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«The Role of Foreign Direct Investment in Financing Growth and in Stabilizing Exchange Rates»

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**The role of foreign direct investment in avoiding
an over-valued currency**

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The role of foreign direct investment in financing growth and in stabilising exchange rates

(Patrick Artus)

Abstract This paper examines the differences between countries where growth is financed by financial capital inflows and those where it is financed by foreign direct investment (FDI). Theoretical analysis of the situation in several countries confirms that: using FDI avoids excessive external debt, leads to a better analysis of investment projects, is more stable, transfers new technology, and does not incur real currency over-valuation. We will conduct a theoretical analysis using an equilibrium real exchange rate model which differentiates FDI and financial capital inflows in several ways, with a view to confirming this analysis empirically using a sample of emerging countries.

The purpose of this paper is **to examine the links**, in theory and in practice, **between foreign direct investment (FDI) and the real exchange rate**. In particular, we would like to show that **using FDI to finance growth can avoid the real over valuation of the currency** which is the normal consequence of the use of financial capital inflows (such as bank credit).

Writers have often advanced other positive role played by FDI in financing growth. Lipsey (1999) shows that FDI is far more stable than other forms of financing. It has been widely documented that the Asian crisis was accentuated by the fact that a significant amount of finance was provided via the interbank market, and when the crisis began, this source of finance was removed, triggering a liquidity crisis for Asian banks (Chang-Velasco (1998)). Moreover, Frankel-Rose (1996) show that currency crises are increasingly likely where the ratio of FDI to debt is lower.

In theory, financing growth through FDI also avoids the problems arising from the risk of default involved in debt financing¹, for example, credit rationing preventing profitable projects from being completed. Financing by debt has the disadvantage of the moral hazard risk, where lenders often expect that the borrowing country's political authorities or international organisations will guarantee the solvency of the borrowers, hence the lack of risk analysis. The Asian crisis also shows that lenders lack the capacity to examine investment projects in sufficient detail, hence surplus capital is poorly invested ... There are often several intermediaries between the lender and the final borrower: a western bank lends to a local bank, which finances investment projects but is not used to monitoring the solvency of its borrowers.

It is also widely documented that FDI contributes to growth in several ways: transfer of technology, improvements in management, improvements in human capital, increased competition (see the country surveys of Blomström-Kokko (1996)).

However, we will mostly restrict, in this paper in the analysis of the links between FDI and the real exchange rate.

This paper is in three parts:

¹ See the well known theoretical analysis of default risk in Bulow-Rogoff (1989), Cohen-Sachs (1986), Eaton-Gersovitz-Stiglitz (1986) and Eaton-Fernandez (1995).

Section 1 will consider developments in Brazil, China, South Korea and Poland, with a view to determining whether the extent to which FDI is used to finance growth systematically results in particular developments.

In section 2, we will use an equilibrium exchange rate model² to examine the short- and long-term effects of the choice of finance (FDI or financial flows) on capital accumulation, exchange rates and the efficiency of savings allocations. First, we will describe the model (**section 2-1**) and demonstrate that - excluding other hypotheses - FDI and foreign debt have almost equivalent effects in the short- and long-term. We will analyse the effects of shocks, and compare the equilibrium obtained in the event of autarky or for countries which use only FDI.

Section 2-2 will consider 4 hypotheses which differentiate direct investment and foreign debt: lenders are less informed of the return on projects than companies which make direct investments; foreign debt incurs a risk of default; more advanced technology is introduced by direct investment; companies controlled by foreign companies have more effective management.

Section 3 will carry out an empirical analysis on a sample of emerging markets.

1 – Four representative examples

As seen above, in theory, direct investment appears preferable to financing on the financial markets or by bank loans. FDI results in increased capital accumulation, improved assessment of projects and consequently an absence of over-investment or over-indebtedness, no risk of default or moral hazard related to the role expected of public lenders (IMF, etc.). However, the advantages of direct investment remain to be proven in practice. This first section will examine the situation in four countries with very different strategies: **South Korea, China, Poland and Brazil.**

² Following to Faruqee (1995), Mac Donald (1995), Allen-Stein (1995), Williamson (1994).

1 – 1) Very different financing strategies in the four countries

Table 1
Structure of foreign financing
(%, stocks)

| | Loans | Bonds | Equities | Direct Investment |
|-------------|-------|-------|----------|-------------------|
| Argentina | 10 | 45 | 12 | 33 |
| Brazil | 20 | 49 | 9 | 22 |
| Chile | 36 | 5 | 21 | 38 |
| Mexico | 19 | 28 | 18 | 35 |
| Peru | 23 | 0 | 3 | 74 |
| China | 23 | 4 | 7 | 65 |
| India | 24 | 2 | 51 | 24 |
| Indonesia | 30 | 8 | 17 | 45 |
| Malaysia | 33 | - 4 | 7 | 64 |
| Philippines | - 19 | 27 | 38 | 54 |
| South Korea | 68 | 28 | 10 | - 6 |
| Thailand | 84 | 4 | 5 | 7 |

Source: (UNCTAD, 1997)

Charts 1-4 show the balance of payments in South Korea, China, Poland and Brazil from 1990 to 1999.

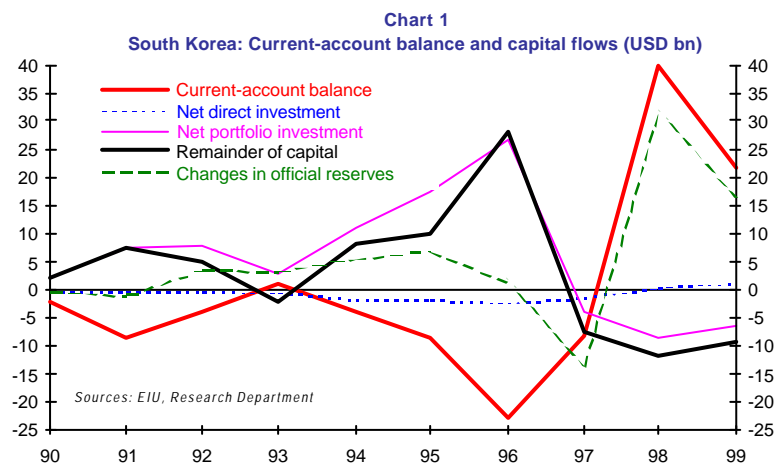


Chart 2
China: Current-account balance and capital flows
(USD bn)

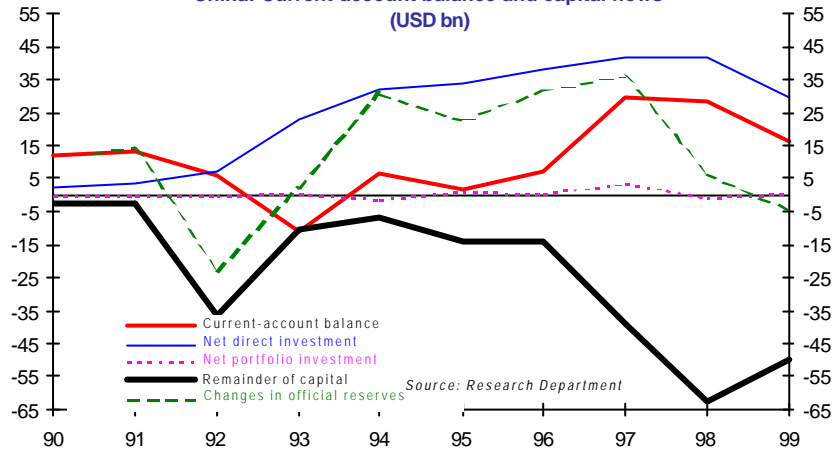
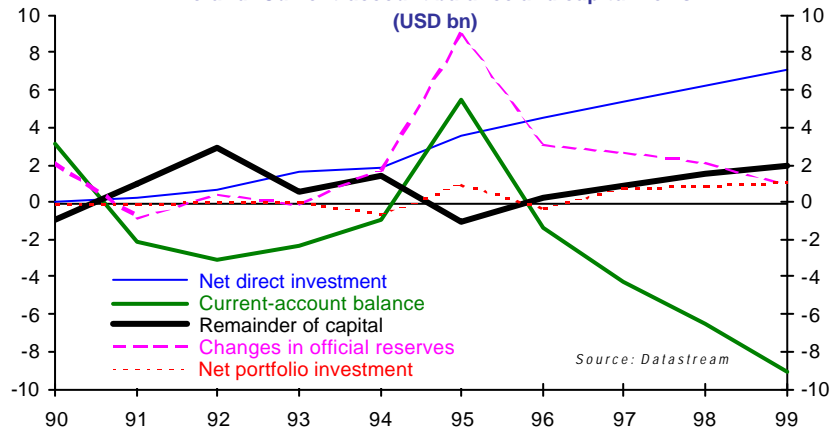
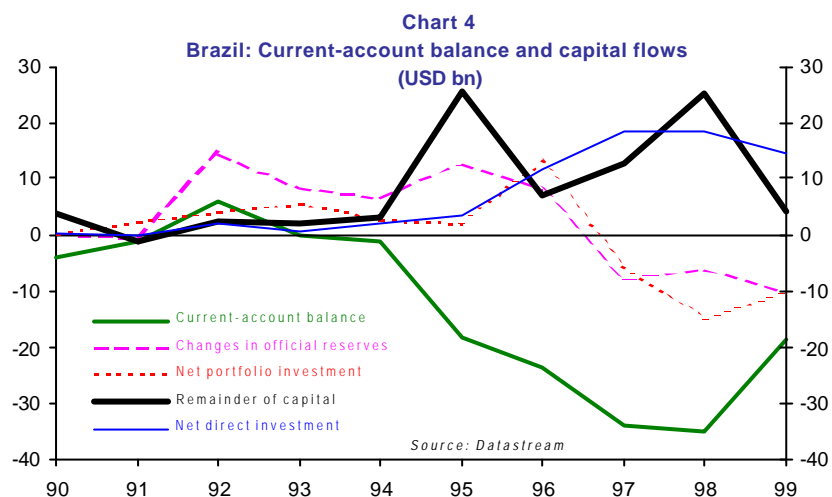


Chart 3
Poland: Current-account balance and capital flows
(USD bn)





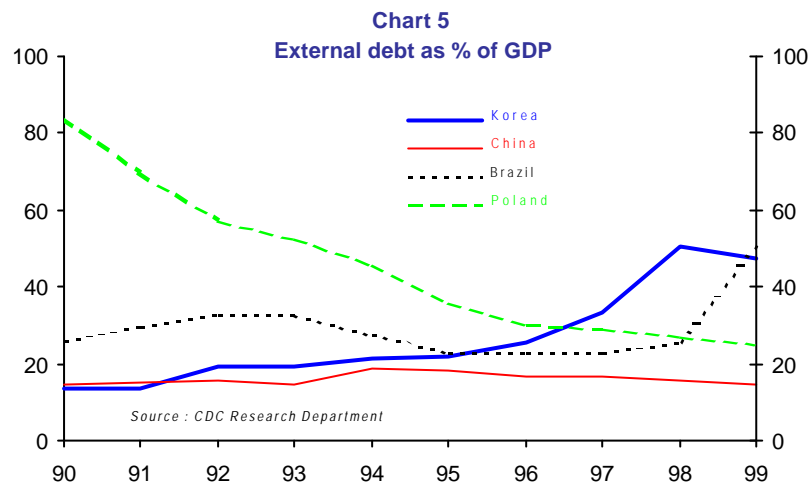
It is clear that South Korea has never received direct investment and that until 1996, the current account deficit was more than financed by portfolio investments, which have since disappeared.

Conversely, due to currency controls in China, there is no portfolio investment, but there has been major direct investment since 1993. Since the current account balance is also positive and currency reserves have not increased since 1998, massive short-term capital outflows have been evident since 1997.

In Poland, the situation is similar to that in China, while in Brazil, we can see simultaneous direct investment and short-term capital inflows (from banks).

Our sample therefore includes two countries - China and Poland – which rely massively on direct investment, one country (South Korea), which only used financial debt, and one country – Brazil – which has an intermediate position.

This is reflected in foreign debt levels (**chart 5**), which are very high in South Korea (50% of GDP), limited at 25% of GDP in Poland and Brazil (until the devaluation of the real, which systematically increased the ratio of debt to GDP), and low in China (15% of GDP).



1 – 2) Over-investment in the absence of direct investment

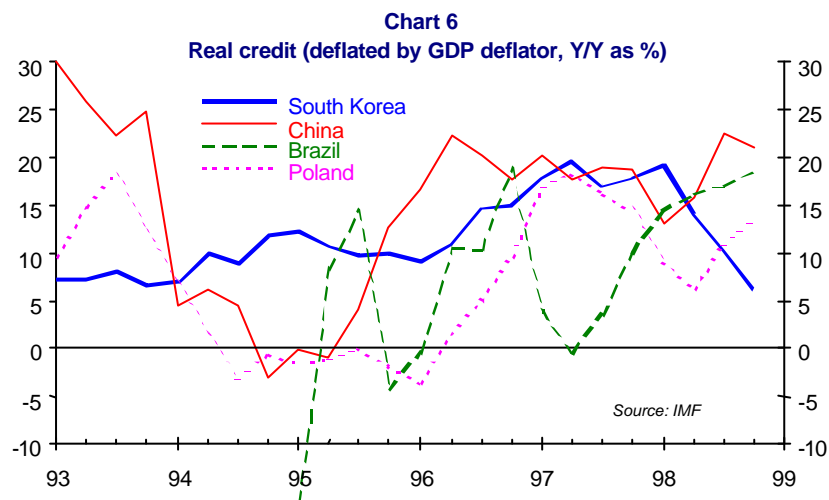
What differences exist between the four countries in terms of savings, investment and the current account deficit?

It is clear that the two countries which use financial debt (South Korea and Brazil) had a high current account deficit between 1994 and the onset of the crisis. This may not be a coincidence. On the contrary, the current accounts of China and Poland have been balanced or in surplus (until 1997).

This gives weight to the theory that financing by debt leads to **over-investment**. At least in South Korea, despite the very high level of national savings, the investment rate is so high that the country currently has a foreign trade deficit and massive surplus capacity.

Another way to consider this is by examining the evolution of interest rates and credit supply. In countries with a high level of financial capital inflows, the liquidity of the banking system increases, and a cut in **domestic interest rates is necessary in order to re-balance the credit market with a sharp increase in credit supply**.

It is clear that credit supply (in real terms) has increased extremely quickly in south Korea since 1994 (chart 6) ; it is however also true for China, since 1996, but in that case it results from the necessity to finance the unsolvent public sector (the SOE's) not from normal market mechanisms.



It is also likely that, the analysis of borrower or project risk is more accurate in countries with foreign direct investment, whatever the increase in credit supply.

Let us examine foreign exchange rates (**charts 7-10**). After the period of hyper-inflation, the Brazilian real was fixed at an over-valued level in real terms; we can see that the real rose by around 10% in real terms between the end of 1995 and the beginning of 1998. The South Korean won rose steadily in real terms between 1993 and 1996 while the Chinese yuan saw a brusque change following the devaluation in 1994, but has generally remained stable in real terms. The zloty has fallen steadily in real terms since 1991.

Chart 7
South Korea: Nominal and real exchange rate
(1992 = 100)

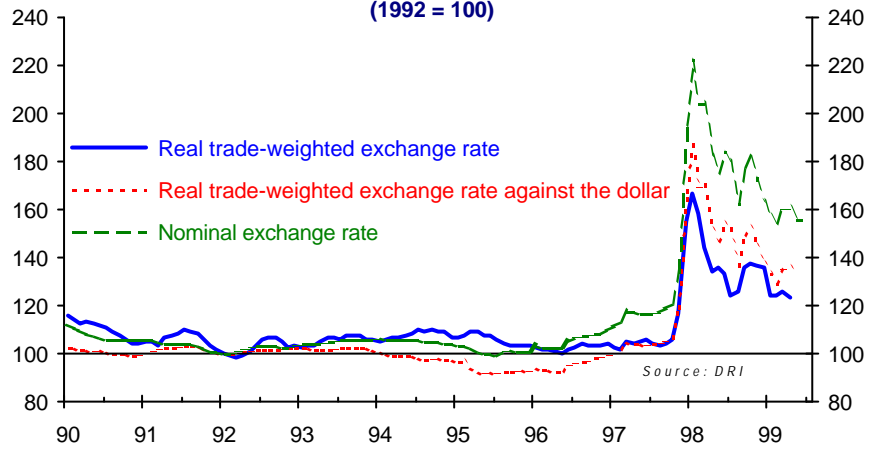


Chart 8
China: Exchange rate (1992 = 100)

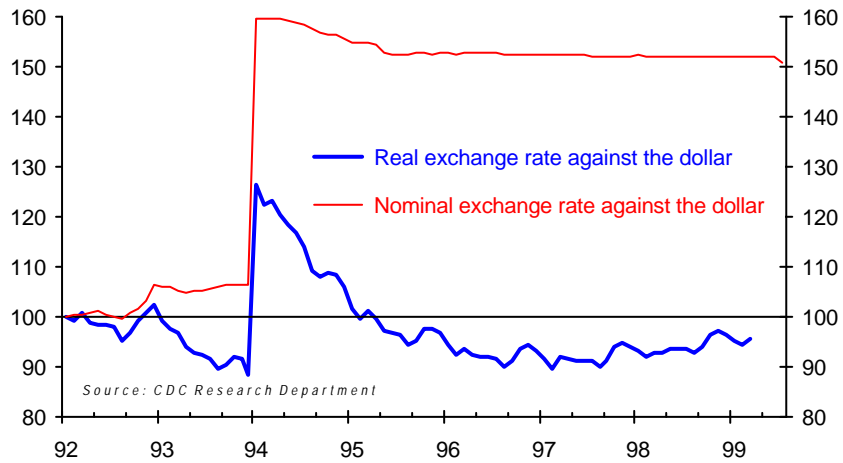


Chart 9
Poland: Exchange rate (1990 = 100)

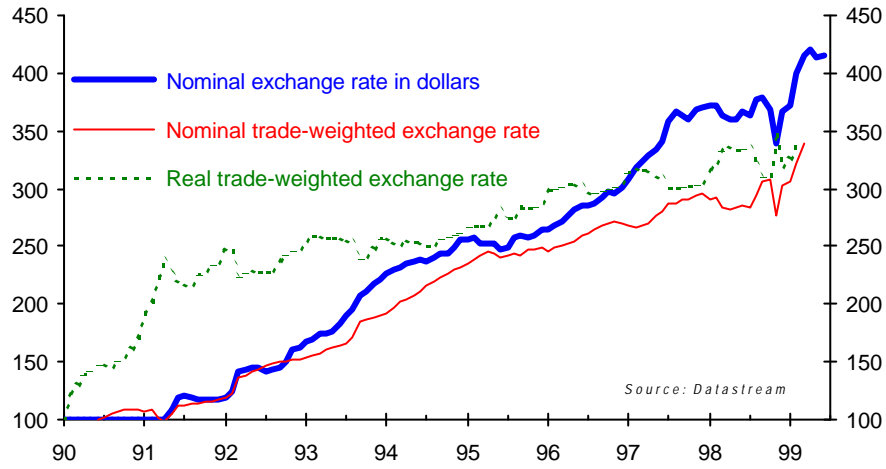
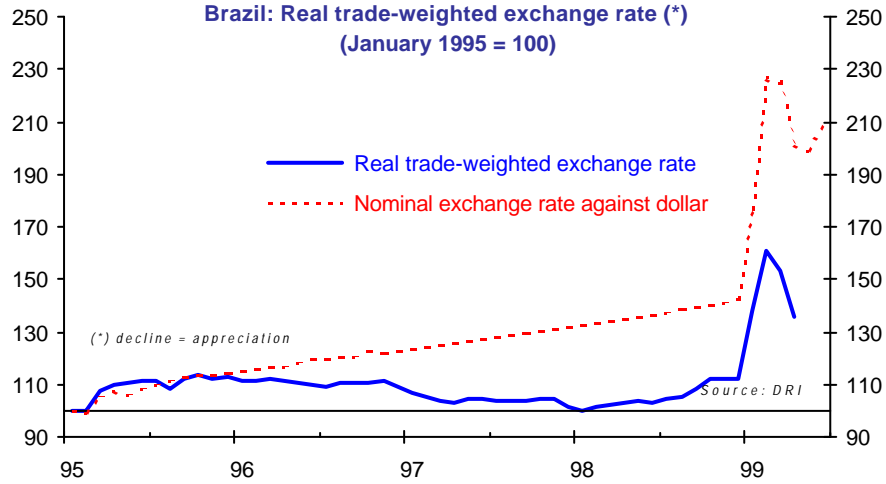


Chart 10
Brazil: Real trade-weighted exchange rate (*)
(January 1995 = 100)



According to these developments, **countries which do not resort to direct foreign investment** (South Korea and to a lesser extent Brazil) **suffered greater pressure from the real term appreciation of their currency than countries which received high levels of foreign direct investment.**

This is to be expected given that financing through debt leads to over-investment: increased domestic demand results in foreign deficit and real currency appreciation, as will be shown by the theoretical analysis.

This confirms the theoretical expectations: either due to insufficient analysis of investment projects in which they are not directly involved, or due to the moral hazard related to the supposed role of public lenders, financial intermediaries lend too much to emerging markets. This results in over-investment, ineffective capital allocation with a foreign trade deficit and real over-valuation in macro-economic terms. **This should lead to increased intermediation of financing in emerging market economies by companies.**

Unfortunately, this lesson has not been learned. As soon as signs of recovery appeared in early 1999, investors returned en masse to the stockmarkets, which simply had the effect of sending indices upwards. At the same time, direct investment remains almost non-existent in South Korea and Brazil: financing is increasingly of a financial nature.

Let us now develop a theoretical model, with several variants, in order to give a theoretical framework to the ideas advanced above, inspired from observing various situations.

Section 3 will give a more systematic empirical analysis.

2 – Theoretical model

Section 2-1 will introduce the model used, without differentiating between direct investment and foreign debt. Section 2-2 will propose several possible differences between these two types of financing:

- Financial lenders (banks) as opposed to companies, receive inadequate information on the return on investment projects from the borrowing country, and we assume that they over-estimate the marginal productivity of capital;
- Due to the risk of default with financing through debt (there is no risk of default with direct investment), debt levels may be limited – this reduces the borrowing

country's productive capital in both the short and long term, but has no significant effect on net revenues (net production of interest payment on foreign debt);

- Direct investment provides the country with more advanced technology than that which it would have developed itself, which we recognise by assuming that the two types of capital (that accumulated by residents or that accumulated from direct investment) have different productivity levels;
- The management of companies controlled by non-resident companies (direct investment) is of better quality than that of companies owned by residents, hence a higher rate of production for an equivalent amount of capital invested.

2 – 1) An equilibrium exchange rate model with no asymmetry between direct investment and debt

a) Description of the model

We shall add direct investment to the usual equilibrium exchange rate model, where the dynamics result from the productive capital of the borrowing country and that of “financial” debt.

The model first shows the **equilibrium of domestic savings**. Savings are the sum of investment and net exports.

$$(1) f(K) = (1-s)(f(K) - rF - \Pi) + I + X(e)$$

or :

$$(1') sf(K) + (1-s)(rF + \Pi) = I + X(e)$$

where s is the savings ratio; $f(K) - rF - \Pi$ represents the net revenues of consumers and $(1-s)(f(K) - rF - \Pi)$ their consumption; $f(K)$ is production (K is capital); rF interest on debt (assuming a situation of perfect capital mobility, where r is the international interest rate; F is foreign debt); Π represents earnings on direct investment in the country repatriated by non-residents; I is total productive investment, X net exports, e the exchange rate (when e rises, the currency falls and foreign trade increases, thus: $X' > 0$). If $rF + \Pi$ (foreign interest payments) increases, consumption falls and the trade surplus increases.

Investment breaks down into domestic investment (I^D) and direct investment from abroad (I^F):

$$(2) I = I^D + I^F$$

Similarly, total capital K breaks down into capital K^D held by residents and capital K^F held by non-residents, with:

(3) $\dot{K}^D = dK^D/dt = I^D - \delta K^D$; $\dot{K}^F = I^F - \delta K^F$, where δ is the rate of capital depreciation.

We assume that investment covers capital depreciation and increases with the excess of marginal productivity on interest rates, both for domestic investment and foreign direct investment:

$$(4) \begin{cases} I^D = \theta(f'(K) - r) + \delta K^D \\ I^F = \theta(f'(K) - r) + \alpha(\lambda K^D - K^F) + \delta K^F \end{cases}$$

$f'(K) = f'(K^D + K^F)$ is the marginal productivity of the total capital. In order to determine K^D and K^F separately in the long term, we include the second term in determining direct investment I^F ; this means that non-residents have a target, λ , for the structure of total capital between that which they hold and that held by residents.

The dynamic of both types of capital (K^D, K^F) is unambiguously stable.

The dynamics of foreign debt is:

$$(5) \dot{F} = \frac{dF}{dt} = rF + \Pi - X(e) - I^F$$

: debt increases with interest payments and repatriation of profits, and decreases with the trade balance and direct investment received I^F .

The savings ratio remains to be determined: as in the usual equilibrium exchange rate model, we assume that the savings ratio falls with the country's net wealth, i.e.:

$$(6) s = s(K^D - F) \quad (s' > 0)$$

where net wealth is the difference between capital held by residents and foreign debt.

b) Short-term equilibrium and dynamic stability

The dynamic of foreign debt is rewritten (see (1')) as:

$$(7) \dot{F} = (rF + \Pi) - sf(K) - (1-s)(rF + \Pi) + I^D = s(rF + \Pi) - sf(K) + I^D$$

where $s = s(K^D - F)$

Foreign debt decreases with net exports ($X = sf(K) + (1-s)(rF + \Pi) - I$), increases with direct transfers abroad ($rF + \Pi$), and decreases with direct investments I^F (which explains that only I^D appears on the right of (7)).

(7) shows that:

$$(8) \frac{\partial \dot{F}}{\partial F} = s'(f(K) - rF - \Pi) + sr$$

Dynamic stability implies that $\frac{\partial \dot{F}}{\partial F} < 0$, thus that the savings ratio reacts sufficiently to the evolution of wealth (that (s') is sufficiently large, $s' < 0$). When debt increases, wealth decreases, the savings ratio increases, all of which have a stabilising effect; the accumulation of interest has the opposite effect.

Short-term equilibrium, for the given values F , K^D and K^F , is:

$$(9) s(K^D - F)f(K) + (1-s)(rF + \Pi) = I^D + I^F + X(e)$$

(where $K = K^D + K^F$) which determines the exchange rate e . A rise in demand (for I^D, I^F), or an exogenous fall in the savings ratio s require an appreciation in the currency (fall in e), which increases the foreign deficit.

(9) can be rewritten as:

$$(9') sf(K) + (1-s)(rF + \Pi) = I^D + I^F + X(e)$$

where $s = s(K - (F + K^F))$

which demonstrates that if Π (repatriation of profits) $\approx rK^F$, the short-term equilibrium is identical to the equilibrium without direct investment, where only total foreign debt ($F + K^F$, financial debt plus capital held by non-residents) matters.

1-c Long-term equilibrium

In the long-term, $\dot{K}^D = \dot{K}^F = \dot{F} = 0$, or $I^D = \delta K^D, I^F = \delta K^F$; hence:

$$(10) \begin{cases} f'(K^D + K^F) = r \\ K^F = \lambda K^D \end{cases}$$

The marginal productivity of capital is equal to the interest rate and capital K^F held by non-residents represents the desired portion λ of capital K^D held by residents.

The transfer of profits Π on capital K^F remains to be determined. We assume simply that:

(11) $\Pi = f'(K) \cdot K^F$, hence in the long term $\Pi = rK^F$. The stability of debt requires that net exports X plus long-term direct investment flows δK^F equal interest payments $(r(F + K^F))$:

$$(12) 0 = rF + rK^F - X(e) - \delta K^F$$

The savings equilibrium is:

$$(13) s(K^D - F)f(K^D + K^F) + (1 - s(K^D - F))(rF + rK^F) = \delta K^F + \delta K^D + X(e)$$

In the long-term, investment is reduced to offsetting the erosion of capital.

(12) can be written:

$$(12') F = -K^F + \frac{X(e)}{r} + \frac{\delta K^F}{r}$$

hence, for (13):

$$(13') s \left(K^D + K^F - \frac{X(e)}{r} - \frac{\delta K^F}{r} \right) f(K^D + K^F) \\ + \left(1 - s \left(K^D + K^F - \frac{X(e)}{r} - \frac{\delta K^F}{r} \right) \right) (X(e) + \delta K^F) \\ = \delta (K^F + K^D) + X(e)$$

which determines the equilibrium exchange rate. It is interesting to note that: if there was no capital erosion ($\delta = 0$), (13') would only involve total capital $K^D + K^F$, and (12') total foreign debt (in direct investment and financial flows), $F + K^F$.

The only difference in this situation comes from the fact that in the long-term, non-resident investors must continue to invest in the country in order to offset the capital erosion K^F ; nevertheless, notwithstanding this factor, this model makes no distinction between direct investment and purely financial foreign debt.

Assuming **an exogenous increase in the marginal productivity of capital** ($f'(K)$ becomes $f'(K+x)$); in the long-term, total capital increases (we have ($f'(K) = r - x$) instead of $f'(K) = r$), and K^F varies as $\frac{\lambda}{1+\lambda} (K^F + K^D)$.

Differentiating (13'), we have:

$$(14) \left(-\frac{s'}{r} (f(K) - rF - rK^F) - s \right) X'(e) de \\ = \left[-s' \left(1 - \frac{\delta}{r} \frac{\lambda}{1+\lambda} \right) (f(K) - rF - fK^F) + \delta - (1-s)\delta \frac{\lambda}{1+\lambda} \right] dK$$

where $-s'(f(K) - rF - rK^F) - sr > 0$, given the condition of dynamic stability. Clearly, in the long term, additional capital leads to a depreciation of the currency (de > 0) - (12') then demonstrates that $F + K^F$ (total foreign debt) is increased.

The dynamics is as follows: if the productivity of capital is increased, there is a short-term increase in investment hence, as shown above, an appreciation in the currency and a fall in foreign trade. There is also an accumulation of foreign debt, which progressively offsets the effect on wealth of the increase in capital. In the long term, since the wealth effect prevails, there is inevitably an increase in foreign debt, thus in interest payments, hence the trade surplus (with a fall in the currency) to settle the current account balance.

1-d Autarky and welfare

Let us now consider the situation of a country with financial autarky ($K^F = F = 0$).

At all times, domestic savings must be at such levels to prevent an accumulation of debt. If initially, $\dot{F} > 0$ and $I^F > 0$, this means that domestic investment I^D must be below the desired level (defined by (4)).

Domestic investment is therefore given by:

$$(15) 0 = -s(K^D) f(K^D) + I^D$$

since, at all times, $K^F = F = \Pi = 0$

In the long term, capital is given by:

$$(16) s(K^D) f(K^D) = \delta K^D$$

: savings cover capital erosion.

We represent **long term welfare** by net revenues. Here, welfare is:

$R_1 = f(K_1^D)$; while in the previous example, it was:

$$R_2 = f(K^D + K^F) - rF - rK^K = f(K^D + K^F) - X(e) - \delta K^F \quad (\text{where } f'(K^D + K^F) = r)$$

K_1^D is the capital stock under autarky.

To compare R_1 and R_2 .

We have:

$$(17) R_1 - R_2 \cong r(K_1^D - K^D + F) \quad (\text{since } f'(K^D + K^F) = r)$$

where K_1^D is capital K^D (domestic) under autarky,

and

$$(18) \begin{cases} s(K^D - F)(f(K^D + K^F) - rF - rK^F) = \delta K^D \\ s(K_1^D) f(K_1^D) = \delta K_1^D \end{cases}$$

(18) implies that:

$$(18') (K_1^D - K^D + F)(fs' + rs) = \delta (K_1^D - K^D)$$

where $fs' + rs < 0$.

$$\text{with } K^D = \frac{1}{1+\lambda} (K^D + K^F) \text{ and } K_1^D < K^D + K^F$$

(18') demonstrates that:

- if there is no capital erosion ($\delta = 0$), then $K_1^D - K^D + F \cong 0$, therefore $R_1 - R_2 \cong 0$: long-term revenues are the same with autarky and with debt.

- if there is capital erosion ($\delta > 0$), if $K^D > K_1^D$ (domestic capital is larger with debt, which requires that λ is small, and the portion of total capital held by non-residents is low), then $K_1^D > K^D - F$: autarky is preferable since replacing capital consumes a smaller portion of savings than in the case of debt. If there is a high level of direct investment, λ is large, and debt is preferable to an autarkic situation.

1-e Absence of foreign debt

If there is no foreign debt ($F = 0$), just direct investment ($I^F > 0$), then the long-term equilibrium is (if $\delta = 0$) exactly the same as with foreign debt, since only $K^D + F$ counts. In the short term, if $\dot{F} > 0$, domestic investment is rationed by the fact that there is no possibility of debt, and the **time needed for convergence with the long term scenario is shorter**.

The short-term equilibrium with $F = 0$, is:

$$(19) \begin{cases} 0 = f'(K)K^F - X(e) - I^F \\ s(K)f(K) + (1-s)f'(K)K^F = I^D + I^F + X(e) \end{cases}$$

or:

$$(19') \quad I^D = s(K)f(K)$$

which determines resident investment.

The real exchange rate is given by the first equation (19), and thus in this case does not depend on domestic demand, since this must be at such levels not to require financial debt. **In this case, in the short term, the exchange rate only depends on direct investment I^F .**

2-2) *Distinguishing between direct investment and financial debt*

In order to avoid direct investment being almost equivalent to financial debt as seen above, it is necessary to distinguish between the effects or the motivation behind these two types of finance.

We will use three theories:

- financial lenders have far less detailed information on the return on capital than companies which carry out direct investments. Companies evidently have direct access to information on the profitability of the capital employed - information which does not pass via banking intermediaries and which does not include borrower bias ...
- financing through debt carries the risk of borrower default, which may lead to a rationing of loans. On the contrary, with direct investment, the lender is the direct owner of the capital, and it would require an extreme event such as nationalisation to cause default,
- financing through direct investment provides the country benefiting from the investment with advanced technology.

a – Different information on the return on capital

We will complete the model in three ways, assuming that there is no direct investment by foreign companies;

- non-resident lenders are banks, which lend to domestic banks. These non-resident lenders use the following method for granting their loans:

$$(20) \dot{F}^0 = \eta(\rho - (r^* + h))$$

r^* is the international interest rate (in the country of the borrower); h is a risk premium (a spread) required by the lender; ρ is the marginal productivity of capital in the borrowing country, as perceived by the lender.

In terms of our analysis, (20) has the following significance: lending banks offer credit to banks in the borrowing countries while the marginal return on an increase in capital in these countries exceeds the loans rate which equals the international interest rate r^* plus a margin h ; this represents the following behaviour: while loans are assumed to generate a revenue (at rate of return ρ), above that at which the loans are made ($r^* + h$), there is no danger in continuing the loan,

- in the borrowing country, the production function is $g(K)$, where K is capital, as before; we have:

(21) $g'(K) = f'(K) - \varepsilon$: the marginal productivity of the capital is lower than that expected.

We can represent the asymmetrical nature of the information as follows: **lenders** (non-resident banks) believe that the marginal productivity of capital is $f'(K)$.

Consequently, ρ in (20) (the assumed marginal productivity of capital), is equalised with $f'(K)$, while the effective marginal productivity of capital is $f'(K) - \varepsilon$

- the banks of the borrowing country lend to domestic investors at **rate** r . Domestic banks receive a loan request from investors, equal to:

$$(22) I - s(g(K) - rD) = \dot{D}$$

where $s = s(K - D)$ for determining the savings ratio: economic agents within the country have revenues of $g(K) - rD$ (interest paid to banks at rate r), with D being the outstanding debt vis-à-vis these banks. Their capital requirement is $I - g(K) + rD + (1-s)(g(K) - rD)$

Investment I is given in the same way as in (4) by:

(23) $I = \theta(g'(K) - r) + \delta K = \dot{K} + \delta K$ (as before, δK represents capital erosion).

The equilibrium of the lending markets is as follows: domestic banks are faced with demand for loans D (\dot{D} in demand for new loans); they acquire finance \dot{F}^0 from foreign banks; they receive interest payments rD on the loans they have granted, and pay interest $(r^* + h)F$ on their loans from the foreign bank. At all times, the domestic loan interest rate r , is determined by the equilibrium of the banks accounts, i.e.

$$(24) \delta K + \theta(g'(K) - r) - s(g(K) - rD) + (r^* + h)F \\ = \eta(f'(K) - (r^* + h)) + rD$$

(24) has the characteristics we were seeking; the fact that the marginal productivity of capital is over-estimated by foreign lenders ($f'(K) = g'(K) + \varepsilon$) leads to an additional offer of loans, and therefore to a fall in the equilibrium domestic interest rate r .

The main results are the following

- an ineffective allocation of savings appears since foreign lenders supplied: credit with $f'(K) \geq r^* + h$, while the true marginal productivity is $f'(K) - \varepsilon$ and may fall below $r^* + h$.
- the borrowing country's banks undoubtedly have a **solvency problem**. The domestic equilibrium interest rate r falls and the income of banks falls. In the long term, the dynamic capital is stable and $g'(K)$ and r are equalised; the dynamic of domestic debt D is stable since the savings rate reacts to the evolution of D , but there is a continuous accumulation of foreign debt by the banks of the borrower country since no stabilizing mechanism is attached to the increase in the level of foreign debt.

b – Risk of default

Let us assume that foreign financing is solely through loans (without direct investment).

We have already analysed the autarkic situation (in 2-1). If the capital erosion rate is zero ($\delta = 0$), as assumed here, **in the long term**, net revenues from interest payment on foreign debt are the same under autarky and with foreign debt.

In the short term, investment with foreign debt is given by:

$$(25) I = s(K - F)(f(K) - rF) + \dot{F}$$

or under autarky by:

$$(25') I = s(K)f(K)$$

The accumulation of debt enables a higher rate of investment to be maintained. Let us assume that in $t = t_0$, where accumulated capital is K_{t_0} and accumulated foreign debt is F_{t_0} , the borrowing country decides to default on its debt. We shall also assume that the cost of default has two components:

- no loans will be granted in the future ($\dot{F} = F = 0$ after $t = t_0$)
- a permanent cost in terms of production (loss of credibility, loss of markets, less technology input) equal to H .

In the long term, default is never advantageous, since net revenues under autarky are the same as with debt, and the cost of default must be paid.

In the short term, net revenues after default are given by:

$$(26) Y = f(K) - H$$

and the variation in net revenues is $\dot{Y} = f'.I$.

To avoid a default in the short run, lenders impose a maximum debt level, implying that $F \leq H / r$ at all times. This reduces, in the long run, the country's productive capital, but increases net revenues $(f(K) - rF)$; this increase is slight, since it results from the fact that capital amortisation (δK) is low since the capital itself is reduced.

c- Advanced technology provided by foreign direct investment

We will use the model from section 2-1, and assume that capital accumulated from direct investment K^F provides a higher level of production than that provided by capital financed by residents K^D . For production, let:

(27) $Y = f(K^D) + Af(K^F)$ with $A > 1$. The two stocks of capital can no longer be substituted for each other, since they correspond to different types of technology. Investment – unlike in (4) – is given by:

$$(28) \begin{cases} I^F = \theta(Af'(K^F) - r) + \delta K^F \\ I^D = \theta(f'(K^D) - r) + \delta K^D \end{cases}$$

The dynamic of foreign debt and the savings ratio are still given by (5) and (6).

In the long-term, we have:

$$(29) Af'(K^F) = r; f'(K^D) = r; F = -K^F \frac{X(e)}{r} + \frac{\delta K^F}{r}$$

and for the savings equilibrium:

$$(30) s(K^D - F)[f(K^D) + Af(K^F)] + (1 - s(K^D - F)) \cdot (rF + rK^F) = \delta K^F + \delta K^D + X(e)$$

Let us consider the effects of a rise in A , which represents the **technological advantage related to direct investment**.

We have:

$$(31) dF \left[-s'(f(K^D) + Af(K^F) - sF - rK^F) - rs \right] = -\frac{dA}{A} (Af(K^F)) < 0$$

The coefficient of dF is positive due to the dynamic stability. There is undoubtedly a fall in long-term foreign debt when A increases.

(32) is rewritten:

$$(32') s(K^D - F)(f(K^D) + Af(K^F) - rF - rK^F) = \delta K^D$$

with $Af'(K^F) = r$

A rise in A increases K^F and production $f(K^D) + Af(K^F)$, and thus increases savings ex ante; a drop in the savings ratio is therefore necessary, i.e. a rise in wealth, resulting from a fall in foreign debt.

The dynamic is as follows: if A increases, there is additional direct investment, which does not alter financial debt F , hence additional production, which in the short-term improves the trade balance and progressively reduces debt.

Since $X(e) = rF + (r - \delta)K^F$, F falls and K^F increases, **the effect on long term exchange rates when A increases is unclear.**

On the contrary, **net revenues clearly increase**, since the change $f(K^F)dA - rdF$ (the term $Af'(K^F)dK^F - rdK^F$ is zero in the long term) is positive ($dA > 0, dF < 0$).

d – Improved management of companies controlled by non-residents

Unlike in the previous section, let us assume here that the two stocks of capital can be substituted for one another, but that since companies controlled by non-residents are better managed, they have a higher rate of production. Therefore, (27) is replaced by:

$$(27') Y = f(K^D + AK^F) \text{ with } A > 1$$

and (28) is replaced by:

$$(28') \begin{cases} I^D = \theta(f'(K^D + AK^F) - r) + \delta K^D \\ I^F = \theta(Af'(K^D + AK^F) - r) - \alpha(\lambda K^D - K^F) + \delta K^F \end{cases}$$

A rise of dK^D in domestic investment increases production by $f' dK^D$; while a dK^F rise in non-resident investment increases production by Af' .

We will reintroduce the term α for the structure of the possession of capital, or (28') would have no stationary solutions³.

In the long term, the equilibrium of savings is:

$$(29) s(K^D - F)(f(K^D + AK^F) - rF - rK^F) = \delta K^D$$

where:

$$(29') \begin{cases} f'(K^D + AK^F) = r \\ K^F = \lambda K^D + \frac{\Theta(A-1)r}{\alpha} \end{cases}$$

Since $f'(K^D + AK^F) = r$, $K^D + AK^F$ does not vary as A varies. (29') implies:

$$(30) \begin{cases} dK^D \left(A + \frac{1}{\lambda} \right) = -dA \left(\frac{A\Theta r}{\alpha\lambda} + \frac{K^F}{\lambda} \right) \\ dK^F \left(A + \frac{1}{\lambda} \right) = dA \left(\frac{\Theta r}{\alpha\lambda} - K^F \right) \end{cases}$$

and (29):

$$(31) dF \left(-s'(Y - rF - rK^F) - sr \right) = -s'(Y - rF - rK^F) dK^D + \delta dK^D + sr dK^F$$

where $-s'(Y - rF - rK^F) > sr$

³ Capital stability implies that $I^D - \delta K^D = 0$ and $I^F - \delta K^F = 0$

which clearly shows that if δ is not too large, $dF < 0$

A rise in A does not alter production Y , since the marginal productivity of capital must remain equal to r . Since $K^D + AK^F$ is invariable and A increases and K^D decreases, the effect on K^F is ambiguous. A fall in K^D reduces wealth, which is offset by a fall in foreign debt. The dynamic is as follows: a rise in A initially leads to $f' < r$, hence $I^D < 0$ **disinvestment by residents**; this improves the trade balance and reduces debt.

Net revenues $f(K^D + AK^F) - rF - rK^F$ are increased by the fall in foreign debt, rather than by a change in production.

Since $X(e) = rF + (r - \delta)K^F$, the decrease in foreign debt leads to a long term appreciation of the currency.

Conclusion: what role should foreign direct investment play?

What should be expected – in theory - from financing growth essentially using foreign direct investment (FDI)? FDI is distinct from traditional foreign debt by the fact that lenders have incomplete information on the return of the projects they finance either directly or indirectly, while this is not the case for companies. Financing by FDI avoids the inefficient allocation of savings which results from the financing of unprofitable projects, and more particularly - according to our model - a continuous accumulation of foreign debt by the country's banks and a steady fall in the income of these banks.

If the difference between the two methods of finance resides in the fact that there is no default risk with FDI, financing by FDI increases the rate of productive capital accumulation in the long term and also increases the level of long-term capital.

If FDI transfers advanced technology to the borrowing country, the country will benefit from increased production and net revenues in the short and long term, as well as benefiting from a steady reduction in its foreign debt. If, on the other hand, FDI improves the management of companies controlled by foreign companies, the effect is not beneficial to the borrowing country, since it leads to disinvestment by residents in line with the increase of FDI resulting from the high level of productivity of capital controlled by non-residents.

Our models also show that **financing by FDI avoids over-valuation of the real exchange rate in the short term**

If financing by debt leads to excessive growth in credit supply, the domestic equilibrium interest rate falls, investment increases artificially and there is a trade balance deficit and a real currency appreciation. If FDI has capital with higher productivity, there is an increase in the supply of goods and in the short term, a trade account surplus and real depreciation of the currency.

In all cases, FDI prevents foreign debt levels from becoming excessively high, and thus prevents them from exceeding the threshold above which lenders become too sensitive to default risk, withdraw their loans and trigger a currency crisis. **The absence of real currency appreciation in the capital accumulation process with FDI is a major factor which stabilises exchange rate regimes.**

3 – Empirical analysis

The above suggests that financing a current account deficit by FDI instead of financial flows:

- avoids real over-valuation of the exchange rate
- reduces long-term foreign debt
- increases long-term capital and growth
- avoids excessive growth in credit and over-accumulation of capital.

We shall examine these ideas, among others, by considering developments in the 1990s, prior to the Asian crisis, in eighteen emerging market economies. We will consider – visually and econometrically - the link between a certain number of variables as well as FDI or financial flows.

All these observations are taken from the Datastream database. The sample covers 18 countries:

- 6 in Latin America: Argentina (AG), Chile (CL), Mexico (MX), Brazil (BR), Colombia (CB), Venezuela (VE),
- 7 in Asia: South Korea (CO), Thailand (TH), Malaysia (MA), Indonesia (ID), China (CH), India (IN), Pakistan (PK),

- 3 in Africa: Egypt (EG), Morocco (MC), South Africa (AS),
- 2 in Central Europe: Poland (PO) and Hungary (HN).

All the “observations” on the sample are in fact average figures calculated over the 1992-96 period inclusive, country by country. The effects of the crisis have been removed due to the resulting deformations on the following variables:

- **the FDI/GDP variable** represents net FDI flows. The average was calculated using the difference between inflows and outflows, as a ratio of GDP for each country,
- **CB/GDP** reflects the current account balance as a ratio of GDP over this period,
- **Exp** is the annual growth rate in goods and services exports in volume terms,
- **Imp** the rate of growth in imports in volume terms,
- **INV/GDP** is domestic investment as a ratio of GDP for each country,
- **M2/GDP** is the rate of growth in the money supply / GDP,
- **For Debt/GDP** is foreign debt in relation to GDP for each country,
- **ORV/GDP** is “official reserve variations” in relation to GDP. Variations in currency reserves correspond to the difference in amount from one year to the next as a ratio of GDP,
- **GDP** is real growth in GDP in volume terms,
- **RExR** is the growth in the real exchange rate, calculated as follows:
$$\text{RExR} = \text{ExR}/\$ \text{ (price of US GDP / price of GDP of the country in question),}$$
- **FiInv/GDP** is the average of short-term financing (including portfolios) in relation to GDP.

What conclusions can be drawn from these observations?

Contrary to our expectations, financial capital inflows do not appear to cause an appreciation in the real exchange rate more than FDI, as the link between these variables is low (**charts 1 and 2**).

Chart 1 (Real exchange rate)
FDI/GDP - RExR (92-96)

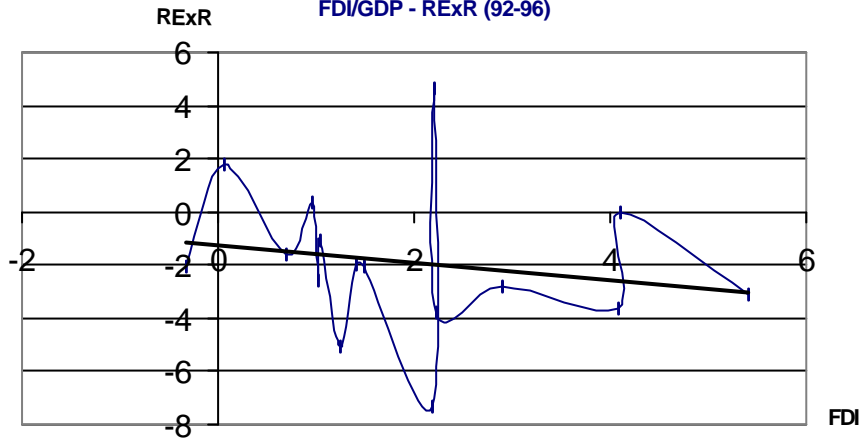
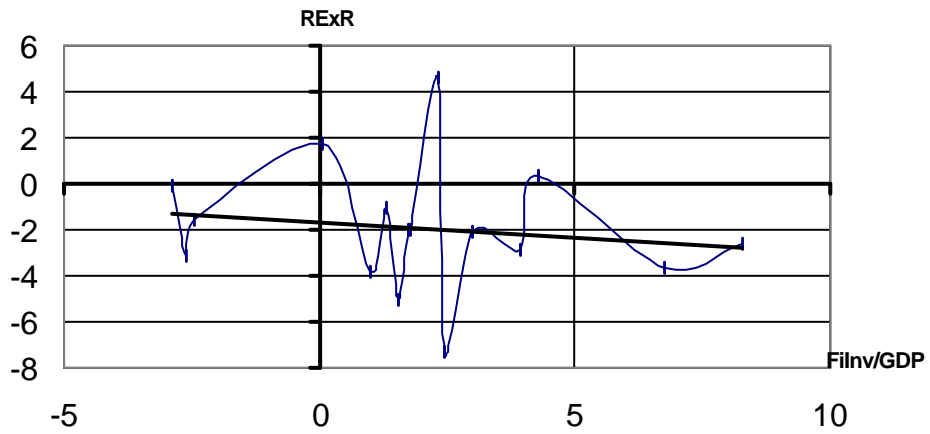


Chart 2 (real exchange rate)
Filnv/GDP - RExR (92-96)



The correlation between the external method of financing and growth in exports is not clear (**charts 2 and 3**), with no significant link being found (**charts 3 and 4**).

Chart 3 (exports)
FDI/GDP - Exp (92-96)

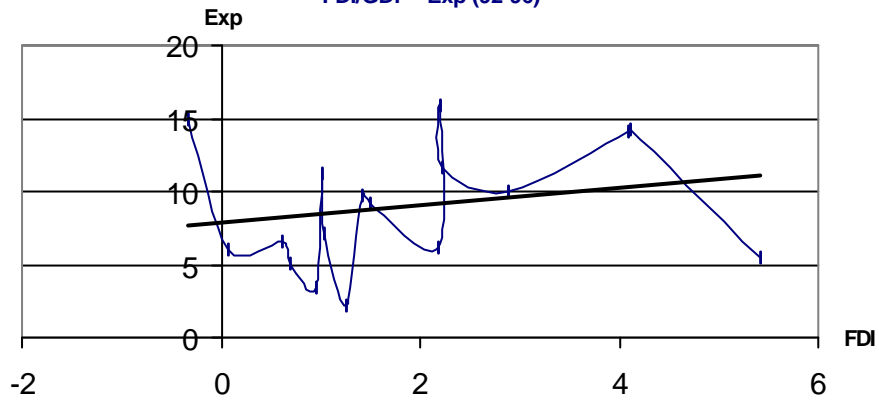
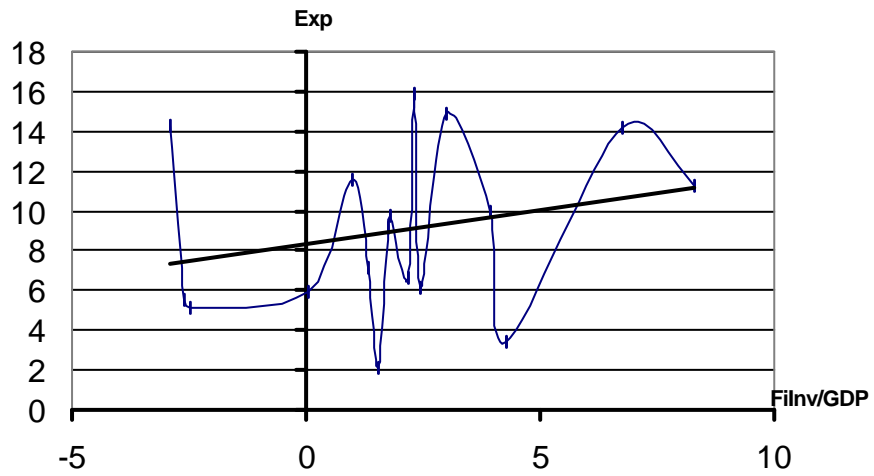


Chart 4 (exports)
Filnv/GDP - Exp (92-96)



A slightly positive correlation appears between growth in imports and flows of financial capital (**chart 5**), which is not the case for FDI (**chart 6**). However, this does not apply to foreign debt (**charts 7 and 8**) nor to the ratio of money supply to GDP (**charts 9 and 10**).

Chart 5 (imports)
Filnv/GDP - IMP (92-96)

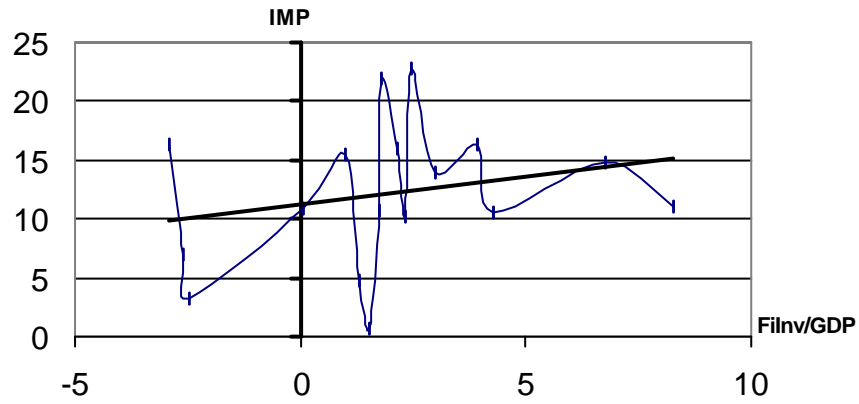


Chart 6 (imports)
FDI/GDP - IMP (92-96)

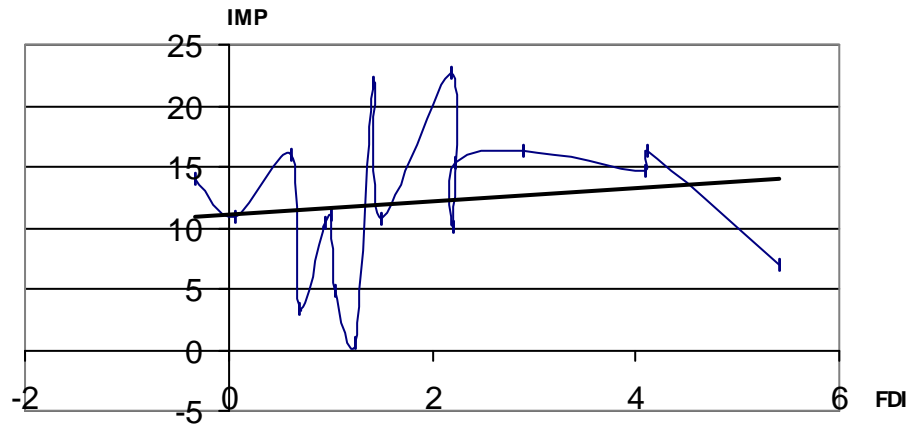


Chart 7 (foreign debt)
Filnv/GDP - ForDebt / GDP (92-96)

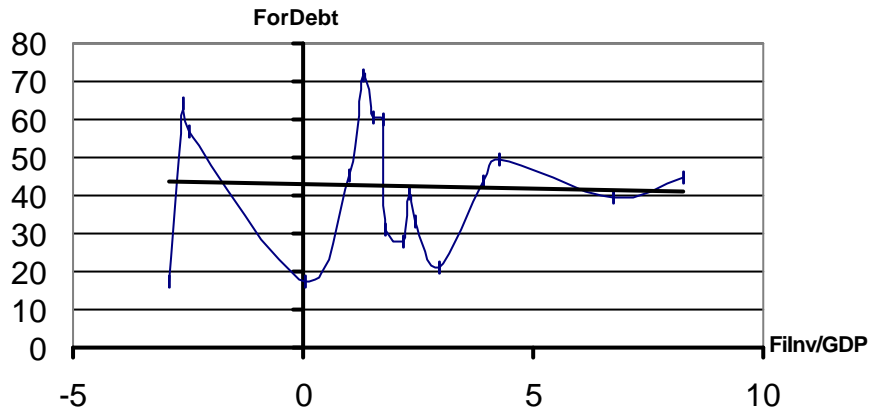


Chart 8 (foreign debt)
FDI/GDP - ForDebt/GDP (92-96)

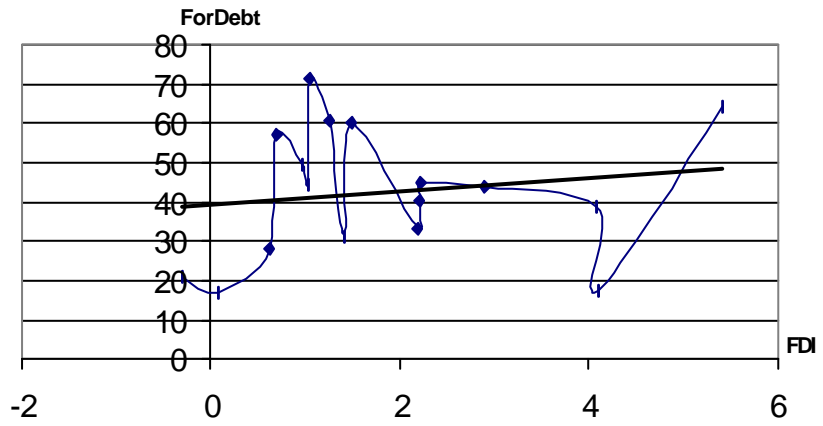


Chart 9 (money supply/GDP)
FDI/GDP - M2/GDP (92-96)

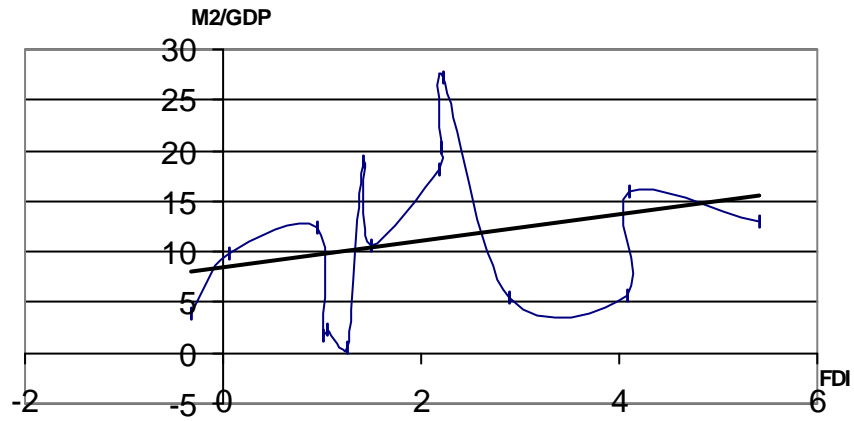
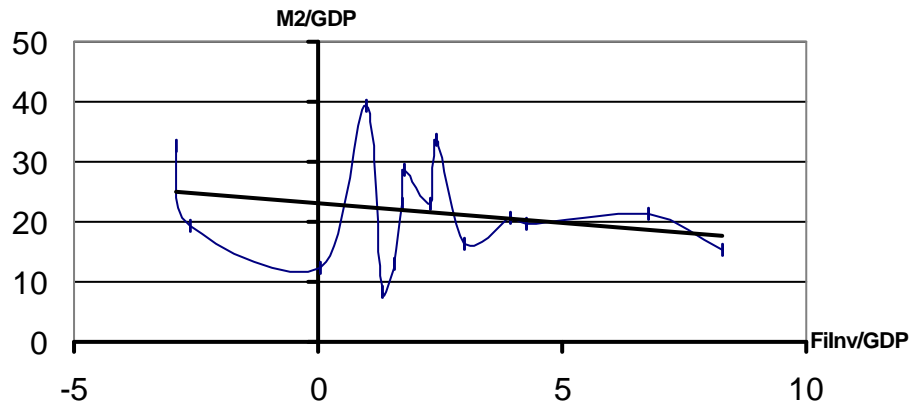


Chart 10 (money supply/GDP)
Filnv/GDP - M2/GDP (92-96)



The **table** below summarises econometrically significant results.

Econometrically significant relationships

| | | | | | | |
|----------------------------|---|-----------------------|-------|-----------------------|---------|----------|
| Growth | } | GDP = | 0.77 | FiInv/GDP | + 2.82 | (excl. |
| | | | (4.9) | | (5.1) | China) |
| | | R ² = 0.63 | | | | |
| | | GDP = | 1.50 | FDI/GDP | + 2.84 | (excl. |
| | | | (2.9) | | (2.7) | Hungary) |
| | | | | R ² = 0.38 | | |
| Investment | } | INV/GDP = | 1.31 | FiInv/GDP | + 21.71 | |
| | | | (2.0) | | (9.5) | |
| | | | | R ² = 0.21 | | |
| Current account balance | } | CB/GDP = | -0.53 | FiInv/GDP | -1.32 | |
| | | | | (2.9) | (2.1) | |
| | | | | R ² = 0.36 | | |
| | | CB/GDP = | -0.68 | FDI/GDP | -1.09 | |
| | | | | (1.7) | (1.1) | |
| | | | | R ² = 0.16 | | |
| Currency reserve variation | } | CRV/GDP = | 0.18 | FiInv/GDP | +1.43 | |
| | | | | (1.6) | (3.2) | |
| | | | | R ² = 0.12 | | |
| | | CRV/GDP = | 0.48 | FDI/GDP | + 0.87 | |
| | | | | (2.1) | (1.6) | |
| | | | | R ² = 0.22 | | |

- **FDI and financial investment cover the current account deficit:** the larger the deficit, the larger FDI and financial investment (**charts 11 and 12**).

Chart 11 (current account balance)
FDI/GDP - CB/GDP (92-96)

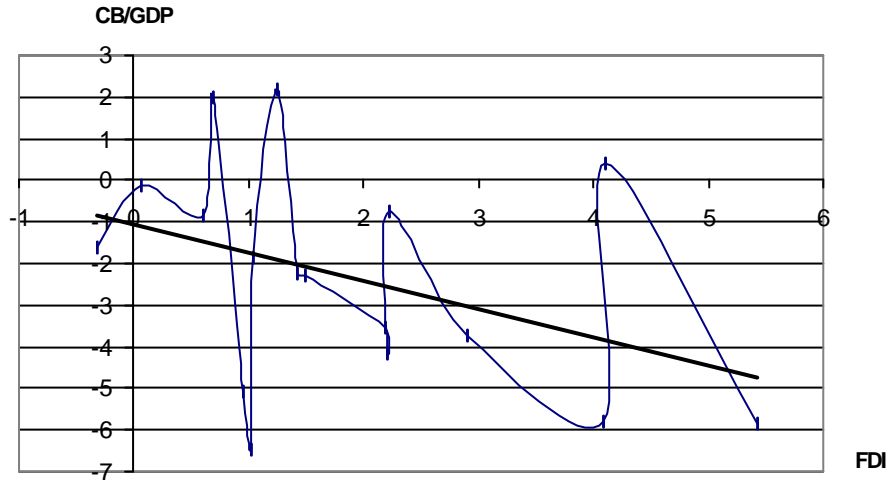
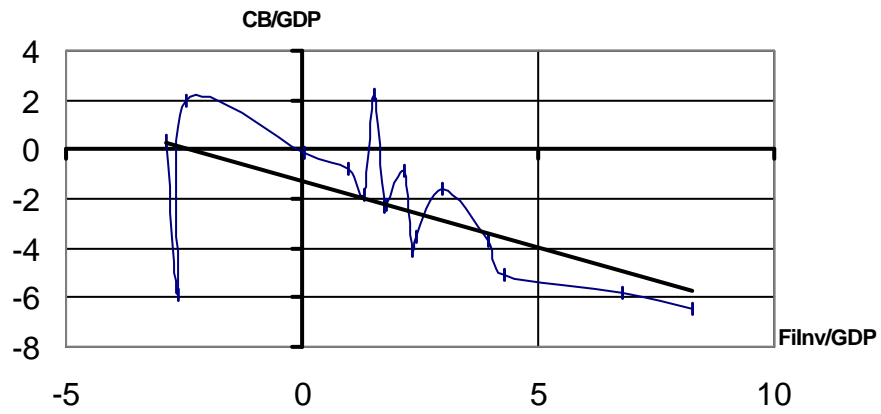


Chart 12 (current account balance)
Filnv/GDP - CB/GDP (92-96)



With the exception of China, high inflows of financial investment increase the rate of investment in the country (**charts 13 and 14**), which is not the case for FDI. **The hypothesis of over-accumulation of capital in the event of financing through financial flows is therefore not ruled out.**

Chart 13 (investment)
FDI/GDP - Inv/GDP (92-96)

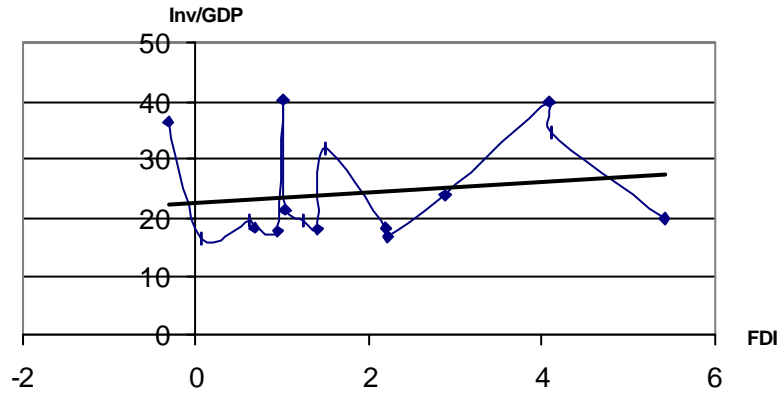
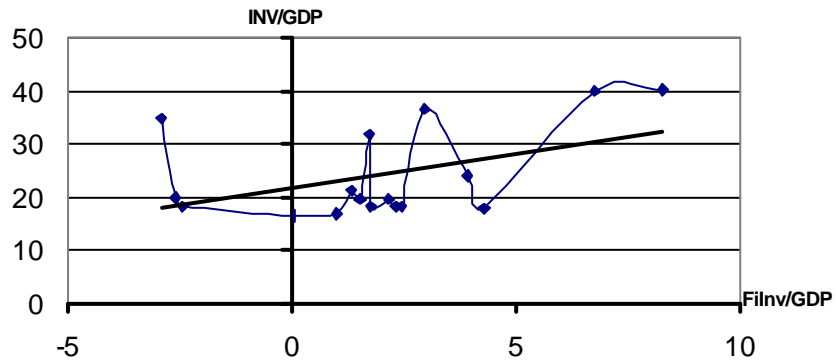


Chart 14 (investment)
Filnv/GDP - INV/GDP (92-96)



We have already seen the absence of a link between growth in money supply and the external financing method.

This lack of correlation is also evident in official reserves, which do not increase more in those countries which receive more financial flows (**charts 15 and 16**).

Chart 15 (official reserves)
FDI/GDP - ORV/GDP (92-96)

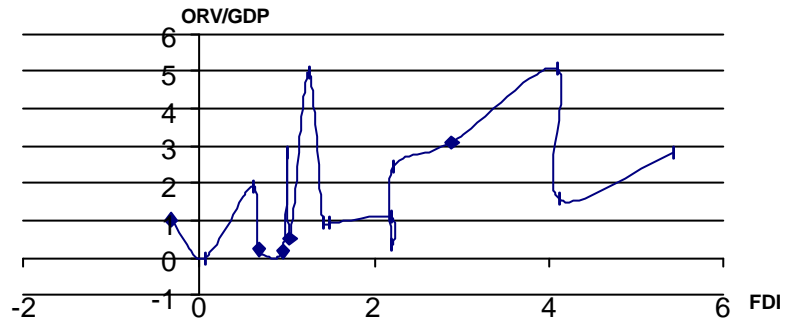
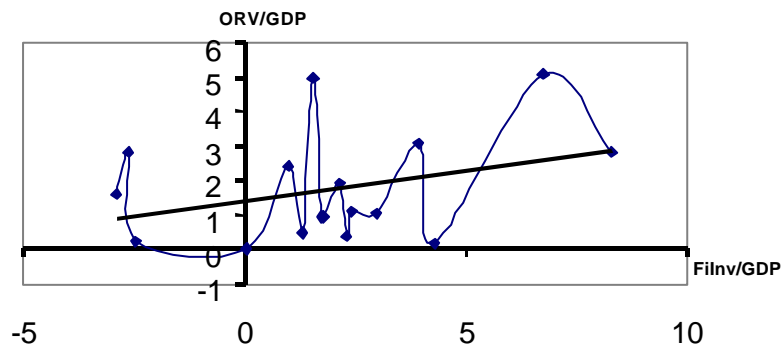


Chart 16 (official reserves)
Filnv/GDP - ORV/GDP (92-96)



Since Hungary is a particular case, **the correlation between growth and the level of direct investment is significantly higher than that between growth and financial flows (charts 17 and 18).**

Chart 17 (growth)
FDI/GDP - GDP

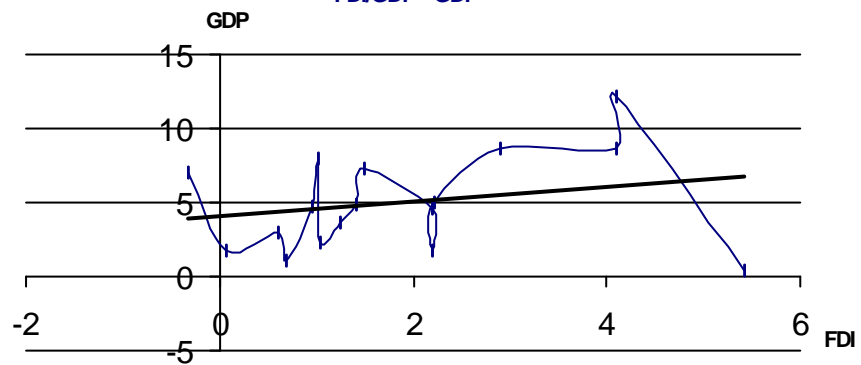
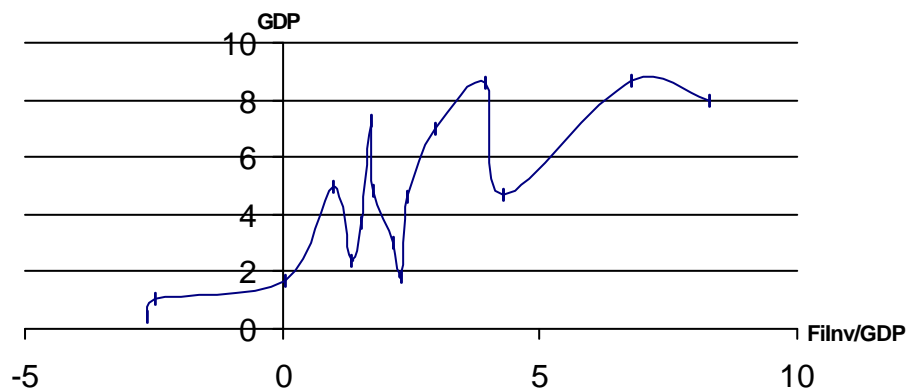


Chart 18 (growth)
Filnv/GDP - GDP



These econometric results are disappointing alongside the conclusions we were able to draw from the four-country analysis at the beginning of this paper, or in relation to the theoretical model. In particular, the real exchange rate did not appreciate substantially in countries which received high levels of financial flows. It can be only envisaged that FDI prevents over-accumulation of capital (and subsequent imports), enabling faster growth.

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