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Is FDI a Safer Form of Financing?

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Is FDI a Safer Form of Financing?

by

Eduardo Fernández-Arias
Ricardo Hausmann

Prepared for the Seminar

The New Wave of Capital Inflows: Sea Change or Just Another Tide?

Annual Meetings of the Board of Governors, Inter-American Development Bank
and Inter-American Investment Corporation

New Orleans
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Financial crises have been frequent and costly in Latin America and other emerging markets. Currency and banking crises occur everywhere from time to time, but they have been especially virulent in developing countries because they are usually accompanied by a “sudden stop” in capital inflows, i.e. a loss of access to external finance (Calvo and Reinhart, 1999). Consequently, banking and currency crises are associated with dramatic swings in the current account and a collapse in output. Banking and currency crises seem to share common symptoms and may actually cause one another (Kaminsky, Lizondo and Reinhart 1998). That is why they are often referred to as the twin crises. However, they are usually also accompanied by “sudden stops,” making it more a case of “triplets.”

It has been common to attribute crises to short-term capital inflows, while FDI is seen as a safer form of finance. The relationship between crises and the composition of capital flows is particularly relevant at present because Latin America has seen a very dramatic change in the nature of the capital flows it attracts. The flow of capital to Latin America is becoming increasingly dominated by foreign direct investment (FDI). In fact, while private capital inflows declined to US\$ 68.6 billion in 1999, off 36 percent from a peak of US\$ 107 billion in 1997, FDI has been exploding. From US\$ 7.3 billion in the early 1990s, and US\$ 35.8 billion (36.8 percent of private flows) as recently as 1996, FDI reached US\$ 66.5 billion in 1999, just under 97 percent of net private capital inflows in 1999.

In this context, it is useful to ask whether the composition of capital flows is at all related to the likelihood of crises. The dominant view is quite straightforward. FDI involves a long-term commitment to a country and is “bolted down” in such a way that it cannot leave at the first sign of trouble. Hence, it is unlikely to be associated with crises for two reasons: first, because there must be something right about the country if capital is coming in as FDI; second, because even if there were problems, FDI does not have the explosive characteristics of other flows. As expressed by the World Bank (1999) “FDI also is less subject to capital reversals and contagion that affect other flows, since the presence of large, fixed, illiquid assets makes rapid disinvestment more difficult than the withdrawal of short-term bank lending or the sale of stock holdings.”

It is therefore important to ask whether the composition of capital inflows and of the stock of foreign liabilities is relevant for these crises, be it their frequency, depth, or length. In this paper, we explore the possible role of FDI as a benign form of external liability relative to other classes of liabilities, reviewing both analytical and empirical arguments.

Theoretical Arguments

Before confronting the evidence, it is important to review the theoretical arguments concerning why FDI may be safer in terms of its differential effect on the risk of crisis.

The traditional argument is related to the illiquidity of FDI, i.e. the notion that it is “bolted down.” Hausmann and Fernández-Arias (2000) argue that this view is inappropriate by pointing out that FDI is not a physical asset of a firm, but only one of its liabilities. The firm has other liabilities and assets. Some assets may be “bolted down,” but financial claims backed by “bolted down” physical capital can easily fly away. In fact, foreign investors can hedge their earnings and protect the value of their assets, or outright speculate, by borrowing in domestic currency and pledging physical capital as collateral. More than a theoretical possibility, these schemes have been observed in practice.¹

One key implication of the relevance of the previous “round tripping” scheme is that the degree of risk of various classes of flows cannot be assessed by looking at each flow separately; outflows may be generated under an account other than FDI, a circumstance especially likely during a crisis. Said differently, what comes in through the door may go out through the window. This would be a limitation of any simple-minded analysis of flow reversals or of the relative volatility of flows. If a foreign firm saw a crisis coming and wanted to take money out, it would not choose to repatriate equity. Instead, it would borrow domestically and buy foreign assets or repay foreign loans. More generally, the volatility of FDI provides little information on the overall volatility of the capital account.

¹ See IMF (1998), Box 2.2.

However, there is one serious argument in favor of the greater safety of FDI (and equity in general), concerning financial crises. The argument has to do with incomplete markets, original sin and, consequently, crises caused by exchange rate and maturity mismatches.

A currency is said to suffer from original sin when it cannot be used to borrow abroad, or even domestically to borrow long term. This means that firms will be confronted with what Pedro Pou has called the Devil's Choice: borrow in dollars and face a currency mismatch or borrow short term and face a maturity mismatch. Both alternatives increase the risks faced by all firms and favor greater reliance on equity finance. Equity from this point of view involves neither currency nor maturity mismatches, since it is a residual claim that has no fixed value or currency denomination and is, in principle, infinitely long-lived.

As argued by Fernández-Arias and Lombardo (1998), Krugman (1999), Chang and Velasco (1999), Calvo (1999) and Eichengreen and Hausmann (1999), if a country has a sufficiently large stock of foreign currency debt, exchange rate movements will have very large balance sheet effects that will make it vulnerable to self-fulfilling attacks. If the currency were to depreciate significantly, firms would find it impossible to service their debts. Lenders and borrowers would want to take their money out before this happens, thus precipitating a crisis. They would not regret *ex post* having pulled the trigger since the depreciation would precipitate the bankruptcies they were trying to avoid. If the authorities try to defend the currency, they will have to tighten domestic credit conditions, making it difficult for those who borrowed domestically to roll over their short-term debts, generating a potential banking crisis.² If a country does not suffer from original sin, the depreciation will have small balance sheet effects and maturity mismatches will not be as severe, allowing the authorities a freer hand in setting monetary policy.³

² In fact, after the banking crisis the attempt of the Central Bank to act as lender of last resort by expanding domestic credit usually leads to a currency crisis as it did for example in Mexico 1994, Venezuela 1994, Thailand 1997 and Ecuador 1999.

³ Hausmann, Stein and Panizza (2000) show that original sin is related to the degree of exchange rate volatility actually allowed by countries that float their currencies.

In this context, equity liabilities such as FDI can be expected to be less crisis-prone because, as opposed to debt liabilities, they involve neither currency nor maturity mismatches. Holders of equity are entitled to whatever cash flow is left over, in whatever currency it is denominated in, after paying all other claimants. The conclusion is that since equity does not involve mismatches it is unlikely to generate crises of this type. The market understands this as can be seen from the larger proportion of FDI in the external liability mix of countries suffering from original sin (Hausmann and Fernández-Arias, 2000).⁴ Hence, external equity investment is a way of avoiding the debt maturity and currency mismatches caused by original sin.

Empirical Evidence

As an empirical matter, the importance of the composition of capital inflows has been almost invariably studied by comparing the volatility of each class of liability, an approach that is vulnerable to the round-tripping argument. A number of studies have demonstrated that the volatility of FDI is smaller than that of other series.⁵ However, as can be seen from Table 1, the standard deviation of FDI is not very different from that of total net flows, especially for Latin America. Moreover, the volatility of FDI itself has been on the rise. Furthermore, while the overall share of FDI in capital inflows has been rising in the 1990s in most developing countries, it has not helped make the overall capital account more stable.

As argued above, this evidence based on the statistical properties of univariate time series does not appear relevant to the problem at hand, since the flows need not leave from the account in which they entered. In addition, the volatility of capital inflows may be the reflection of volatile demand for funds. For example, if a country suffers from volatile terms of trade and financial markets allow the country to

⁴ Whether all the beneficial effects of FDI are internalized by the market, i.e., whether the observed liability mix is optimal as a second-best palliative of original sin remains open to future research.

⁵ For example, UNCTAD 1998 and Chuhan, Perez-Quiroz, and Popper (1996). However, Claessens, Dooley, and Warner (1995) do not find this pattern. Sarno and Taylor (1999) find that FDI is more persistent.

smooth its consumption inter-temporally, capital flows would be volatile but stabilizing. This case can be distinguished from a situation in which the volatility reflects an unstable and unreliable supply of funds. Only the latter problem is of concern.

Furthermore, the relevant question is whether the composition of foreign liabilities is related to the probability of crisis. This question cannot be answered by examining the evidence during periods of tranquility, when the fact that countries have market access would make the volatility of a particular class of liabilities largely innocuous. Instead, it requires a comparative analysis of classes of liabilities around crises, which in traditional time-series studies amount to a minor portion of the sample variation. Surprisingly, very few empirical studies take this approach. Frankel and Rose (1996) is a salient exception. In that study, based on developing country data for the period 1970-92, the authors estimate how the composition of liabilities of developing countries affects the probability of a currency crisis. They use regression analysis to see how the composition of stock liabilities is associated with the probability of suffering a currency crisis in each year.⁶

Of the many explanatory variables utilized, they find only a few to be statistically significant. Surprisingly, they do not find that overall indebtedness is a relevant factor, nor is the share of short-term debt in the total debt stock. However, they do find that the ratio of FDI to debt has a negative effect on the probability of crisis and is statistically highly significant. This means that for a given level of debt, more FDI would actually decrease the probability of default! Thus, this study does not find debt to be crisis creating but it identifies FDI as crisis preventing. Said

⁶ A currency crisis is defined as a nominal exchange depreciation of more than 25 percent in their annual average levels, with special provisions for high inflation countries. They require that the rate of depreciation accelerate at least 10 percent relative to the previous year's rate of depreciation in order to control for high inflation cases. Repeated crises in a given country in close years are counted as one crisis. See Appendix for details.

differently, FDI was found not only to be less risky than debt, but also to reduce risk. This “superprotective” FDI is difficult to rationalize.⁷

In our own empirical study we update the data to include information up to 1997 and extend the set of countries to include industrial countries but maintain Frankel and Rose’s definition of currency crises. Our results are presented in Table 2. The table shows results for the probit regression of the probability of a currency crisis as a function of the stocks of FDI and non-FDI liabilities, using openness (the ratio of exports to GDP) and income per capita as controls. We look at three different sets of countries: 1) developing countries with a GDP of at least US\$ 5 billion in 1997, 2) all developing countries, and 3) all countries.

We find that the control variables are highly significant. The level of development and the degree of openness of the economy are related strongly and negatively to the probability of crisis. Non-FDI liabilities have a positive and significant impact on the probability of crises, while FDI liabilities do not seem to have a statistically significant effect (albeit the coefficient is typically negative). This result is robust to different specifications⁸ and to the inclusion or not of small countries from the sample. We get similar but somewhat weaker results using Goldstein, Kaminsky and Reinhart’s (1999) quite different definition of currency and banking crises, which they apply to a much smaller set of emerging markets (Table 3). However, when we include industrial countries in the sample (in Table 2) the result breaks down and non-FDI liabilities appear to have no impact on the probability of crisis.

Consequently, the evidence suggests that FDI is safer than non-FDI only when we restrict the sample to developing countries. For this set of countries, non-FDI

⁷ Frankel and Rose (1996) are also puzzled by this result and suggest that it might be that FDI flows decline in anticipation of a crisis. They used data on FDI flows because data on FDI stocks were not available. We repeated their analysis using stocks and reproduced their same results. Hence, the explanation of the negative coefficient on FDI must have a different explanation. In fact, when we control for determinants of overall risk, such as income per capita and openness, the negative coefficient on the stock of FDI disappears.

⁸ We vary the use of controls and we measure liabilities either as a share of GDP or as a share of exports.

exposure appears to increase the probability of currency crises while FDI appears to be neutral and, if anything, seems to lower it.

However, these results break down when we include industrial countries. Statistically, this may be driven by the fact that these countries have a much larger stock of non-FDI liabilities than do developing countries and have a lower frequency of crisis. How can industrial countries support larger debt stocks without a higher risk of crisis? One possible explanation is original sin. Many of them can borrow abroad in the same currency they use domestically and hence can avoid currency mismatches. These currencies also support long-term markets, thus limiting maturity mismatches. Is there any evidence for this hypothesis?

To check this story we developed a variable to measure original sin (see Appendix for more details). Figure 1 uses BIS data to show the proportion of international securities denominated in a country's currency relative to the amount issued by that country's residents. Countries like the United States and Switzerland appear with ratios greater than 1 because many non-residents issue debt denominated in US dollars or Swiss francs. Countries that do not appear in the graph simply have no international issues in their own currency. Essentially, all of Latin America and East Asia have either zero or insignificant issues in their own currency. We use this BIS data on the currency denomination of bonds and money market instruments and define a currency as not suffering from original sin if the average 1993-98 ratio of securities issued in that country's currency to the securities issued by the country was larger than 20 percent.⁹

For countries within currency unions, we gave them the classification received by the common currency. We used the data on currency unions in Rose (2000). This has the advantage of including a large set of developing countries as not suffering from original sin because they share a currency that can be used to borrow internationally. Table 4 shows a two-by-two matrix in which we have classified countries according to whether they suffer from original sin and whether they have

⁹ We checked that our results are not sensitive to the choice of this threshold, since few countries are on the borderline.

suffered currency crises in the 1970-97 period.¹⁰ Of the 170 countries in the sample, 27 are free from original sin and only 2 register currency crises (7.4 percent). By contrast, of the 143 countries that suffer from original sin, 99 of them have had currency crises (69 percent).

This suggests that some interaction between original sin and debt may be part of the story. To test this hypothesis, we extended the model presented in Table 2 to include original sin and its interactions with the stocks of FDI and non-FDI liabilities. We use a dummy which is equal to 1 when a country suffers from original sin, according to the definition described above. The results appear in Table 5. The first column repeats the last equation of Table 2. The middle column introduces the original sin dummy, by itself and interacting with FDI and non-FDI stocks. The results are quite telling. First, original sin per se is not an independent source of crisis. Second, the only stock variable that is statistically significant is the interaction between original sin and non-FDI liabilities. Hence, this suggests that debt is dangerous only when the country suffers from original sin. Finally, FDI appears with a negative sign by itself and with a positive sign when interacted with original sin. Moreover, while these two numbers are not statistically different from zero, they are different from each other. This can be interpreted as meaning that even the risks associated with FDI are different under original sin.

These results statistically confirm the hypothesis that original sin is behind the comparative safety advantage of FDI over debt. However, is there an even more satisfactory hypothesis? An alternative interpretation of the evidence could be that developing countries are somehow structurally riskier for factors other than original sin. In this case, a positive correlation between original sin and lack of development in general could explain the finding. However, this correlation is not that perfect since there are some industrial countries that suffer from original sin and there are developing countries that, through currency unions, have been able to escape from

¹⁰ We use the Frankel and Rose (1996) definition of crisis .

original sin. Therefore, it is possible to discriminate between the effect of original sin and of not being an industrial economy.

To test this hypothesis, we include an additional dummy variable that takes the value of one for developing countries and zero for industrial countries. We also added the interaction of this variable with FDI and non-FDI stocks. The result is shown in the last column of Table 5. Neither the dummy for original sin nor the one for developing country are significant by themselves. Both original sin and being a developing country make non-FDI risky. By contrast, for developed countries without original sin, non-FDI is not associated with additional risk.¹¹ We therefore find that both original sin, as defined in this exercise, and being a developing country are relevant for the greater riskiness of non-FDI stocks. Looking at the magnitude of their coefficient estimates, original sin appears to be the more powerful of the two factors. Combining the relevant estimated coefficients, we find that either redemption from original sin or graduation to industrial country would be enough to eliminate the crisis-generating risk of non-FDI stocks. Finally, we find again that the impact of FDI on the probability of crisis is different when there is original sin.

These results suggest that the level of non-FDI liabilities is not a source of risk in itself. It is more dangerous in developing countries, but is even more problematic when a country suffers from original sin. This evidence supports the idea that a fundamental source of crisis is related to the mismatches in debt exposure caused by original sin.

In fact, original sin seems to matter even for FDI. This is consistent with the idea that FDI is not “bolted down.” Firms in an environment of original sin will be quick to use their fixed assets as collateral to short the currency if they see the possibility of crisis.

¹¹ Interestingly, debt appears to be “super-protective.” This can be rationalized by noting that countries with those characteristics may attract more non-FDI liabilities because of the safety they offer to foreign investors, which would bias the estimation in this direction.

Conclusions and Policy Implications

Emerging markets have suffered from frequent and costly crises. Is the composition of external liabilities relevant for the risk of crisis? This paper has addressed this question by examining the richest data sets on developing country currency and banking crises available. It focused on the hypothesis that FDI offers a safer form of financing and found that the evidence tells a consistent and interesting story, full of new insights and policy ramifications.

FDI liabilities seem to be safer than debt or other forms of non-FDI obligations, irrespective of country risk factors such as income level and degree of openness (consistently found associated with lower risk in all country samples). In particular, non-FDI is crisis prone but FDI is neutral. This finding is consistent with the conventional view that FDI is safer because it is “bolted down,” while other liabilities are crisis prone because they can “fly away.” However, there is a nuance to this result: it holds true only for developing countries. Developed economies can have large concentrations of external liabilities in the form of debt without generating crises. This finding, as well as other evidence and analysis, does not support the “bolted down” versus “fly away” hypothesis.

Alternatively, we advance the hypothesis that FDI’s relative safety springs from the risk of crisis that debt liabilities entail when they suffer from excessive currency or maturity mismatches. This mismatch condition is not relevant to equity liabilities because they are a residual claim. This “debt mismatch” hypothesis implies that FDI is superior when debt is a defective instrument that generates currency and maturity mismatches.

Countries unable to borrow abroad in their domestic currency can be expected to suffer from excessive debt mismatch. We formalize this “original sin” hypothesis and find that, accordingly, debt liabilities are crisis prone only in this case. Original sin appears even to increase the risk associated with FDI liabilities, which runs counter to the “bolted down” view. While there are other unspecified relevant explanatory factors related to being a developing economy, the “original sin” hypothesis consistently tells most of the story. Our findings suggest that a crucial difference between industrial and developing countries relates to the fact that many

of the former do not suffer from original sin. They can borrow internationally in their own currency, thus avoiding the mismatches that cause crises in other economies.

What are the policy implications of these findings? Should countries adopt policies that discourage debt and favor FDI? This solution would distance emerging markets from the pattern of finance among developed countries, where FDI represents barely 12 percent of external liabilities, compared with over 30 percent in Latin America. Obviously, this solution is, at most, second best.

A first best solution would involve finding a way out of original sin. As long as Latin American companies face the devil's choice of either borrowing short-term or borrowing in dollars they will have weak and risky balance sheets. In this environment, even FDI can become a source of problems in a crisis.

However, how can a country obtain redemption from original sin? Solutions are not obvious. First, it is clear that original sin is not explained by Latin America's history of inflation, since many of the 143 countries suffering from original sin have no history of inflation (e.g. the East Asian economies). Thus, sticking to a policy of fiscal prudence and low inflation may not be enough.

One alternative is to adopt a common currency that does not suffer from original sin. Countries in our sample that have done this appear safer than those that have a national currency that suffers from original sin. In this respect, dollarization may be a way out and some countries may pursue this course of action. Other countries may want to choose an alternative that achieves redemption without renouncing monetary independence. In this sense, it becomes a critical issue to try to understand how Australia, New Zealand and especially South Africa did it.

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Table 1: Emerging Market Economies: Volatility of Net Capital Flows 1

	Volatility					
	Mean		Standard deviation		Coefficient of variation ²	
	1980s	1990s	1980s	1990s	1980s	1990s
	(In percent of GDP)				(Ratio)	
FDI						
Developing countries	0.4	1.5	0.1	0.6	0.3	0.4
Africa	0.3	0.9	0.2	0.5	0.6	0.5
ASEAN-4 plus Korea	0.6	1.1	0.3	0.3	0.5	0.2
Latin America	0.7	1.5	0.2	0.8	0.3	0.5
Transition economies	0.0	1.3	0.0	0.8	...	0.6
Portfolio						
Developing countries	0.2	1.0	0.1	0.6	0.7	0.6
Africa	-0.2	0.1	0.1	0.3	-0.8	2.8
ASEAN-4 plus Korea	0.3	0.9	0.3	0.9	1.0	0.9
Latin America	0.1	1.8	0.3	1.0	5.3	0.6
Transition economies	0.0	1.5	0.0	1.2	...	0.8
Other net investment ³						
Developing countries	1.3	0.5	0.5	1.2	0.4	2.4
Africa	2.9	2.5	1.0	1.6	0.3	0.7
ASEAN-4 plus Korea	2.0	1.0	2.0	3.0	1.0	3.1
Latin America	1.5	-0.3	1.7	1.0	1.2	-3.7
Transition economies	-0.2	-0.4	0.2	1.4	-1.4	-3.4
Total net flow						
Developing countries	1.9	3.0	0.4	1.0	0.2	0.3
Africa	3.0	3.6	1.0	1.0	0.3	0.3
ASEAN-4 plus Korea	2.9	3.0	2.2	3.2	0.8	1.1
Latin America	2.2	3.0	1.9	0.9	0.9	0.3
Transition economies	-0.2	2.4	0.3	1.5	-1.3	0.6

Source: International Monetary Fund. 1999. "World Economic Outlook". Washington, D.C.

1 Categories of capital flow are in accordance with *Balance of Payments Manual*: Fifth Edition (Washington, DC: International Monetary Fund, 1993).

2 Standard deviation divided by mean.

3 Is a residential category including financing from official and private sources. Instruments in this category are usually not traded in

secondary markets, in contrast to instruments classified with portfolio investment.

4 The ASEAN-4 countries are Indonesia, Malaysia, the Philippines, and Thailand.

TABLE 2

**Probability of Currency Crisis
(Frankel and Rose definition)**

	Developing countries (Excludes small countries)		All developing countries		All countries	
FDI/GDP	-0.023 (0.19)	-0.052 (0.43)	-0.070 (0.74)	-0.092 (0.96)	-0.028 (0.54)	-0.061 (1.13)
Non FDI/GDP	0.387 ** (4.16)	0.428 ** (4.48)	0.299 ** (5.49)	0.311 ** (5.80)	-0.001 (0.10)	0.002 (0.59)
Exports/GDP	-0.461 ** (3.09)	-0.405 ** (2.71)	-0.388 ** (3.67)	-0.313 ** (2.95)	-0.230 ** (4.49)	-0.135 ** (2.51)
Per capita GDP	-----	-0.930 * (1.89)	-----	-1.110 ** (2.81)	-----	-0.270 ** (3.45)
Sample size	802	802	1436	1436	2107	2107
% Crisis (Obs. P)	9.1	9.1	8.0	8.0	6.4	6.4

Note: Probit slope derivatives (x100, to convert into percentages) estimate the average increase of the annual probability of crisis when the explanatory variable increases by one unit. All ratios measured as percentages. Per capita GDP (1995) measured in thousands of dollars.

Associated z-statistics are between parenthesis (in absolute value).

** Significant at 5%.

* Significant at 15%.

TABLE 3

**Probability of Crisis
(Goldstein, Kaminsky and Reinhart sample)**

	Currency crisis		Banking crisis	
FDI/GDP	-0.005 (0.02)	0.068 (0.26)	-0.024 (0.14)	-0.090 (0.51)
Non FDI/GDP	0.096 * (1.59)	0.066 (1.04)	0.049 (1.25)	0.082 * (1.85)
Exports/GDP	-0.180 (1.12)	-0.372 * (1.75)	-0.096 (0.89)	0.030 (0.23)
Per capita GDP	-----	0.343 (1.42)	-----	-0.280 * (1.64)
Sample size	638	638	638	638
% Crisis (Obs. P)	13.0	13.0	5.2	5.2

Note: Probit slope derivatives (x100, to convert into percentages) estimate the average increase of the annual probability of crisis when the explanatory variable increases by one unit. All ratios measured as percentages. Per capita GDP (1995) measured in thousands of dollars.

Associated z-statistics are between parenthesis (in absolute value).

** Significant at 5%.

* Significant at 15%.

Table 4: Currency Crises and Original Sin

	Crisis	Non Crisis	Total Sin-no Sin
Sin	99	44	143
No Sin	2	25	27
Crisis- nonCrisis	101	69	170

TABLE 5

**Probability of Currency Crisis
(Frankel and Rose definition)**

	Without controls	Controlling by Original Sin	Controlling by Original Sin and Developing country
Per capita GDP	-0.270 ** (3.45)	-0.178 ** (2.89)	-0.012 (0.14)
Exports/GDP	-0.135 ** (2.51)	-0.163 ** (4.04)	-0.163 ** (4.46)
Original Sin	-----	-0.119 (0.05)	0.404 (0.20)
Developing country	-----	-----	-0.218 (0.13)
FDI/GDP	-0.061 (1.13)	-0.313 (1.04)	-0.178 (0.68)
Original Sin X FDI/GDP	-----	0.294 (0.97)	0.212 (0.85)
Developing country X FDI/GDP	-----	-----	-0.056 (0.43)
Non FDI/GDP	0.002 (0.59)	-0.002 (0.13)	-0.093 ** (2.73)
Original Sin X Non FDI/GDP	-----	0.109 ** (4.68)	0.125 ** (5.79)
Developing country X Non FDI/GDP	-----	-----	0.091 ** (2.80)
Sample size	2107	2107	2107
% Crisis (Obs. P)	6.4	6.4	6.4

Note: Probit slope derivatives (x100, to convert into percentages) estimate the average increase of the annual probability of crisis when the explanatory variable increases by one unit. All ratios measured as percentages. Per capita GDP (1995) measured in thousands of dollars.

Original sin and developing countries are dummies that take the unit value when these conditions are met and zero otherwise (i.e., no original sin and developed country, respectively).

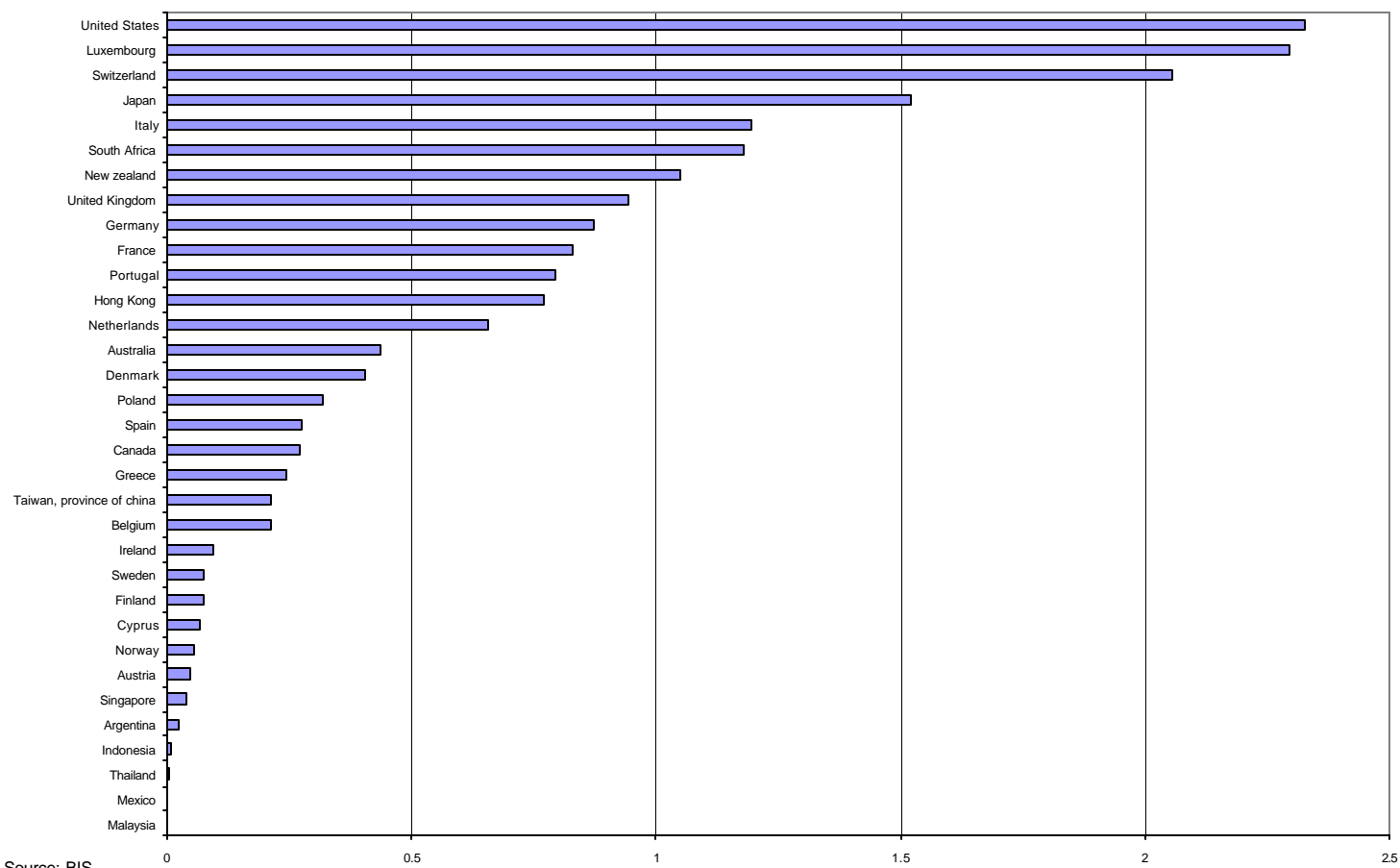
Associated z-statistics are between parenthesis (in absolute value).

** Significant at 5%.

* Significant at 15%.

FIGURE 1

Debt in Currency X Over Debt in Country X, 1998 (Money Market Instruments and Bonds)



Source: BIS

Appendix 1

I. The Sample

The sample consists of all countries where information is available from 1970-1997.

Five sub-samples were used:

- 1- All countries.¹²
- 2- All countries excluding small countries (GDP less than US\$5 billions in 1997) and financial centers (Panama and Switzerland).
- 3- Developing countries (103-country sample of J. Frankel and A. Rose- (1996).
- 4- Developing countries excluding small countries (GDP less than US\$5 billions in 1997) and financial centers (Panama).
- 5- 25-country sample of Currency and Banking crises of M.Goldstein, G. Kaminsky and C. Reinhart (2000).

¹² United States is excluded because its currency is used as numeraire for exchange rates.

II. Dependent Variables.

Variable	Description	Source
Currency Crisis	<p>Currency Crisis: changes in the annual average US dollar exchange rate of 25% or more and in excess of 10% of the previous year's change. Allow a three-year window around crisis. Period 1971-1997.</p> <p>Currency Crisis: weighted average of exchange rate changes and reserve changes, weighted to have equal volatility. Period 1970-1997.</p>	<p>J. Frankel and A. Rose (1996), updated and with extended country coverage.</p> <p>M.Goldstein, G.Kaminsky and C.Reinhart (2000)</p>
Banking Crisis	<p>Banking Crisis: 1- Bank runs that lead to closure merging, takeover or large-scale government assistance of an important financial institution. 2- If no runs, the closure, merging, takeover, or large-scale government assistance of an important financial institution. Period 1970-1997.</p>	<p>M.Goldstein, G.Kaminsky and C.Reinhart (2000)</p>

III. Explanatory Variables

Variable	Description	Sources
Income per capita	1990 GNP per capita (constant 1995 US\$)	Income per capita

Exports	Current dollars	WEO
GDP	GDP in PPP current dollars	WDI, World Bank
Openness	Exports/GDP	WEO. WDI, World Bank.

IV. The Model

Probit model using maximum likelihood. It reports the average effect of one unit change in the stock of FDI and Non-FDI liabilities (as percentage of GDP or exports) on the probability of a currency crisis and a banking crisis. Two sets of regressions with similar specifications and different samples of countries across time.

In the first set, the independent variables are the stock liabilities (FDI and Non FDI) divided by GDP, controlling for the income per capita of the country and its degree of openness across our samples (see below a similar exercise in which openness is controlled, by using FDI and Non-FDI divided by exports).

The second set of regressions uses the same specifications with the addition of the “original sin” dummy and a developing country dummy, as well as their interactions with the liabilities. In this case, we study the probability of a currency crisis in the whole sample of countries and across time.

**Probability of Currency Crisis
(Frankel and Rose definition)**

	Developing countries (Excludes small countries)		All developing countries		All countries	
FDI/Exports	-0.004 (0.26)	-0.005 (0.28)	-0.017 * (1.86)	-0.013 (1.42)	-0.007 (1.11)	-0.011 * (1.77)
Non FDI/Exports	0.041 ** (6.32)	0.043 ** (6.47)	0.013 ** (5.31)	0.013 ** (5.71)	0.000 (0.72)	0.001 * (1.46)
Per capita GDP	-----	-0.942 ** (1.99)	-----	-1.500 ** (3.62)	-----	-0.442 ** (5.41)
Sample size	846	846	1573	1573	2284	2284
% Crisis (Obs. P)	9.0	9.0	7.9	7.9	6.3	6.3

Note: Probit slope derivatives (x100, to convert into percentages) estimate the average increase of the annual probability of crisis when the explanatory variable increases by one unit. All ratios measured as percentages. Per capita GDP (1995) measured in thousands of dollars. Associated z-statistics are between parenthesis (in absolute value).

** Significant at 5%.

* Significant at 15%.

**Probability of Crisis
(Goldstein, Kaminsky and Reinhart sample)**

	Currency crisis		Banking crisis	
FDI/Exports	-0.005 (0.18)	0.002 (0.08)	-0.003 (0.19)	-0.009 (0.46)
Non FDI/Exports	0.029 ** (3.29)	0.028 ** (3.24)	0.009 * (1.52)	0.009 * (1.62)
Per capita GDP	-----	0.130 (0.92)	-----	-0.103 (1.00)
Sample size	656	656	656	656
% Crisis (Obs. P)	13.1	13.1	5.2	5.2

Note: Probit slope derivatives (x100, to convert into percentages) estimate the average increase of the annual probability of crisis when the explanatory variable increases by one unit. All ratios measured as percentages. Per capita GDP (1995) measured in thousands of dollars.

Associated z-statistics are between parenthesis (in absolute value).

** Significant at 5%.

* Significant at 15%.

**Probability of Currency Crisis
(Frankel and Rose definition)**

	Without controls	Controlling by Original Sin	Controlling by Original Sin and Developing country
Per capita GDP	-0.442 ** (5.41)	-0.205 ** (3.01)	-0.274 ** (2.42)
Original Sin	-----	2.702 (1.04)	3.339 (1.33)
Developing country	-----	-----	-7.410 (1.34)
FDI/Exports	-0.011 * (1.77)	-0.051 (0.89)	-0.054 (0.82)
Original Sin X FDI/Exports	-----	0.046 (0.80)	0.041 (0.68)
Developing country X FDI/Exports	-----	-----	0.008 (0.20)
Non FDI/Exports	0.001 * (1.46)	-0.002 (0.27)	-0.014 (1.20)
Original Sin X Non FDI/Exports	-----	0.012 * (1.66)	0.010 * (1.89)
Developing country X Non FDI/Exports	-----	-----	0.014 (1.23)
Sample size	2284	2284	2284
% Crisis (Obs. P)	6.3	6.3	6.3

Note: Probit slope derivatives (x100, to convert into percentages) estimate the average increase of the annual probability of crisis when the explanatory variable increases by one unit. All ratios measured as percentages. Per capita GDP (1995) measured in thousands of dollars. Original sin and developing countries are dummies that take the unit value when these conditions are met and zero otherwise (i.e., no original sin and developed country, respectively).

Associated z-statistics are between parenthesis (in absolute value).

** Significant at 5%.

* Significant at 15%.

