows in the future.

The paper by Calvo et. al. was followed by a series of other research papers that attempted to fill in the gaps and improve upon their methodology. The main conclusion that emerges from these papers is that, in addition to the economic conditions in industrial countries—the so called *push* factors—, macroeconomic fundamentals in the recipient countries—or the so called *pull* factors—also matter to explain the surge in private flows of the early 1990s, and, in particular, the allocation of capital among emerging market economies. The importance of each kind of factor—*push* or *pull*—in explaining the inflows, nevertheless, varies depending on the type of flow (i.e., foreign investment versus short-term debt) and the horizon for which the analysis was carried out (whether the authors analyze the cyclical or the permanent component of capital inflows).

The methodologies and samples used vary across the different studies, nevertheless. Calvo et. al. (1993) use principal components to explain total capital inflows to 10 Latin American countries during 1988-91, while Chuhan et. al. (1998) use a panel regression to explain portfolio flows to 18 emerging market economies in both Latin America and East Asia during 1988-92. The latter authors conclude that domestic (*pull*) factors, among which they consider proxies for creditworthiness, are equally important than external (*push*) factors to explain portfolio flows to Latin America, and three to four times more important to explain portfolio flows to east Asia. In a similar study Fernandez-Arias (199_) uses panel regressions to explain private capital flows⁷ to 13 recipient countries during 1989-93. He concludes that when a country's creditworthiness is made dependent on the level of the international interest rate⁸, then

⁶ For instance, in their sample the authors included countries from only one region (LAC) and mainly large recipients, and used as a proxy for private capital flows the changes in international reserves. In addition, they did not control for other (*pull*) factors influencing inflows.

⁷ Excluding FDI flows.

⁸ The rationale for this result is straightforward. For a given a stock of foreign debt, a country creditworthiness decreases when the international interest rate rises because the latter has a negative effect on the country's debt service and current account.

external or *push* factors again become the dominant force underlying the surge in private inflows. All these studies use high frequency data and a short time period, and most important, do not control for macroeconomic fundamentals, something that may bias their results⁹.

In an attempt to overcome these problems, other researchers have used longer series of annual data, and estimated models that try to explain the flow of private capital toward developing countries while explicitly controlling for macroeconomic fundamentals (Hernández and Rudolph, 1997; Corbo and Hernández, 1999; Taylor, 1996). These studies use either a time series or a panel, and regress the different flow variables against the external or *push* factors and a set of domestic variables. The main conclusion that emerges from this research is that in the medium- and long-term flows are less sensitive to changes in cyclical external conditions. Instead, private flows respond positively to variables such as the country's investment and saving rates, GDP growth, and terms of trade, and negatively to variables such as net foreign indebtedness and macroeconomic uncertainty (the latter being proxied by the volatility of key macro variables).

In this paper we follow the same approach as in the last group of studies above. In other words, we run panel regressions of the same sort used by Corbo and Hernández (1999), and Hernández and Rudolph (1997), but also consider the possibility of contagion of flows among the recipient countries. The methodology used to study the latter effect draws from the studies summarized below.

*(B) Contagion, spillover and herd behavior*¹⁰

The phenomenon of contagion has been studied mainly in the context of currency and balance of payments crises. In particular, the analysis has focused on the noticeable augment in the degree of co-movement (correlation) among countries' financial and foreign exchange markets that occurs in the wake of a crisis. For instance, several papers have documented that the correlation across stock returns in Latin America increased significantly in the wake of the Mexican crisis of 1994. Similar exercises have been carried out for the European countries in the wake of the 1992 ERM crisis, and for a group of emerging market economies during the 1997 crisis in Thailand, and during the Russian crisis of 1998.

⁹ Most likely this is due to the lack of high frequency data for most macroeconomic variables that are relevant.

¹⁰ This section summarizes the results of Calvo and Reinhart (1996), De Gregorio and Valdés (1999), Glick and Rose (1998), Eichengreen, Rose and Wyplosz (1996), Kaminsky and Reinhart (1998), and Baig and Goldfajn (1998).

The analyses have also documented a significant increase in the correlation of the countries' cost of borrowing during crisis periods, the latter being measured by the yield –or spread over Libor– of sovereign debt instruments (usually Brady bonds). The observed increase in the degree of market co-movement during crisis periods is attributed to contagion mainly because countries' fundamentals tend to change slowly, and also because they tend to differ significantly across countries. In other words, it is hard to explain the contemporaneous drop in assets prices across countries on the basis of a simultaneous deterioration in fundamentals¹¹.

Since using simple market correlations constrains the analysis of contagion to two countries at a time, different studies look at this phenomenon within a larger set of countries by constructing indexes that measure the extent of the crisis in each country. The analysis consists of using these indexes to test whether the severity of the crisis in a particular country can be in part explained by crises elsewhere. The analysis is carried out in two steps. First, crisis indicators are constructed which measure the pressure on the foreign exchange market¹². This is done by taking a weighted average of the following¹³: (i) the rate of depreciation of the domestic currency, (ii) the increase in domestic interest rates, and (iii) the losses of international reserve losses¹⁴. Second, each country index is regressed against a set of macro variables –proxies for the country's fundamentals– and the index of other countries also affected by the crisis. The right-hand side variables in the regression can include only the index of the country that triggered the crisis –the *ground-zero* country–, or the crisis indexes of all the other countries in the sample. The latter can be weighted or not depending on the particular hypothesis that the authors are interested in testing. The typical estimated equation looks as follows:

$$(1) \quad Ci_{jt} = \alpha_j + \bar{\Psi}_{j,t-1} \bar{\beta} + \bar{\Omega}_t \bar{\chi} + \bar{M}' \bar{C}_{i,t} \gamma + \varepsilon_{j,t}$$

where:

¹¹ In a recent paper, Forbes and Rigobon (2000) argue that this type of analysis, that compares the correlation between two variables before and after a crisis, is likely to lead to the wrong conclusion that contagion occurred when in fact it didn't. This is caused by an heteroskedasticity problem that if left unchecked biases the t tests upwards.

¹² Some authors have used the same methodology, but measured the severity and extent of the crisis using the drop in stock prices (Sach, Tornell and Velasco, 199_).

¹³ The weights are inversely proportional to the volatility of each series simply to avoid that one series dominates the behavior of the crisis index.

¹⁴ Note that at least one of these three variables will adjust during a currency attack.

C_{jt} is the crisis index indicator for country j at time t
 $\Psi_{j,t-1}$ is a vector of predetermined domestic factors (fundamentals)
 Ω_t is a vector of exogenously determined external factors
 C_{it} is a vector containing the crisis indicators at time t for all countries $i \neq j$
 M is a vector of weights
 α_j, γ are constants
 β, χ are vectors of coefficients
 ε_{jt} is a random term

In the notation above γ is the parameter that indicates whether contagion occurs, while M is a vector used to test for specific channels of contagion. For instance, if interested in testing for regional contagion (or contagion from the ground-zero country only), then M assigns positive weights to those countries that are in the same region than country j (or to the ground-zero country) and zero otherwise. Similarly, if interested in testing the hypothesis that contagion is due to trade linkages, then M assigns weights according to the importance that each country i has on country j 's total trade.

There are several channels for contagion to occur, and each of them can be tested using a regression like (1) by constructing the appropriate M vector. For instance, trade linkages, either direct between countries or indirect through competition in a third market, can cause contagion because of the loss in competitiveness suffered by country j after a devaluation in country i . Similarly, financial linkages, either direct because of cross border investments between countries, or indirect because of common creditors in third (usually industrial) countries, can cause contagion because the losses suffered by investors in market i may lead to portfolio shifts and, therefore, sales in market j . All these causes of contagion, for which an economic linkage can be recognized, can be grouped under the concept of *spillover* effects. The main conclusions that have arisen from this line of research is that contagion occurs mainly through trade linkages, but also within a specific region. However, the finding about regional contagion can be due to unidentified –or poorly proxied– links or to common shocks that operate at the regional level.

There is another type of contagion for which a direct economic link does not exist, however. This refers to investors reacting to a negative shock in country j by pulling out from country i , in spite of not existing any identifiable reason why the developments in the former country would affect –directly or indirectly– the fundamentals in the latter. This type of apparently irrational behavior is called *herd behavior*, and has been explained by arguing that for small investors it is not economically efficient to

be well informed at all times about all the markets in which they invest. Instead, it is more efficient for them to imitate the behavior of large and well informed investors or, alternatively, revise their assessments of countries only sporadically while clustering them in groups based on their similarities. This implies that the market as a whole will react swiftly and disproportionately to the actual change in country i 's fundamentals when something –a shock in country j – warns investors that the economic environment has changed¹⁵. A way to test for this hypothesis in the context of equation (1) above is to look for observable similarities across countries. Thus, after a shock (i.e., a devaluation) in country j , investors will look for and pull out of countries that on the surface appear similar to j . This is the approach taken in a recent paper by Ahluwalia (2000), who reports a strong contagion effect based on countries' similarities during the Mexican, Asian and Russian crises. However, in testing for what he calls the *discriminating contagion* effect, Ahluwalia uses countries similarities directly instead of as a device to weight other countries' crisis indexes. In this paper we follow the latter approach.

In a different paper, S. Calvo and C. Reinhart (1996) investigate the possibility of contagion among countries that are receiving capital flows. Their paper is the exception to the rule in the sense of being the only one that does not study contagion during crisis periods. Calvo's and Reinhart's approach consists of regressing the inflows received by a group of countries against some exogenous (*push*) variables, and the inflows received by other (large) recipients¹⁶. Their sample comprises 11 Latin American economies and covers the 1970-93 period, but they also study shorter periods. The main conclusion of the Calvo's and Reinhart's paper is that during 1970-93, there was positive contagion in flows from the large to the small recipients, but not in the opposite direction. Further, the contagion effect was stronger during 1979-93 than in prior years. The main limitations of Calvo's and Reinhart's paper, nevertheless, are that they do not control for domestic or *pull* variables (something that may be biasing their results¹⁷), that their measure of inflows comprise official and private flows¹⁸, and that their conclusions refer to a small sample of Latin American countries.

¹⁵ This irrational behavior has also been labeled the "wake up call" effect, since investors will react only after being awakened by the crisis in the first country.

¹⁶ In their regressions Calvo and Reinhart (1996) use principal components rather than the inflows directly.

¹⁷ Note that the strong contagion effect found by Calvo and Reinhart may be due to co-movement in country fundamentals.

In this paper we attempt to overcome these difficulties by using a model similar to the one depicted in equation (1), but referred to private capital inflows instead of crisis indexes. Further, we use a larger sample of developing countries from several regions and control for other domestic (*pull*) factors. In this way we are actually measuring contagion after accounting for the direct effect of fundamentals on capital inflows. This is explained further below.

3. Model, sample, and data

In this paper we test for the existence of contagion in private capital flows during the period 1977-97. This 21 year period includes the two most recent episodes in which large amounts of private capital flow into the developing countries, with the debt crisis occurring in between. We are interested in the possibility of “pure” contagion, that is, a statistically significant co-movement in private flows across countries after controlling for changes in the other determinants of capital flows. Further, we are interested in contagion due to *herd behavior* (as opposed to the one caused by some underpinning economic linkages). In other words, we are interested in testing the hypothesis that foreign investors buy certain assets without a proper and thorough evaluation, just because it is fashionable to do so. In this regard they imitate what others are doing by looking for observable similarities among countries, and invest in the assets of those emerging market economies that look alike. The model used in testing this hypothesis is the following:

$$(2) \quad Fi_{jt} = \alpha_j + \bar{\Psi}_{j,t-1} \bar{\beta} + \bar{\Omega}_t \bar{\chi} + \bar{M}' Fi_{i,t} \gamma + \varepsilon_{j,t}$$

where

- Fi_{jt} : private flows received by country j at time t
- $\Psi_{j,t-1}$: vector of predetermined domestic (*pull*) factors
- Ω_t : vector of exogenously determined external (*push*) factors
- Fi_{it} : vector of flows received by all countries i ($i \neq j$) at time t
- M : vector of weights
- α_j, γ : coefficients to be estimated
- β, χ : vectors of coefficients to be estimated
- ε_{jt} : random term

¹⁸ Note that in the aftermath of the debt crisis and until the early 1990s, the Latin American region received mainly official flows from the multilateral financial institutions and other bilateral sources. This may be driving Calvo’s and Reinhart’s results.

In the above notation Fi stands for type- i flows, where i refers either to portfolio flows, foreign direct investment, medium and long-term debt, or total private capital flows. Following the standard literature, we include in the Ω vector the real interest rate in international capital markets –measured by the dollar real ex-post 90 days LIBOR– and the total amount of private funds available to all developing countries. The latter variable is aimed at capturing institutional changes as well as technological innovations during the past decades, that have facilitated investment abroad –in emerging market economies– by institutional investors in industrial countries. Also, the credit rationing hypothesis suggests that the price of credit –i.e., the interest rate– alone may not be sufficient to convey all the necessary information with regards to the equilibrium in international credit markets. These two interpretations aside, this variable can also be interpreted as evidence of contagion (see below).

In the Ψ vector we include domestic variables (*pull factors*) that are easily observable by market participants and that could potentially explain capital flows. These comprise lags of the rate of economic growth, the balance of the public sector, the investment rate, the growth in banking sector credit, a measure of trade integration with the rest of the world, a measure of the country external indebtedness, and a measure of the degree of appreciation of the real exchange rate¹⁹. The precise variables and their expected signs are presented in the table below.

¹⁹ Other variables were also included initially but later on disregarded because of multicollinearity. Among these were the inflation rate, the amount of international reserves held by the Central Bank, the stocks of total and short-term foreign debt, and the private savings rate. Other variables were considered but also disregarded because of poor data quality and/or missing values (terms of trade, and the level of the real domestic interest rates).

	Table 1	
	Definition	Expected Sign
<i>External Variables</i>		
<i>REXT</i>	Real ex-post international interest rate: US dollar 3-months Libor minus the US-CPI 3-months inflation	–
<i>NPKF</i>	Net private capital flows available to all developing countries, as a share of GDP of the major industrial countries	+
<i>Domestic Variables</i>		
<i>GPIB</i>	Real GDP growth	+
<i>PSB</i>	Public sector (central government) balance as a share of GDP	+
<i>INV</i>	Gross domestic investment as a share of GDP	+
<i>TRADE</i>	Total exports as a share of GDP	+
<i>DEBTSS</i>	Foreign debt service as a share of GDP	–
<i>CRPR</i>	Growth in banking sector nominal credit to the private sector	–
<i>APPR</i>	Real exchange rate appreciation (in percent) during the past year: [RER _t -RER _{t-1}]/RER _{t-1}	–

An increase in any of the first four domestic variables indicates stronger fundamentals and should *pull* more flows. In contrast, an increase in any of the last three variables is a sign of a weakening—more indebted and/or overheated—economy and should therefore reduce the amount of inflows. The *APPR* variable was used instead of expected depreciation because of the difficulties associated with estimating market expectations, which entails estimating the long-run equilibrium RER for each country. In the above formulation we are simply assuming that an appreciating real exchange rate is a sign of a weaker economy, though it could also serve as a proxy for expected depreciation; in both cases it should lead to smaller inflows. Similarly, the *CRPR* variable was used because fast growing bank credit to the private sector can be the cause of either a deterioration in the quality of banks portfolios, or overheating in the form of higher inflation, both signals of a weakening economy^{20, 21}.

Vectors M in equation (2) above are constructed by measuring similarities among countries in observable macro-financial variables such as the fiscal surplus, inflation rate, etc. (the specific variables used are discussed in the empirical part of the paper). This is done by taking the difference between X_{it}

²⁰ Note that because of the fixed-effects estimation we do not need to subtract the steady-state growth in nominal bank credit (this is captured in the different constants estimated for each country). This contrasts with the approach used in Sachs, Tornell, and Velasco (1996), which is justified because of their using a cross-section instead of a panel.

²¹ It is worth noting that when replacing the *CRPR* variable for both the real growth in credit and the rate of inflation, the results remain qualitatively the same, except because the two variables attain statistical significance levels of 10% (or less) less often.

and X_{jt} ($\forall t$), where X is a relevant variable that has first been standardized to make the comparison meaningful²². All data is taken either from the World Bank's *World Development Indicators* database, or from the IMF's *International Financial Statistics* and *World Economic Outlook* databases.

Finally, for the empirical analysis the sample period was broken into two. The first capital inflow episode (sample 1) comprises 1977-84, and therefore includes the debt crisis years, while the second episode (sample 2) comprises 1987-97 and includes both the Mexican and the Asian crises. Years 1985-86 were excluded because of all the structural changes brought by the debt crisis at both the domestic and international levels. The second sample –1987-97– was broken further into smaller samples to analyze the potential effects on capital flows of the Mexican and Asian crises—one sub-sample stops before the Mexican crisis, while the other includes the latter but not the Asian crisis. The countries included in each sample are listed in Annex 1.

4. Empirical results

(A) *Determinants of capital inflows*

We begin by explaining capital flows toward developing countries without trying yet to disentangle the nature of contagion. This is done by estimating a simpler version of equation (2), one that includes in the right-hand side only the variables listed in the Ψ and Ω vectors. The following are the most important conclusions that emerge from this exercise –the results discussed below are presented in Tables 2-5²³.

First, the real interest rate prevailing in international capital markets (*rext*) did not play a significant role by *pushing* private flows toward emerging market economies in any of the capital inflow episodes. This result contrasts sharply with those reported earlier by Calvo et.al. (199_), Calvo and Reinhart (1996), Chuan et. al. (199_) and Fernandez-Arias (199_). A possible explanation for this

²² The standardization is done by subtracting and dividing each country-*i*'s observation by the sample mean and standard deviation, respectively. The last two are computed separately for each year using all the countries in the sample.

²³ The results reported in tables 2-5 show that some explanatory variables were excluded in the final regression. This was done after checking that these variables were never statistically significant and that their exclusion did not change the value of any other coefficient. The main purpose of eliminating some insignificant variables was to reduce the existing multi-collinearity. Finally, the results in tables 2-5 include some dummies introduced to control for some unexplained changes in some of the flow series (see footnotes in tables 2-5).

contrasting difference however, is the use in this paper of low frequency data²⁴, a different (larger) sample of countries, and the fact that we are controlling of other *domestic* factors. In fact, the same result is obtained in other studies that use low frequency data and estimate an equation similar to 2 that controls for country fundamentals (Corbo and Hernández 1999, and Hernández and Rudolph 1997).

Second, the debt service capacity and past investment rate are both important determinants of debt flows. Thus, an increase in foreign debt service of 1% of GDP reduces private debt flows by about $\frac{1}{4}$ or more of one percent of GDP, while a similar rise in the investment rate increases debt flows by about $\frac{1}{5}$ of one percentage point of GDP (less during the late 1970s-early 1980s). Portfolio flows also respond to changes in the investment rate but their responsiveness is smaller— $\frac{1}{10}$ or less. Also, foreign direct investment flows respond positively to changes in the rate of economic growth.

Third, foreign investors were more concerned about real exchange rate appreciation in the late 1970s and early 1980s than during the 1990s. However, foreign investors seem to learn from past bad experiences. Thus, it appears that the easy lending of the 1970s, and the losses incurred after the debt crisis, prompted foreign investors to worry about and be more sensitive to the growth in banking sector credit. Similarly, they became marginally more selective in allocating fdi flows after the Mexican crisis.

Fourth, contrary to what was expected, the public sector balance does not seem to play, in general, the role of a *fundamental* in the sense of affecting private flows because of its relationship with a country's solvency. Instead, sometimes it helps to forecast private capital flows because it determines the financial needs of the country's government. This interpretation is fully consistent with the fact that during the 1970s many governments in developing countries borrowed abroad to finance largely ambitious investment programs, and that some highly indebted governments in developing countries launched large privatization programs in the late 1990s, thereby boosting fdi –i.e., Mexico, Brazil, etc. In sum, it appears that on average in our sample the government was never indebted enough to constraint the country's access to private sources of finance. However, during the 1990s private debt flows were sensitive to changes in government's solvency, a result consistent with the argument raised above about investors (foreign banks) being more selective and having learnt from the bad experience of the late 1970s-early 1980s.

²⁴ This does not apply to Calvo and Reinhart (1996).

Finally, and most important for our purposes, in almost all the regressions *NPKF* is statistically significant and with the correct expected sign, showing that the availability of funds to all developing countries was an important determinant of the flows received by each of the almost 30 recipients included in our sample in both episodes. This result confirms that countries receive more inflows just because others do, and, therefore, provides evidence that is consistent with the contagion hypothesis; i.e., capital starts flowing into the emerging market economies because it is fashionable. This finding, however, may also be the result of a common unidentified shock which, in turn, is correlated with the amount of funds available to all developing countries. Note that this common shock cannot be a drop in international interest rates, however, since this is controlled for in all the regressions reported in tables 2-5. Nevertheless, as argued earlier, this common shock can be the removal of institutional restrictions that limit the investment in emerging market economies by industrial countries' institutional investors. Under a proportional portfolio allocation model, the lifting of such restrictions would predict a similar increase in the inflows to all recipient countries.

(B) The role of capital controls

Next, we investigate the role of capital controls in determining –detering– capital inflows. For this we repeat the regressions above, but include among the explanatory variables an index measuring the difficulty that agents encounter when trying to move capital to and from abroad. Similar to previous studies, the index is constructed by combining –adding– two dummy variables, one indicating the presence of restrictions on payments for capital transactions, and the second the presence of surrender or repatriation requirements on export proceeds. Both dummies are built based on the IMF's *Exchange Arrangements and Exchange Restrictions*. The index fluctuates between zero and two, a higher value indicating a more restrictive environment. Data availability only allows investigating the role of capital controls during the 1990s and for a slightly smaller sample.

The results reported in table 6 show that a more restrictive environment for the movement of capital across borders was not a deterrent to capital inflows. There is weak evidence indicating that, other things being equal, a more restrictive environment led to smaller portfolio flows during 1987-94, but this effect weakened in later years. This result is fully consistent with previous findings that capital controls are effective in changing the composition but not the total amount of flows. With regards to the

other determinants of capital flows, the results (not reported in the table²⁵) remain qualitatively identical to those reported in tables 2-5.

(C) The nature of contagion: is there evidence of herd-behavior

Finally, we attempt to disentangle the nature of contagion; that is, we try to uncover the forces underlying the strong effect that total flows toward all developing countries –nprkf in the above regressions– have on the flows received by each particular country. For this we repeat all the regressions reported in tables 2-5, but including as explanatory variables the indices that measure macro similarities among recipient countries. The indices were constructed as described in equation (2) above. We consider six macro variables one at a time, namely, the annual inflation rate, the current account balance, the stock of international reserves, the stock of foreign debt, the rate of economic growth, and total exports. The different macro variables are measured either in percentage points or as a share of another relevant economic variable (GDP, exports, or imports). In addition, we consider the possibility of regional contagion by constructing a similarity index based of countries belonging to the same region. Several conclusions emerge from this exercise (the results are presented in tables 7 through 11):

- First, except for the case of foreign direct investment during the late 1990s, we do not find robust and strong evidence of contagion based on macro similarities. For mostly all the other flow types and periods, the contagion related coefficients turn out to be insignificant or (significant but) with the incorrect sign (Tables 8-11).
- Second, among all the macro variables considered the only ones that could cause contagion because of countries looking alike are the annual inflation rate and the size of the current account balance.
- Third, there is stronger evidence of regional contagion during the 1990s, although it varied among flow types. In particular, it was stronger in the case of foreign direct investment and portfolio flows (Tables 10-11) and weaker in the other two cases (specially medium and long-term debt).
- Fourth, the positive influence of total flows toward all developing countries –nprkf– on the inflows received by each country remains, although it becomes less significant possibly because of the

²⁵ There are two regressions where the significance of one regressor changes. In one of them (total flows, sample 3) lappr turns out significant at 10%, while in other (medium term debt, sample 2) lpsb turns out insignificant. The results are available from the authors upon request.

increased collinearity among regressors. This is so even in the cases when contagion based on macro similarities occurs. This is less true however, in the case of regional contagion, implying that the flows toward its own region are more important for a specific country than the flows toward all developing countries.

- Fifth, with respect to the other right-hand side variables, the majority of the results reported in tables 2-5 remain qualitatively the same. There are a few changes (reported in table 7) that do not change the broad picture, however—it can still be argued that *pull* factors are the main force underlying the surge in private capital flows to the developing countries in the 1970s and 1990s. The most unstable equation is the one for FDI in sample 2 (1987-94), where some variables become statistically insignificant while others turn out statistically significant and with the correct sign²⁶.

It is worth noting that despite some methodological differences, the strong regional contagion effect reported in tables 8-11 is consistent with Calvo's and Reinhart's (1996) result with regards to contagion in capital flows. These authors report that contagion occurred during 1979-93 from Mexico to several small economies in Latin America.

5. Conclusions and future research agenda

Private capital flows returned to the developing countries in the early 1990s, just a few years after the debt crisis. This development was to a great extent unexpected, especially because many of the large recipient countries had not made enough progress in the implementation of much needed economic reforms—although when the inflows started several of these countries had announced and were committed to implement significant reforms in future years. Also, the flows fell sharply in 1997-98 after the Asian crisis, resembling the same pattern observed after the debt crisis in the early 1980s.

The surge in inflows during the early 1990s resembles to a great extent the one occurring in the late 1970s and early 1980s, especially with regards to the high concentration of inflows in a small group of countries, mainly in the Latin American and Asian regions. This suggests that the forces underpinning the surge in capital inflows were the same across the two episodes. However, despite the similarities

²⁶ These results are not reported in the paper but are available from the authors upon request.

between them, the causes of the inflows during the 1990s have been studied thoroughly, while the earlier episode has received little attention in the literature.

Three causes of the inflows have been advanced. The first refers to developments in the world capital markets (*push factors*), such as a fall in international interest rates. The second refers to developments in the recipient countries (*pull factors*), such as the implementation of economic reforms that improve the country's prospects. Finally, the third refers to fads or seemingly irrational behavior on the part of investors in industrial countries—in other words, investors in those countries would invest irrationally by imitating others and following market fads and trends. The latter cause, called *herd behavior*, suggests that countries can receive inflows just because others start receiving them; in other words, capital inflows would be contagious in nature.

This paper analyses the determinants of private capital flows to the developing countries in the 1970s and 1990s, and tests for the possibility of contagion based on country similarities. Consistent with prior findings, our results show that private capital inflows were determined mainly by a country's own characteristics, and that external or *push* factors were not significant in explaining the inflows in any of the two episodes. More interesting, we find only weak evidence of contagion in inflows based on country macro similarities. However, we find stronger evidence of contagion in flows for countries in the same geographical region, specially for foreign direct investment and portfolio flows. It follows that there is no policy recommendation at this stage that could be advanced for countries to reduce the possibility of contagion. Finally, we find that a more restrictive capital account does not lead to smaller inflows of capital; i.e., there is no sufficient evidence in favor of using capital controls to address inflow related problems (but note that in advancing this conclusion we are ignoring prudential aspects).

To the best of our knowledge this paper is the first attempt to disentangle the nature of contagion in capital inflows in a more systematic way. Several hypotheses remain to be analyzed in future research, however. For instance, we did not test for the possibility of contagion occurring on the basis of trade or financial linkages. Similarly, we considered country similarities on the basis of only six macro variables. These should be the focus of future research.

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Table 2**Sample 1: 1977-84**

	m< debt	fdi	portfolio	tot. flows
lgpib	n/a	0.021		--
lpsb	-0.139	-0.024		--
linv	0.129	n/a		0.176
ldebtss	-0.369	-0.026		-0.355
lcrpr	--	--		n/a
lappr	-0.027	-0.004		-0.017
rext	n/a	n/a		n/a
npkf	1.336	0.644		1.234*
N	111	111		111
R-sq	0.358	0.230		0.349
F test	6.890	4.670		6.730
Prob>F	0.000	0.000		0.000

* Mg significance level equal to 11%

Table 3**Sample 2: 1987-94**

	m< debt	fdi	Portfolio	tot. flows
lgpib	n/a	--	n/a	--
lpsb	0.111*	--	n/a	--
linv	0.233	--	0.077*	0.253
ldebtss	-0.181	--	n/a	-0.132
lcrpr	--	-0.004	-0.002	-0.008
lappr	--	--	--	--
rext	n/a	--	n/a	--
npkf	--	2.418	0.992	3.152
N	194	194	194	194
R-sq	0.179	0.197	0.128	0.285
F test	5.550	5.750	4.780	6.180
Prob>F	0.000	0.000	0.001	0.000

* Mg significance level equal to 11%

- Notes: (1) unless indicated with an asterisk, the table reports those coefficients with a mg. sig. level of 10% or less.
(2) n/a indicates that the variable was not included in the final regression because preliminary results showed that it was not statistically significant, and its exclusion reduced the collinearity among regressors without significantly changing any of the estimated coefficients.
(3) All estimations use a fix-effects panel with robust standard errors to correct for potential heteroskedasticity problems.
(4) The dummy variable differs across regressions. In the regressions for foreign direct investment and total flows, it takes the value of one starting in 1994 and zero otherwise, for all the countries where fdi increases in that year by more than the sample mean. In contrast, in the regression for medium- and long-term debt (sample 4) the dummy variable takes the value of one in 1997 only and for all the sample countries.

Table 4
Sample 3: 1987-96

	m< debt	fdi	Portfolio	tot. flows
lgpib	n/a	0.039	n/a	n/a
lpsb	0.116	-0.044	n/a	n/a
linv	0.207	--	0.074	0.184
ldebtss	-0.221	n/a	--	-0.122
lcrpr	--	-0.004	-0.002	-0.004
lappr	--	--	--	--
rext	--	--	--	-0.337
npkf	2.094	1.471	1.334	--
dummy	n/a	1.286	n/a	2.983
N	236	236	236	236
R-sq	0.202	0.371	0.167	0.442
F test	6.750	13.260	6.470	20.750
Prob>F	0.000	0.000	0.000	0.000

Table 5
Sample 4: 1987-97

	m< debt	fdi	portfolio	tot. flows
lgpib	n/a	0.036	n/a	0.074
lpsb	0.113*	-0.050	n/a	--
linv	0.204	--	0.057	0.151
ldebtss	-0.241	--	--	-0.136
lcrpr	--	-0.004	-0.002	n/a
lappr	--	--	--	n/a
rext	--	--	--	n/a
npkf	1.858	1.569	0.904	3.009
dummy	1.432	1.316	n/a	2.643
N	253	253	253	253
R-sq	0.222	0.380	0.129	0.439
F test	6.350	14.460	5.670	28.690
Prob>F	0.000	0.000	0.000	0.000

* Mg significance level equal to 11%

- Notes: (1) unless indicated with an asterisk, the table reports those coefficients with a mg. sig. level of 10% or less.
(2) n/a indicates that the variable was not included in the final regression because preliminary results showed that it was not statistically significant, and its exclusion reduced the collinearity among regressors without significantly changing any of the estimated coefficients.
(3) All estimations use a fix-effects panel with robust standard errors to correct for potential heteroskedasticity problems.
(4) The dummy variable differs across regressions. In the regressions for foreign direct investment and total flows, it takes the value of one starting in 1994 and zero otherwise, for all the countries where fdi increases in that year by more than the sample mean. In contrast, in the regression for medium- and long-term debt (sample 4) the dummy variable takes the value of one in 1997 only and for all the sample countries.

Table 6: Capital controls (1990s; 27 countries)

Sample 4: 1987-97				
	Coef.	Std. Err	t	P> t
m&lt debt	0.229	0.364	0.630	0.529
tot. flows	-0.183	0.308	-0.594	0.553
fdi	0.008	0.211	0.037	0.970
portfolio	-0.245	0.162	-1.512	0.132
Sample 3: 1987-96				
	Coef.	Std. Err	t	P> t
m&lt debt	0.157	0.399	0.394	0.694
tot. flows	0.092	0.367	0.250	0.803
fdi	0.091	0.232	0.391	0.696
portfolio	-0.190	0.166	-1.147	0.253
Sample 2: 1987-94				
	Coef.	Std. Err	t	P> t
m&lt debt	0.299	0.617	0.485	0.628
tot. flows	-0.544	0.673	-0.809	0.420
fdi	-0.087	0.348	-0.249	0.804
portfolio	-0.513	0.255	-2.014	0.045

Table 7: Determinants of capital inflows when introducing similarity indices

A.- Sample 1: 1977-84	
Dependent variable/equation	
Explanatory variable	Total flows
Public sector balance (lpsb)	Becomes significant (with negative sign) in all equations

B.- Sample 2: 1987-94			
Dependent variable/equation			
Explanatory variable	Medium and long-term debt	Foreign Direct Investment	Portfolio flows
GDP growth (lgpib)		Becomes significant in all equations	
Investment rate (linv)		Becomes significant in all equations	Loses its significance
Private credit (lcrpr)	Becomes statistically significant in 2 equations (and attains marginal significance of 12% in other 2)	Becomes statistically insignificant	
Nominal appreciation (lappr)		Becomes significant <u>with incorrect sign</u> in 5 equations	

Table 7 (continued)

C.- Sample 3: 1987-96		
Dependent variable/equation		
Explanatory variable	Medium and long-term debt	Foreign Direct Investment
Private credit (lcrpr)	Becomes significant in 5 out of 7 equations	Becomes insignificant

D.- Sample 4: 1987-97		
Dependent variable/equation		
Explanatory variable	Foreign Direct Investment	Portfolio flows
Investment rate (linv)		Reduces its marginal significance
Private credit (lcrpr)	Becomes insignificant in all regressions	

Table 8
Total Private Capital Flows
 sample 1 sample 2 sample 3 sample 4
 1977-84 1987-94 1987-96 1987-97

total flows (npkf) inflation (cpi)		3.209		1.981
total flows (npkf) CAD (%GDP)	1.585		1.589*	2.337
		0.006		
total flows (npkf) Intl' Res (m_of_i)		0.021	0.010	1.402 0.008
total flows (npkf) foreign debt/exports	0.012	0.028	0.019	0.020
total flows (npkf) gdp growth		0.012		2.086
total flows (npkf) exports/gdp		0.024	0.012	
total flows (npkf) region				1.00*
		0.058		0.034

* mg sig = 13%
 = with correct sign
 = incorrect sign

Note: unless indicated, the table reports those coefficients with a mg. sig. level of 10% or less.

Table 10
Foreign Direct Investment

	sample 1 1977-84	sample 2 1987-94	sample 3 1987-96	sample 4 1987-97
total flows (npkf)	0.624	1.905	1.09*	1.327
inflation (cpi)			(0.003)	(0.004)
total flows (npkf)	0.803	1.852	1.211	1.270
CAD (%GDP)	(0.014)		(0.007)	(0.005)
total flows (npkf)	0.636			
Intl' Res (m_of_i)				
total flows (npkf)	0.579			
foreign debt/exports		0.019		
total flows (npkf)	0.592			
gdp growth		0.011		
total flows (npkf)	0.675		1.143	1.521
exports/gdp				(0.014)
total flows (npkf)	0.753			
Region		0.042	0.036	0.045

* mg sig = 12%

= with correct sign

= incorrect sign

Note: unless indicated, the table reports those coefficients with a mg. sig. level of 10% or less.

Annex 1: Country List

1977-84

1987-97

Sample 1

Argentina
Brazil
Central African Republic
Chile
Cote d'Ivoire
Colombia
Costa Rica
Ecuador
Ghana
Hungary
Indonesia
India
Iran, Islamic Rep.
Korea, Rep.
Mexico
Malaysia
Nicaragua
Nigeria
Pakistan
Peru
Philippines
Paraguay
Thailand
Turkey
Uganda
Uruguay

Samples 2 - 4

Argentina
Bolivia
Brazil
Chile
China
Cote d'Ivoire
Colombia
Costa Rica
Ecuador
Ghana
Hungary
Indonesia
India
Iran, Islamic Rep.
Korea, Rep.
Mexico
Malaysia
Nigeria
Nicaragua
Pakistan
Peru
Philippines
Poland
Paraguay
Thailand
Turkey
Uganda
Uruguay