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Does Financial Liberalization Really Improve Private Investment in Developing Countries?

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An increase in real interest rates, which is a typical element of financial reforms, does not necessarily involve a positive effect on private investment unless the authorities are careful to ensure that (1) bank deposits are closer substitutes to unproductive assets (cash, gold) and foreign assets than to capital goods, (2) the financial sector assures an efficient allocation of domestic credit, and (3) the flow of domestic credit to the private sector is not absorbed by the needs of the public sector.

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This paper — a product of the Debt and International Finance Division, International Economics Department — is part of a larger effort in PRE to determine the interaction between external and domestic finance in support of investment in developing countries. Copies are available free from the World Bank, 1818 H Street NW, Washington DC 20433. Please contact Sheilah King-Watson, room S8-045, extension 31047 (22 pages).

Assuming that liquidity constraints exist in most developing countries, the majority of analysts believe that increasing real interest rates will raise the volume of lending and hence private investment.

Morisset, focusing on the demand for capital goods, argues that the positive effect on the domestic credit market may be offset by the negative effect of a portfolio shift from capital goods and public bonds into monetary assets. He also demonstrates that a policy of financial liberalization could increase the public sector's demand for domestic credit, thus limiting the funds available to the private sector. This crowding out does not result from a change in the government's behavior but from a shift in the portfolio of private agents. Higher demand for bank deposits reduces the private sector's willingness to hold government bonds, so the public sector must finance a given budget deficit with more domestic credit.

His simulations for Argentina for 1961-82 suggest that the low response of private investors to changes in interest rate policy in those 20 years was attributable not to the low values of interest elasticities but to the interaction of the mechanisms allowed for in the model, which tends to neutralize the impact of such policies.

Morisset concludes that the effect of changes in interest rate policy on the demand for capital goods is weak in Argentina — and might affect the quality of private investment more than its quantity.

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Introduction

In the economic literature, the relationship between real interest and private investment in LDCs has received considerable attention. Until the early 1970s, the economists assumed that low interest rates would promote investment spending and economic growth in accordance with Keynesian and neoclassical theories. McKinnon (1973) and Shaw (1973) were the first to challenge seriously this conventional wisdom. These two authors suggested that higher real interest rates would raise savings, increase the volume of domestic credits extended by the financial system and hence the equilibrium rate of investment. In order to assess the McKinnon-Shaw hypothesis, an impressive number of empirical studies have been carried out during recent year2/. In the present state of research, the tendency is to admit the validity of this hypothesis. As a matter of fact, "establishing high real interest rates has become a standard part of the policy advice given to LDC's by external experts, ranging from the visiting academic economist via the World Bank to emissaries of the IMF"(see Van Wijnbergen (1983) or Polak (1989)).

The most favored justification for a high interest rates policy in LDCs is derived from the presence of liquidity constraints on private investment decisions. Policies that impose artificially low interest rate ceilings tend to constrain the supply of capital and lead to an excess demand for capital relative to what would happen if the deposit interest rate were allowed to find its market-clearing level. Because the principal constraint on investment is the quantity, rather than the cost, of financial resources, a rise in interest rates will increase the supply of credit to finance private investment. "Any effect exerted by the rate of interest on private investment is not direct within this rationing framework but, rather, occurs via the channel of financial savings" (Blejer an Khan (1984), p.386). Even if a clear consensus has emerged in recent years that a significant fraction of the population in developing countries is affected by liquidity constraints3/, the problematic issue is how far to go. We argue, by focusing on the demand for capital goods, that a number of factors might influence the relationship between real interest rates, the supply of domestic credits and private investment.

The purpose of this paper is to confront the McKinnon-Shaw hypothesis with a simple model of investment behavior. The resulting model is estimated and simulated for Argentina over the 1° .-82 period, given that this country has been affected by various inte. ,st rates

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2/For a review of this literature, see Fry (1988).

3/Note that the rationing in LDCs is justified as a disequilibrium phenomenon caused by legal ceilings on interest rates. By contrast, for developed countries, the argument is based on modern theories of imperfect information.

policies during the last twenty years4/. Simulation results indicate that, in the case of Argentina, the quantity of private investment is little responsive to movements in interest rates. While this finding may not be entirely unexpected (e.g. Khatkhate (1988)), it appears that this insensitivity is not due to the low values of some important parameters, but rather to the interactions of many opposing forces allowed by the model. In particular, we will demonstrate that the positive effect suggested by McKinnon and Shaw may be offset simultaneously by a crowding out effect and a shift that could occur in the portfolio of the private sector.

The paper proceeds as follows. In section 1 we present a simplified portfolio model. Although this approach is derived from a Tobin-Sidrauski framework, a liquidity constraint is introduced into the model in accordance with the McKinnon-Shaw hypothesis. The demand for capital accumulation by the users of capital goods is specified in section 2 using a modified version of the flexible accelerator theory of investment. Section 3 is devoted to the demonstration that the positive impact of a rise in interest rates on the supply of domestic credits to finance private investment might be reduced or even reversed when the public sector is introduced into the analysis. The equations constituting the complete model are presented in Table 2. The empirical results for Argentina are presented and discussed in section 4. Finally, section 5 contains our conclusion.

1. A Simple Portfolio Model

An increase in real interest rates following a financial liberalization generates, in general, a portfolio shift in favor of bank deposits. The authors in favor of the McKinnon-Shaw hypothesis assume that this portfolio shift is coming out from unproductive assets such as cash and gold. This seems, however, a drastic simplification of the reality because it is not at all obvious that deposits are closer substitutes to these unproductive assets than to capital goods in LDCs. To illustrate this point, private investment in LDCs is mostly the demand for capital accumulation by the owner of capital (see Khatkhate (1988, p.580)). This form of savings tends to decline when real interest rates rise and correspondingly saving in financial assets goes up. Unless the latter effect dominates significantly the former effect, private real investment may not register an upwards change with the rise in the real interest rate. In this section, we address the critical issue of whether the positive effect suggested by McKinnon and Shaw is strong enough to offset the shift from capital goods into monetary assets that could occur in the portfolio of private agents.

4/Specification using cross-section data from LDCs, while providing many more observations, assumes as similarity of behaviors which is questionable.

As a starting point, we consider the following real budget constraint for the private sector5/ :

(1) $s_{pt} + \Delta L_{pt}/P + \Delta D_{pt}/P = \Delta m_t + \Delta h_t + \Delta j_t$

The private sector can accumulate assets into three components : real domestic money (m), real domestic assets (Δh) and real foreign assets (j). Equation (1) states that private expenditure for net accumulation of assets is constrained by the amount of real private savings (s_p), the changes in net real domestic credits to the private sector extended by the banking system (L_p/P) and the changes in gross real private external debt (D_p/P).

The demand for real monetary assets is defined as the changes in the stock of money M3. Although foreign assets purchasing by residents are not recent, no such direct measures are available for developing countries. Therefore capital flight is used as representative of this form of savings. The definition proposed by the World Bank (1985) appears to be the most appropriate to measure foreign assets holdings by the private sector since it does not distinguish between "normal" capital flows and capital flight:

(2) $\Delta j_t = (\Delta D_t + I^*_t - \Delta R_t)/P - f_t$

This definition of capital flight takes inflows of capital in the form of increases in gross external debt (D) and net foreign direct investment (I^*) and subtracts from these inflows the current account deficit (f) and the increase in official reserves (R). The difference between these inflows and the extent to which they are used to finance the current account deficit and an increase in reserves is taken to reflect an increase in net foreign claims by the private sector (j).

Finally, real domestic assets (Δh) are nothing but the difference between the financing available to the private sector and the two components defined above. Thus:

(3) $\Delta h_t = s_{pt} + \Delta D_{pt}/P + \Delta L_{pt}/P - \Delta m_t - \Delta j_t = i_{pt} + \Delta b_t$

Real domestic assets include the amounts of physical capital (i_p) and public bonds (b) that the private sector can accumulate. Government bonds are assumed to be net wealth to the private sector because liquidity constraints, by preventing the optimal consumption-savings decisions from being realized, can make present taxation less desirable to households than future taxation (e.g. Haque (1988)).

5/Since the model is designed explicitly for empirical testing, we do not distinguish firms and households in (1). Indeed, if we assume that all firms equities are held by households, this asset can be eliminated from (1). Furthermore, Tybout (1986) suggested that both behaviors can be specified by a portfolio model.

The demand for $\hat{\Delta}m$, $\hat{\Delta}h$, and $\hat{\Delta}j$ can be specified by a standard portfolio model6/. For simplicity, we assume that the amount of private savings is predetermined so that we can write7/:

$$(4a)\quad \hat{\Delta}m = \alpha_{10} + \alpha_{11} y + \alpha_{12}\pi^{e} + \alpha_{13} r + \alpha_{14}(r^{*}+x) + \alpha_{15}(\hat{\Delta}D_{p}/P) + \alpha_{16}(\hat{\Delta}L_{p}/P) + \alpha_{17}W_{p-1}$$

$$(4b)\quad \hat{\Delta}h = \alpha_{20} + \alpha_{21} y + \alpha_{22}\pi^{e} + \alpha_{23} r + \alpha_{24}(r^{*}+x) + \alpha_{25}(\hat{\Delta}D_{p}/P) + \alpha_{26}(\hat{\Delta}L_{p}/P) + \alpha_{27}W_{p-1}$$

$$(4c)\quad \hat{\Delta}j = \alpha_{30} + \alpha_{31} y + \alpha_{32}\pi^{e} + \alpha_{33} r + \alpha_{34}(r^{*}+x) + \alpha_{35}(\hat{\Delta}D_{p}/P) + \alpha_{36}(\hat{\Delta}L_{p}/P) + \alpha_{37}W_{p-1}$$

where r is defined as the ex ante domestic real interest rate on deposits, r^{*} as the foreign real interest rate, x as the expected rate of depreciation of the local currency, y as real income, π^{e} as the expected rate of inflation and w_{p} as net real wealth accumulated by the private sector.

The demand functions (4) are based on the theoretical arguments proposed by Brainard-Tobin (1968) and Purvis (1976). These authors suggested that assets demands depend essentially of the disposable income, the level of private wealth held in beginning of period and the rates of return on alternative assets. We defined the return on money as the ex ante real interest rate on deposits and admitted that the demand for domestic assets is positively correlated with the expected rate of inflation. The expected rate of inflation enters to represent portfolio shifts towards capital goods and government bonds (indexed assets) as the expected real rate of return on money falls (see Tobin (1965), Sidrauski (1967) and Fisher (1979)). Note that we do not distinguish the demand for capital goods and government bonds because the rates of return on both assets are generally indexed in developing countries with high and variable inflation. Further desegregation of domestic assets will take place in section 2. We defined the expected rate of return on foreign assets as the foreign real interest rate and the expected rate of depreciation of the local currency. In order to take into account the existence of liquidity constraints on portfolio's decisions, the variations in bank credits to the private sector (L_{p}) and in foreign capital inflows (D_{p}) have been introduced into the model. An increase in real credit or in foreign financing will in general encourage the acquisition of assets since the economic agents are limited by the availability of their current resources.

The expected signs for the parameters of equation (4) are summarized in table 1. Each rate of return influences positively the

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6/A similar model has been presented in more details in Morisset (1989).

7/The decision between present consumption and future consumption does not seem to be significantly influenced by the real rate of interest in most developing countries (e.g. Giovannini (1983) or Khatkhate (1988)).

asset to which it is associated and negatively others assets8/. We also assume that an increase in GDP level raises the demand for money (transaction motive) and decreases the demand for foreign assets (see Conesa (1986)). In the presence of borrowing constraints, one increase in L_p or in ΔD_p is expected to be positive on the three assets demands. Recently, various authors argued in favor of a positive relationship between the variation in gross external debt and capital flight (e.g. Cuddington (1987)) and Lessard and Williamson (1987)).

In view of the budget constraint (1) it is clear that the three asset demand functions are linearly dependant. Once an agent has determined his holdings of any two assets given the level of the resources available to him, his demand for the third asset has implicitly been determined as well. Thus the following restrictions must hold:

(5a) $\alpha_{1j} + \alpha_{2j} + \alpha_{3j} = 0$ with $j = 1,2,3,4$ and 7

(5b) $\alpha_{1j} + \alpha_{2j} + \alpha_{3j} = 1$ with $j = 5$ and 6

Hence equations (4) are linearly dependant and one equation must be omitted for the estimation of the model.

The model (1)-(4) is similar to the one presented by Tobin (1965) in the sense that an increase in the demand for financial savings following high real interest rates on deposits will generally lead to a reduction in domestic assets demands. This portfolio shift represents the larger attractiveness of holding money than productive capital and public bonds. However, this approach fails to take into account the McKinnon-Shaw hypothesis which assumes a positive relationship between the demand for money and the demand for capital accumulation via the domestic credits to the private sector extended by the banking system. This positive link between money demand and real investment may be easily introduced into the model through the real budget constraint of the financial sector. The banking system, which is assumed to integrate the central bank and commercial banks, accumulates reserves, extends credit to the government and the private sector, and issues liabilities in the form of money:

(6) $(\Delta L_p/P) = \Delta m - (\Delta R/P) - (\Delta L_g/P) + \Delta nw$

where the real banking system net profit (Δnw) is defined as the difference between receipts and outlays, i.e. interest received minus interest paid plus other net non-interest income minus operating expenses, corrected by the changes in domestic inflation and exchange rates9/.

8/In other words these three assets are gross substitutes.

9/We can express the banking system net profit as :

Equation (6) indicates that a rise in money demand must cause, ceteris paribus, an increase in the supply of credit to the private sector since domestic credit is the primary asset backing the monetary liabilities of the banking system. Moreover, this presentation also emphasizes that the amount of credit to the private sector is not directly controlled by the financial sector in most developing countries. First, controls on credit to the private sector have been the principal instruments of the monetary policy and, second, the amount of credit to the public sector has been usually determined by the demand of the government rather than the supply of the financial system10/.

Introducing (6) into the system (1)-(4), we can reconcile the Tobin's arguments and the McKinnon-Shaw hypothesis. In a financial liberalization program, the real rate of interest on deposits and lending rates are in general both decontrolled. The variation in the deposit interest rate should encourage financial savings accumulation while the variation in lending rates should assure positive profits by the banking system. Note, however, that the variation in lending rates does not affect directly assets demands because, under rationing, the cost of credit is not an argument of the private sector's portfolio behavior. The total impact of a variation in real interest rates on the demand for domestic assets is11/ :

$$(7) \qquad \frac{d(\Delta h)}{dr} = \alpha_{23} + \frac{\alpha_{26}\alpha_{13}}{(1 - \alpha_{16})} > \text{or} < 0$$

The first term corresponds to the substitution effect suggested by Tobin and the second term to the positive effect postulated by McKinnon and Shaw. A variation (say an increase) in the real interest rate changes the asset portfolio as assetholders move out of real savings and foreign assets into domestic money. On the other hand, the rise in money demand increases the supply of domestic credits to the private sector and private investment since the private sector is assumed to be liquidity constrained. The total impact of a change in the interest rate

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$$\Delta nw = (i_{L_p} - \pi)L_{p-1}/P + (i_{L_g} - \pi)L_{g-1}/P + (i^* - \pi - x)R_{-1}/P - (i_m - \pi)M_{-1}/P + ni$$

where i_{L_p} is defined as the nominal lending interest rate to the private sector, i_{L_g} as the nominal lending interest rate to the public sector, i^* as the foreign nominal interest rate, i_m as the nominal interest rate on deposits, ni as other net non-interest income, π as the inflation rate, P as price level and x as the rate of depreciation of the local currency.

10/see section 4 for a more precise discussion on this remark.

11/For simplicity, we assume that real disposable income and financial sector's net profits are not influenced by changes in real interest rates in equation (7). Higher borrowing and lending rates should affect these two variables in opposite directions so that the total effect should be weak.

depends on whether the increase in domestic credits due to the McKinnon-Shaw effect exceeds or not the reduction in the demand for capital goods due to to the portfolio shift. Note that this approach does not take into account the eventual decline in excessive inventories when firms can invest in an alternative domestic financial assets. If inventories are reduced to normal level, productive investment may increase.

The upshot of all this is that one cannot predict the implication of changes in real deposits rates without having some insight in the financial structure of the economy. Specifically, one wants to know which asset is the closest substitute to bank deposits (i.e the coefficients α_{13}, α_{23} and implicitly α_{33}) and whether the banking system will be allowed to play its intermediary role or not (i.e the coefficients α_{16}, α_{26} and implicitly α_{36}). In that sense, a financial liberalization program may directly improve the allocation of domestic credit to the extent that, with positive real interest rates, credit would be allocated according to expected productivity rather than transaction costs and perceived risks of default (see McKinnon (1973)). Since financial liberalization policies may involve changes not only in the quantity of investment but also in the quality, we will dicuss more precisely on this point in the empirical part of the paper (see section 4).

2. The Flexible Accelerator Model of Investment

The approach presented in section 1 clearly stresses the substitution effects generated by changes in interest rates on assets markets. The portfolio model owes much to the pioneering work of Van Wijnbergen (1983) even if the portfolio shift into bank deposits is coming out from real savings instead of the "curb market" as suggested by this author. Because the majority of the authors who attempt to study the relationship between real interest rates and real private investment in LDCs has viewed investment only as the demand for capital goods by the users of capital services, we introduce into the analysis this second aspect (e.g. Blejer and Khan (1984), Fry (1980) and Tun Wai and Wong (1982)).

The demand for capital services is usually derived from an adapted version of the flexible accelerator model. This approach emphasizes the effects of the resources constraints faced by private investors in accordance with the McKinnon-Shaw view. In the long-run representation of the accelerator model, the desired stock of capital (k^*_p) that the private sector wishes to have in place can be assumed to be proportional to expected output (y^*) :

(8) $k^*_p = \theta y^*$

This is a quite standard formulation in which the underlying production function has (technologically) fixed proportions among

factors inputs so that factor prices do not enter into the specification12/. It is assumed that there is only a partial adjustment of the private's sector actual capital stock to its desired level so that we can write :

$$(9) \quad \Delta k_p = \beta(k^*_p - k_{p-1})$$

where k_p is the actual private capital stock, Δk_p is net private investment, and β is the coefficient of adjustment. Gross private investment is made up of two components - net investment and replacement. Net investment results from changes in the desired stock of capital, while replacement is here assumed always to be a fraction σ of the capital stock on hand at the beginning of the period :

$$(10) \quad i_p = \Delta k_p + \sigma k_{p-1}$$

We then substitute equations (8) and (9) into equation (10), and we get the following investment function for the private sector:

$$(11) \quad i_p = \beta\theta y^* - (\beta - \sigma)k_{p-1}$$

In order to take into account the existence of liquidity constraints, the speed of adjustment between desired and actual private capital stock (β) is assumed to vary systematically with the availability of internal funds, bank credits and foreign capital inflows. A linear representation of this relationship is :

$$(12) \quad \beta = \beta_0 + \frac{(\beta_1 cf + \beta_2(\Delta L_p/P) + \beta_3(\Delta D_p/P)}{(k^*_p - k_{p-1})} \quad \text{with } \beta_i > 0 \ i = 1,2 \text{ and } 3$$

where cf is defined as firms' cash flow; a measure of internal funds available for financing private investment.

Equation (12) states that the speed of adjustment is influenced positively by the total financing available to the private sector measured in relative terms with respect to the size of the discrepancy between desired and actual private capital stock. Note that if the signs of the parameters in equation (12) are all expected to be positive, the impact of the three alternative sources of financing on the speed of adjustment is not assumed to be equal. As bank credits depend on the flow supply extended by the financial sector rather than the demand of private investors, a firm's investment decision is independent of its financial condition. Recently, Fazzari, Hubbard and Petersen (1988) demonstrated that internal and external resources are not perfect substitutes in a firm with liquidity constraints.

12/ Using an alternative production function, the desired capital stock level could be also influenced negatively by the rental price of capital. While this specification may complicated the empirical implantation of the model - such variable cannot be easily calculated for developing countries, it does not change significantly the results presented here.

Finally, substituting equation (12) into equation (11), we obtain the following private investment function :

$$(13)\quad i_p = \beta_{11}y^* + \beta_{12}cf + \beta_{13}(\hat{\Delta}L_p/P) + \beta_{14}(\hat{\Delta}D_p/P) + \beta_{15}k_{p-1}$$

with $\beta_{11} = \beta_0\theta > 0$ $\quad \beta_{14} = \beta_3 > 0$
$\beta_{12} = \beta_1 > 0$ $\quad \beta_{15} = \sigma - \beta_0$
$\beta_{13} = \beta_2 > 0$

A rise in the resources available to the private sector increases the speed of adjustment so that all parameters in equation (13) could a priori be determined positive. If we incorporate this equation into the portfolio model presented in section 2, the effect of an increase in real interest rates on private investment appears to be unambiguously positive13/ :

$$(14)\quad \frac{di_p}{dr} = \frac{\beta_{13}\alpha_{13}}{(1 - \alpha_{16})} > 0$$

The general conclusion is that an increase in the real rate of interest is favorable to financial savings which, in turn, increases the amount of bank credits available to the private sector. This rise influences positively the speed of adjustment between desired and actual private capital stock and, hence, private investment. But this presentation provides a misleading and inconclusive picture of effectiveness of interest policies. In particular, the introduction of the public sector into the analysis may affect dramatically the former result since the government can absorb part of the resources made available for private investment. The next section is devoted to the demonstration of this crowding out effect.

3. The Introduction of the Public Sector

The experience of the last decade indicates that most LDC government financed their fiscal deficit with credits from the central bank. Although these governments could conceivably experiment with this source of financing if it were an independently controllable variable, it would generally be more realistic to treat additional borrowing from the central bank "as a consequence of fiscal disequilibrium or of the inability or unwillingness to finance the growth of exhaustive government expenditures, subsidies, and transfers through explicit taxes or the sale of government debt to the private sector" (von Furstenberg (1983, p.233)). Following this remark, the demand of the public sector for central bank credits can be specified as :

$$(15)\quad \hat{\Delta}L_g/P = def_g - \hat{\Delta}b - \hat{\Delta}D_g/P$$

13/Without loss of generality, we assume that the cash flow of firms is not influenced by a variation in borrowing and lending interest rates because the impact of such variation is difficult to predict.

where def_g is defined as the total fiscal deficit14/, Δb as the sales of public bonds to the private sector, L_g/P as the changes in domestic credits to the government extended by the banking system and D_g/P as the variations in gross public external debt. Equation (15) emphasizes that most LDC government have financed their deficit with central bank credits when they cannot use other sources of financing. Indeed, in many developing countries financing the public deficit in the foreign and domestic credit markets becomes less feasible over time because the declining credibility of the public sector.

The authorities can administer the bonds market by two different instruments: interest rates ceilings and controls on the flow supply of bonds. If either the interest rate on public bonds or the flow supply of bonds is treated as an exogenous variable, the other become endogenous. With the interest rate exogenous, the government chooses to fix legal ceilings on the interest rate on public bonds. In this case, the quantity of bonds is only determined by the bonds demand of the private sector. Alternatively, the government can choose the amount of bonds exogenously and the public bonds market adjusts through a variation in the interest rate on bonds. Let us assume that the interest rate on public bonds is fixed and that the quantity of public bonds is determined by the private sector's willingness to hold public bonds. From equation (3), the demand of the private sector for public bonds is equal to :

(16) $\Delta b = \Delta h - i_p$

The presence of the public sector can alter the positive effect of financial liberalization on domestic credits and, hence on private investment. Introducing equations (15) and (16) into the model, the total impact of a variation in real interest rates on the quantity of bank credits available to the private sector is the following15/ :

14/The total fiscal deficit can be expressed as :

$$def_g = [i_g + g - t] + (i_b - \pi)B_{-1}/P + (i_{Lg} - \pi)L_{g-1}/P + (i^* - \pi)D_{g-1}/P$$

where i_b is the nominal interest rate on public bonds, i_{Lg} the nominal lending rate on domestic credit to the public sector, i^* the foreign nominal interest rate, i_g public investment, g public current expenditures, t net taxes, B_{-1} the nominal stock of public bonds in the beginning of period, L_{g-1} the nominal stock of domestic credit to the public sector, D_{g-1} the nominal stock of public external debt and P price level.

15/Again, for simplification, we assume that a variation in interest rates does not affect the public deficit. In fact, even if the interest rate on public bonds is assumed to be fixed, the public debt-service payments will increase through the change in lending rates so that the crowding out of domestic credit to the private sector is stronger than suggested in (17).

$$(17)\quad \frac{d(\hat{\Delta}L_p/P)}{dr} = \frac{(\alpha_{13} + \alpha_{23})}{(1 - \alpha_{10} - \alpha_{20} + \beta_{13})} = \frac{(\alpha_{13} + \alpha_{23})}{(\alpha_{30} + \beta_{13})} > \text{or} < 0$$

The total impact of an increase in the real interest rate on bank credits available to the private sector cannot be a priori determined in multiplier (17). As suggested by McKinnon and Shaw, a rise in the real rate of interest increases the demand for national liquidities and, therefore, the quantity of bank credits. But, the introduction of the public sector into the analysis sheds light on an important channel through which crowding out of domestic credits to the private sector occurs in many developing countries. The financial reform may exacerbate the demand of the public sector for bank credits and, thereby, limiting the funds available to the private sector. It is noteworthy that the specification chosen here suggests that the crowding out does not come from a change in the government's behavior, but from a shift in the portfolio of private agents. As demands for money and capital goods increase, the private sector's willingness to purchase government bonds is reduced, constraining the public sector to finance its deficit with more credits from the central bank16/.

Interestingly, the crowding out effect does not appear very sensitive to changes in different sources of financing of the fiscal deficit. In order to prevent the diversion of domestic credit to the public sector following an increase in interest rates on bank deposits, the government may be attracted to increase simultaneously the interest rate on public bonds or, if the interest is endogenous, to raise the flow supply of bonds. In this case, the crowding out of domestic credit to the private sector will not come from the portfolio shift from domestic bonds into monetary assets, but from the increase in the public debt service on domestic debt17/. Similarly, the authorities may attempt to increase the rate of inflation - an usual source of financing in a large number of LDCs' economies. The impact of inflationary finance on bank credit remains ambiguous. On one hand, the effect is positive through the increase in public bonds demand (indexed assets) and the reduction in the public debt-service but, on the other hand, the effect is negative through the decline in money demand18/.

16/ The same argument was used a decade ago by various authors in order to justify interest controls in LDCs (e.g. Nicols (1974) and Polak (1989)). These authors suggested that if the rate of interest on bank deposits is kept low, investors lack an attractive alternative to investing in government paper.

17/An increase in the interest rate on public bonds raises the debt service of the domestic debt and, therefore, the public deficit.

18/Of course, this discussion on the effect of a variation in the rate of inflation is tentative because inflation is treated as an exogenous variable in the model and the Oliveira-Tanzi effect is not taken into account.

Using equation (17), we can successively define the short-run total effect of a change in real interest rates on the demand for domestic assets and private investment :

$$(18) \quad \frac{d\Delta h}{dr} = \alpha_{23} + \frac{\alpha_{23}(\alpha_{13} + \alpha_{23})}{(\alpha_{23} + \beta_{13})} \quad > \text{or} < 0$$

$$(19) \quad \frac{di_p}{dr} = \frac{\beta_{13}(\alpha_{13} + \alpha_{23})}{(\alpha_{23} + \beta_{13})} \quad > \text{or} < 0$$

Equations (18) and (19) suggest that the effect of financial liberalization cannot be a priori determined on domestic assets demand and private investment.

In summary, the complete model consist of three behavioral relationships - equation (4a), (4b) and (13) - and four technical relationships - equations (1), (6), (15) and (16). Together these seven equations can be used to explain ΔM, ΔH, ΔJ, ΔB, ΔL_p and ΔL_g. The complete model is presented in Table 2. Within this framework, we address the critical issue of whether the positive effect suggested by McKinnon and Shaw is strong enough to offset the crowding out of domestic credits and the shift from real savings into monetary assets that could occur in the portfolio of the private sector.

4. An Empirical Test : the Case of Argentina (1961-82)

The model developed in the last section could be used in principle to examine the short-run effect of a variety of shocks on private investment and other endogenous variables of the model. By estimating the model for Argentina and by stimulating it, the response of key variables to changes in real rates of interest will be derived for this country.

The data on S_p, Y, ΔM, F, I^*. and ΔR have been obtained from the International Monetary fund's International Financial Statistics. Series from the World Bank (1985) and the Central Bank of Argentina have also been used for π, r, ΔJ, ΔB, ΔD_p, ΔD_g, ΔD, ΔL_p, ΔL_g, def_g, I_g, and I_p19/. All variables have been deflated by the wholesale price index (1974 = 100). The data on private wealth stock (W_{p-1}) have been constructed by cumulatively adding the time series on private savings. Since linear functions are used, the error in estimating the initial wealth stock can be readily absorbed into the intercept term. The net profit of the banking sector (nw) has been calculated as the residual of the financial system budget constraint20/. While we attempted to

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19/The variable r is defined as : $r_t = ((1 + i_t)/(1+\pi^e_t)) - 1$ where i_t is the nominal interest rate.

20/ $\Delta nw = (\Delta L_p/P) - \Delta m + (\Delta R/P) + (\Delta L_g/P)$

measure the expected rate of inflation (π^e) using the adaptative and perfect expectations hypotheses21/, only the results obtained with perfect expectations are presented in this paper. Perfect foresight expectations seem more appropriate than adaptative because the cost of ignoring the future effects of current policy actions can be quite high for economies that have a history of rapid inflation. Assuming that economic agents refer to domestic conditions rather than to the foreign real interest rate, we defined the expected rate of return on foreign assets only with the rate of inflation. Data limitation enforced us to approximate the firms'cash flow with the difference between potential and effective levels of production as measured by the Wharton index (INDW). We assume that the enterprises could respond more easily to changes in desired investment when demand conditions are buoyant. Finally, in order to improve the specification of the model, we introduced into equations (4) an indicator of uncertainty about inflation (VE) measured as the variation of the rate of inflation22/ and we incorporated public investment (i_g) into the private investment function (13) as suggested by various authors23/.

In table 2 we report three-stage Least-Squares (3SLS) estimates for Argentina over the 1961-82 period. On the whole, the results are quite satisfactory. The explanatory power ($\bar{R}^2$) and DW are both acceptable, suggesting a good specification of the model. The most interesting aspect of these results concern the real rates of interest. Indeed, the estimated coefficients for r appear to be positive on financial savings ($d\Delta M/dr = 3.672$) and negative on real savings ($d\Delta H/dr = -1.234$) and capital flight ($d\Delta J/dr = -2.438$). These results seem to be quite compatible with the Argentine experience, e.g. World Bank (1985). For instance, the deregulation of interest rates in 1977 resulted in a further increase in real interest for deposits and thus there was a dramatic increase of savings through the banking system. Our estimates suggest that the buildup of deposits was backed by repatriation of capital invested abroad and by decreasing demand for public bonds and capital goods. In short, an increase in the real rates of interest involved a portfolio shift from capital goods and foreign assets into monetary domestic assets. However, these estimates include only the direct effects of a rise in interest rates and, therefore, they cannot be interpreted as the total effect of such increase (see below for further explanations).

Also of relevance is whether the banking system has played its intermediary role or not. The estimated impact of a variation in flow supply of credit (ΔL_p) on private investment ($di_p/d(\Delta L_p/P) = 0.258$)

21/This reflects the fact that, although rational forecasts could differ from actual price movements in stochastic models, rational expectations are equivalent to perfect foresight in deterministic models.

22/see Blejer (1979) and Gupta (1984).

23/For instance, see Blejer and Khan (1984) and Sundararajan and Thakur (1980).

indicates that only a part of banking credit has been used to finance productive investment in Argentina. But, this is probably an underestimate of the full effect of financial liberalization on private investment because this policy can also increase the efficiency of investment. In particular, higher interest rates can improve the allocation of credit, thereby increasing the productivity of investment projects. As an illustration, the relationship between the incremental output/capital ratio and the real interest rate on deposits appears positive and significant in the case of Argentina24/. This suggests the existence of a positive effect of an increase in interest rates on the quality of investment25/.

The results pertaining to the other variables also deserve a brief explanation. The estimated coefficient of Y is positive on financial savings and not significant on real savings. The effect of $\Delta Dp/P$ seems to be positive on financial savings and negative on real savings. As equations are linearly dependant, we able to deduct that an increase in external debt led to capital flight during the 1961-82 period in Argentina ($d\Delta J/(d\Delta D_p/P) = 0.445$). This positive correlation could be explained from the liquidity effect, corruption and policies which simultaneously promoted foreign borrowing and capital flight, e.g overvaluation of the local currency. The positive relationships between the flow supply of credit ($\Delta L_p/P$) and the demands for financial savings and for real savings are compatible with a priori theoretical expectations since the Argentinean private sector has been liquidity constrained. The expected rate of inflation (π_e) seems to have exerted a positive effect on financial and real savings. With respect to real savings, this result corresponds to the one predicted by the theoretical analysis and, with respect to financial savings, it could be explained by the fact that banking deposits (in particular short term deposits) have been indexed in periods of high and variable inflation. The negative effects of VE on domestic assets demand and money demand confirm that uncertainty about inflation has increased capital flight. Finally, the estimation of the real private investment function seems to be satisfactory since all parameters have the expected signs, except the variables k_{p-1}, y_{-1} and $(\Delta D_p/P)$ whose effects do not appear significant. Note that public investment has a positive effect on private investment, suggesting that complementary relationships between both investment categories dominate in Argentina.

Dynamic simulations (i.e. lagged variables are those generated by the model itself) show that the goodness-of-fit of the model as a whole is satisfying for Argentina over the 1961-82 period. Table 3 provides

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24/We used the procedure proposed by Fry (1988) and Gelb (1989). The estimated coefficient for Argentina is equal to 1.206 on the 1961-82 period.

25/However, beyond the interest rates level, important factors such as the high degree of interlocking ownership and control that existed, and that continues to exist, between industrial firms and financial institutions may jeopardize financial liberalization policies in Argentina.

the correlation coefficient between historic and simulated series and Theil's inequality coefficient for the endogenous variables. If these coefficients indicate that the small structural model is stable and are indicative of its robustness, needless to say, that our simulation results have to be viewed with some care. Actually, they are intended primary as an illustration of our theoretical arguments and not as perfect representation of the Argentinean economy.

The model could be used as basis for deriving the short-run total response of private investment to an increase in real rates of interest. Since the model is linear, the simulations results are independent of the starting conditions and, moreover, they are qualitatively independent of the absolute size of the shock. In Table 4 we report the total short-run elasticity of the main endogenous variables of the model to a one percentage point increase in the real rate of interest. Our simulation results indicate that real private investment is little responsive to interest changes ($di_p/dr = -0.047$), but this is not surprising since it reflects the presence of many opposing forces allowed for by the model. The total interest insensitivity of private investment is largely due to the portfolio shift from capital goods into financial savings. On one hand, the increase in monetary liabilities is favorable to private investment via the domestic credit market as suggested by McKinnon and Shaw. On the other hand, this portfolio shift undermines the private sector's willingness to hold capital goods and government bonds ($d\ b/dr = -0.459$). This last effect implies that the financing of the public deficit in the domestic credit market become less feasible and credits from the banking system must be used to finance part of the deficit ($d\ L_g/dr = 0.376$). In order to offset the expansionary effect of large domestic credits to the public sector on money supply, the monetary authorities have to keep credits to the private sector under strict control. As a consequence, the resulting changes in private real investment depend critically on whether the increase in domestic credits due to the McKinnon-Shaw effect exceeds or falls short of the reduction in domestic credits due to the crowding out effect. Empirical results seem to indicate that for Argentina the negative effect is higher than the positive effect ($d\ L_p/dr = -0.284$) so that the total effect of financial liberalization is weak (even negative) on private investment.

5. Concluding remarks

The purpose of this paper has been to demonstrate with a simple structural model that a number of factors can influence the relationship between real interest rates and private investment in LDCs. We emphasized on two specific problems. First, we pointed out that the positive effect of a rise in domestic credit as suggested by McKinnon and Shaw could be offset by a portfolio shift from capital goods into monetary assets. Second, we demonstrated that a financial liberalization policy could increase the demand of the public sector for credit extended by the domestic banking system, therefore limiting the funds available to the private sector. It is noteworthy that this crowding out effect does not result from a change in the government's behavior, but rather from a shift in the portfolio of private agents.

Higher demand for bank deposits reduces the private sector's willingness to hold government bonds so that the public sector is required to finance a given budget deficit with a larger amount of domestic credit. While the model has been estimated for Argentina, it is quite apparent that this specification can be readily applied to other developing countries as well. The general conclusion that emerges is that the effect of interest rates policies on the demand for capital goods is weak in the case of Argentina, albeit the total impact might be stronger on the quality of investment than on the quantity26/. The absence of any strong relationship between real interest rates and the quantity of invesment does not result from exceedingly small direct interest elasticities of private investment. Instead, it is due to the interactions of a number of mechanisms allowed for by the model which tend to neutralize the impact of such policies.

Although the model used in this paper could be improved in many ways, e.g. inflation should be endogenous and it is very unlikely that real interest rate policies can be considered as exogenous even if it rates are controlled rather than market-determined (e.g. Gelb (1989)), the policy implications of the exercise are straightforward. The increase in real interest rates, which is a typical element of financial reforms, do not necessarily involve a positive effect on private investment unless the authorities are careful to ensure that :
(1) Bank deposits are closer substitutes to unproductive assets (cash, gold) and foreign assets rather than to capital goods;
(2) The financial sector assures an efficient allocation of domestic credits;
(3) The flow of domestic credit to the private sector is not absorbed by the need of the public sector.

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26/It could be clearly of interest in some future work to extend the analysis in this direction.

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Table 1:
Expected Signs of the Parameters

	y	πa	r	$(r^{*}+x)$	$\Delta D_p/P$	$\Delta L_p/P$
Δm	$\alpha_{11}>0$	$\alpha_{12}>0$	$\alpha_{13}>0$	$\alpha_{14}<0$	$\alpha_{15}>0$	$\alpha_{16}>0$
Δh	$\alpha_{21}>0$	$\alpha_{22}>0$	$\alpha_{23}<0$	$\alpha_{24}<0$	$\alpha_{25}>0$	$\alpha_{26}>0$
Δj	$\alpha_{31}<0$	$\alpha_{32}>0$	$\alpha_{33}<0$	$\alpha_{34}>0$	$\alpha_{35}>0$	$\alpha_{26}>0$

Table 2 :
Estimates of the Model for Argentina (1961 -82)
(t-statistics are in parenthesis)

(4a) $\Delta m = -0.652 + 0.069y + 1.012\pi + 3.67r + 0.673\Delta D_p/P +$
(-0.36) (1.79) (1.96) (1.94) (3.47)

$0.953\Delta L_p/P - 0.012wp{-1} - 1.238VE$ $\bar{R}2 = 0.954$
(5.33) (-1.00) (-4.61) $DW = 1.95$

(4b) $\Delta h = 5.063 + 0.063y + 1.447\pi - 1.23r - 0.118\Delta D_p/P +$
(4.07) (1.75) (4.67) (2.02) (-0.94)

$0.678\Delta L_p/P - 0.023wp{-1} - 0.418VE$ $\bar{R}2 = 0.935$
(5.98) (-3.11) (-2.63) $DW = 1.65$

(13) $i_p = -4.959 - 0.015y{-1} + 9.229INDW + 0.258\Delta L_p/P -$
(-1.92) (-0.54) (3.58) (4.85)

$0.201\Delta D_p/P + 0.091k_{p-1} + 0.448i_g$ $\bar{R}2 = 0.920$
(-2.53) (0.79) (3.89) $DW = 2.08$

(6) $(\Delta L_p/P) = \Delta m - (\Delta R/P) - (\Delta L_g/P) + \Delta nw$

(15) $\Delta L_g/P = def_g - \Delta b - \Delta D_g/P$

(16) $\Delta b = \Delta h - i_p$

Table 3
Comparison between Historic and Simulated Series (1961-82)

Variables	correlation coefficient	Theil's coefficient
Δm	0.901	0.354
Δh	0.825	0.314
Δj	0.840	0.466
ip	0.780	0.203
$\Delta Lp/P$	0.757	0.544
$\Delta Lg/P$	0.687	0.497
Δb	0.770	0.532

table 4:
Direct and Total Elasticities of the Real Rates of Interest[1]

Effect	Δm	Δh	Δj	i_p	$\Delta L_p/P$	$\Delta L_g/P$	Δb
Direct	0.104	-0.034	-0.372				
Total	-0.073	-0.160	0.258	-0.047	-0.284	0.376	-0.459

1. Evaluated at sample means

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