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Reflections on Credit Policy in Developing Countries

Its Effect on Private Investment

Mansoor Dailami
and
Marcelo Giugale

The joint effect of both the volume of credit and its price — that is, the interest rate — is relevant to firms' investment decisions. So effective credit policy in developing countries must take into account the influence of both the credit supply and the interest rate, not just one or the other.

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This paper — a joint product of the Financial Policy and Systems Division, Country Economics Department and the Country Operations Division, Country Department III, Europe, Middle East, and North Africa Regional Office — is part of a larger effort in PRE to analyze the role of financial policy in the growth and adjustment process of developing countries. Copies are available free from the World Bank, 1818 H Street NW, Washington, DC 20433. Please contact Maria Raggambi, room N9-041, extension 37657 (28 pages, with charts, figures, and tables).

Previous approaches to credit policy and its role in the stabilization and adjustment of developing countries have emphasized either the role of the availability of credit or the role of its price — that is, the interest rate. Dailami and Giugale argue that effective credit policy in developing countries must take into account both interest rate and credit channels.

The authors develop their argument in the context of the link between credit policy and private investment, using a model of firms' investment behavior in an economy with exogenous, time-varying borrowing constraints. The model incorporates a credit ceiling linked to the firms' net worth and the state of the credit market.

The state of the credit market depends on factors — such as credit and interest rate policy, regulatory and supervisory practices, and market sentiments — that banks consider in making lending decisions. These factors affect banks' decisions independent of a borrower's creditworthiness. Thus, in times of tight money, firms that would otherwise have received loans may be denied them and have to postpone or cut back investment plans.

Dailami and Giugale use their model to specify an equation relating aggregate private investment to aggregate output and to two credit market variables — the real interest rate and aggregate credit. They estimate the equation for five developing countries (Brazil, Colombia, India, Korea, and Turkey) using annual data for 1965-85, and test the joint significance of both interest rate and credit supply conditions. Their findings show that interest rates and credit volume exert a joint influence on the behavior of private investment in the countries examined

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I. INTRODUCTION

Successive developments in the role of credit policy in the stabilization and adjustment strategy of developing countries have been toward greater recognition of the importance of interest rate channel in influencing the pace of financial sector reform,[1] in the process of allocative efficiency,[2] and in influencing aggregate private spending.[3] Indeed, the earlier emphasis placed on volume of credit as an instrument of policy, both in development literature and practice, as exemplified most notably in the IMF approach to stabilization [see for instance, Polak and Argy (1971); Keller (1980)], is now giving way to a new conventional wisdom about the virtues of positive real interest rate policy.[4] But ironically, as this view is gaining the status of a new orthodoxy there exists a growing body of theoretical research and empirical evidence which proport to return the quantitative channel of credit policy to the forestage.

Thus, there exists the important strand of literature on credit rationing which either in its micro context [Hodgman (1960, 1962); Jaffee and Russell (1976); and Stiglitz and Weiss (1981)] or in its traditional "availability doctrine," context [Roosa (1951); Scott (1957); Lindbeck (1962)] has led to rationalize non-price credit rationing even in environments where interest rates are free of administrative control and regulation.[5] Moreover, by shifting the spotlight from the saver/borrower decisions to that of the intermediary, i.e. the

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[1] On this see, McKinnon (1973); Khatkate (1972); Galbis (1977); and World Bank (1989).

[2] See, for instance, Balassa (1982); and Roe (1982).

[3] See, Taylor (1979, 1981); van Wijnbergen (1983) and Dailami (1989).

[4] See Sauvé (1986) for current state of debate on interest rate policy in developing countries.

[5] See also, Baltensperger and Devinney (1985) for a recent survey and synthesis of credit rationing theory.

lender or the bank, in the debate about the link between credit/monetary policy and the real economy, this literature has provided a rational basis for consideration of the joint influences of interest rate and credit channels. The underlying argument being that an increase in interest rate, for instance, could also be accompanied by a reduction in the level of bank lending as a result of banks' efforts to adjust their asset portfolio, thereby reinforcing the contractionary influence of higher interest rates. The net outcome could be a more severe slowdown in economic activity than anticipated. Such a possibility is particularly likely in a situation where the economy is under stabilization measures.

Following this line of reasoning, this paper argues that effective credit policy in the context of developing countries must acknowledge the influence of both interest rate and credit channels. The argument is elaborated in the context of the link between credit policy and private investment and is conducted in two stages.

In the next section, we draw on the recent literature on credit rationing to introduce a form of bank credit constraint, linked to the firms' net-worth and to the state of credit market, into the standard neo-classical model of firms' investment behavior. While the relevance of borrowers' net-worth, i.e., credit worthiness to banks' lending decisions and practices is familiar and has been well documented, both theoretically and empirically,[6] the introduction of the state of credit market, as a component of the supply of bank loan needs some elaboration. We refer to the state of credit market as a shorthand for a composite of several factors including the level of interest rate, the pace of credit policy, the stringency to which regulation and supervision on the banking system is imposed. These factors are expected to influence banks' lending decisions independently of their impacts on the creditworthiness, i.e., net-worth of individual borrowers. Thus, including the state of credit market in the banks' loan supply function signifies the possibility that credit to a particular

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[6] See, for instance, Leland and Pyle (1977); Bernake and Gertler (1989, 1990); and Calomiris (1990).

firm may change as the result of macro and financial fluctuations, even if the borrower's creditworthiness has not changed. Thus, in times of tight money, or in "bad times," borrowers that otherwise would have been considered eligible are likely to face a more stringent credit evaluation process or simply to be denied loans. As a consequence, firms' investment plans may have to be postponed or cut back.

In Section III we estimate and test for the relevance of credit market condition variables over a set of developing countries over the last two decades; specifically, we have compiled annual time series data on private fixed domestic investment and other relevant variables for Brazil, Colombia, India, Korea and Turkey over the 1965-85 period.[1] Linear three-stage least squares are used in the estimation to correct both for the endogeneity of aggregate and expected variables (via instrumental variables) and for the shortness of the sample period.

Our findings not only show that credit market condition variables as a whole are key determinants of private domestic investment behavior but also (and perhaps more interestingly) that it is their expected future values that really matters. Moreover, the expected volume of aggregate credit appears to be the single most important variable in explaining investment behavior. This implies that credit constraints have actually been binding in the countries in the sample and, presumably, profitable investment opportunities have been lost. In the paper's conclusions, we use those results to offer some policy recommendations.

II. THEORETICAL FRAMEWORK

In this section we develop an optimal model of private investment behavior in the context of an owner-managed representative firm operating in an economy characterized by credit rationing, and administratively set interest rates. To finance its investment outlays, the firm can resort either to its own internally generated source of funds, i.e. retained earnings, or to borrowing from the banking sector.[7]

Also, since the firm is owner-managed, no managerial incentive problems are operative, and the objective of the firm is to maximize the present value of future stream of net cash flows. Formally, let net cash flow in real terms at time t be R(t), and ρ be the discount rate, then the long-term objective of the firm can be stated as,

$$\max \int_0^\infty e^{-\rho t} R(t)\, dt \tag{1}$$

By virtue of the assumption that the firm cannot resort to new equity issue through the stock market, its net cash flow (income) can be derived simply as net operating profit (net of taxes and interest) plus new bank loans that the firm can raise in the market, minus debt amortization, and minus new investment expenditures.

$$R(t) = (1-\tau)[\pi(K,.)] - [(1-\tau)r(t) - x(t) + \alpha]B(t) + b(t) - q(t)I(t) \tag{2}$$

where $\pi(.)$ = before tax profit, taken to be an increasing and concave function of K, i.e. $\frac{\partial\pi}{\partial K}>0, \frac{\partial^2\pi}{\partial^2 K}\le 0, K$ = the stock of real capital, B = total debt outstanding, τ = the corporate profit tax rate, r = interest rate, a = amortization rate on debt, q = the price of capital goods relative to output, I = gross real investment, x = rate of inflation, and all variables refer to time t.

If not further constraints were operative, the firm would solve the optimization problem (1), (2) subject to the evolution of the stocks of capital and debt;

[7] The implicit assumption here is that the firm does not raise capital through issuance of new equity. This assumption is likely to apply to many developing countries where the equity market is not sufficiently developed or broad to serve as an important source of external capital to the firm. For the case that the firm has the option of recorse to equity market, see Dailami (1990).

$$\dot{K} = I(t) - \delta K(t) \text{ and } \dot{B}(t) = b(t) - \alpha B(t)$$

where δ is the rate of depreciation of physical capital.

In this case it can be shown that the firm would raise its desired amount of loan at each point in time. At the margin, the real cost of equity, ρ, would be equal to the real effective cost of debt $[(1-\tau)r-x]$, which implies that the only financial variable relevant to the firm's investment decision is the real after-tax rate of interest. In other words, the firm would face an infinitely elastic supply of credit. Figure 1 illustrates for a given point in time the resulting equilibrium for the firm. At point E no further credit is desirable, though it is still available at a fixed cost. This situation, however, hardly describes the reality of loan markets in developing countries, where excess demand for credit and consequently quantity credit rationing prevail. To formalize this phenomenon, we introduce a time varying bank credit ceiling imposed on each firm. Such a ceiling, furthermore, will be assumed to be dependent on the firm's net-worth and on the state of credit market as described by the following equation:

$$b(t) \leq \psi(V(t); S(t)), \qquad \frac{\partial\psi}{\partial V} \geq 0, \quad \frac{\partial\psi}{\partial S} \geq 0 \tag{3}$$

where v(t) is the firm's net worth at time t, and the function ψ (v, S) defines the bank credit ceiling imposed on a firm with net worth v(t), at time t, when the state of credit market is indicated by S(t). The state of credit market depends, presumably, on an array of factors including the level of interest rates, the pace of credit policy, the stringency to which regulation and supervision on the banking sector is imposed. Its significance is to emphasize the possibility that credit supply to a particular firm may change as the result of macro and financial fluctuations, independently of the firm's credit worthiness, i.e. its net worth. Thus, in times of tight money, i.e., "bad times," borrowers that otherwise would have been considered eligible for credit are likely to face a more stringent credit evaluation process or simply denied loans. Also, for a given state of the credit market (i.e. for a given value of "S") the position of the credit ceiling will depend on the firm's investment and borrowing history (i.e. on its current net worth). There is, then, a second reason (apart from future output and profits) to invest now: by doing so, the firm can optimally relax tomorrow's borrowing constraint.

A graphical representation of the supply of credit schedule facing the firm under binding credit constraint is shown in Figure 2. The equilibrium point is shown by point E", where the firm's demand for credit intersects its supply schedule in the vertical portion. In this case investment will be constrained by supply of credit; indeed, we have $\rho > (1-\tau)r - x$, implying that there are investment opportunities with positive net present value which are not undertaken due to lack of availability of credit.

To solve for the firm's optimal time path of capital accumulation under credit constraint, we formulate the current value Hamiltonian, H(t) as:

$$H(t)=(1-\tau)\,[\pi(K(t))-[(1-\tau)r(t)-x(t)t\alpha]\,B(t)+b(t)-q(t)\tau(t)$$
$$-\lambda(t)\,(I(t)-\delta K(t))+\mu(t)\,(b(t)-\alpha B(t)) \qquad (4)$$

where λ (t) and μ (t) are the associated shadow prices of capital and debt respectively.

Taking into account the credit supply constraint (1), we define the Lagrangian L(t) as

$$L(t)=H(t)+\Omega(t)\,(\psi(V(t);S(t))-b(t)) \qquad (5)$$

where $\Omega(t)$ is the Lagrangian multiplier associated with bank credit ceiling (3). Given the assumption that there exists no uncertainty, the necessary conditions for an optimal solution are the following:

$$\dot{\lambda}(s)=(\rho+\delta)\,\lambda(s)-\left[(1-\tau)\,\frac{\partial\pi}{\partial K}-q(s)\,\Omega(s)\,\psi_v\right] \qquad (6.a)$$

$$\dot{\mu}(s)=(\rho+\alpha)\,\mu(s)+[(1-\tau)\,r(s)-x(s)+\alpha+\Omega(s)\,\psi_v] \qquad (6.b)$$

$$\frac{\partial L}{\partial b}=1+\mu(s)-\Omega(s)=0 \qquad (6.c)$$

Figure 1: Firm's Equilibrium Without Credit Ceilings

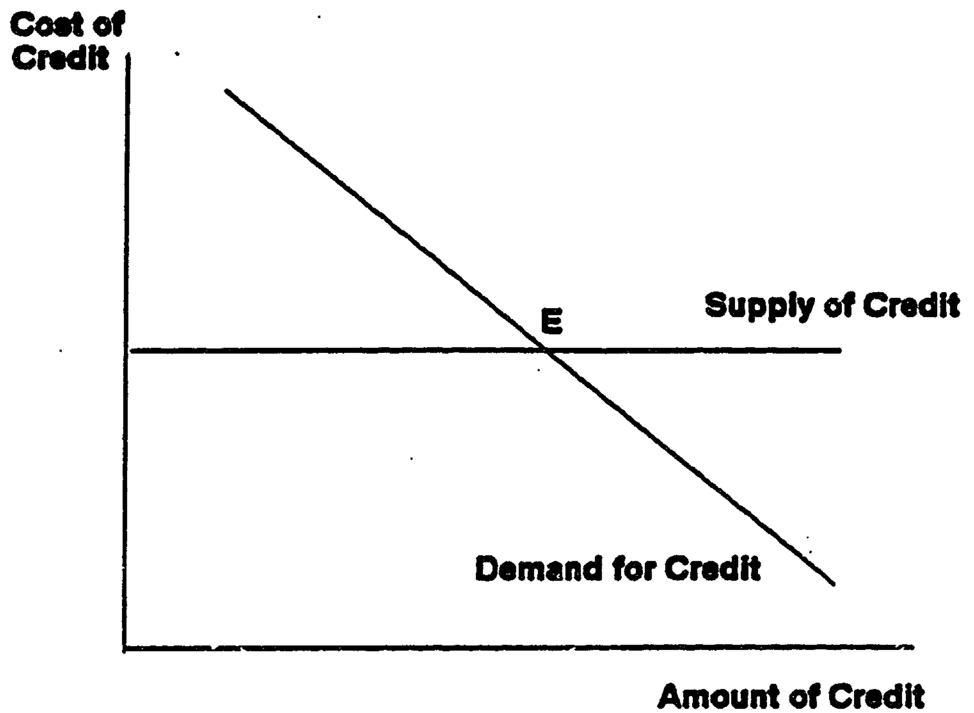
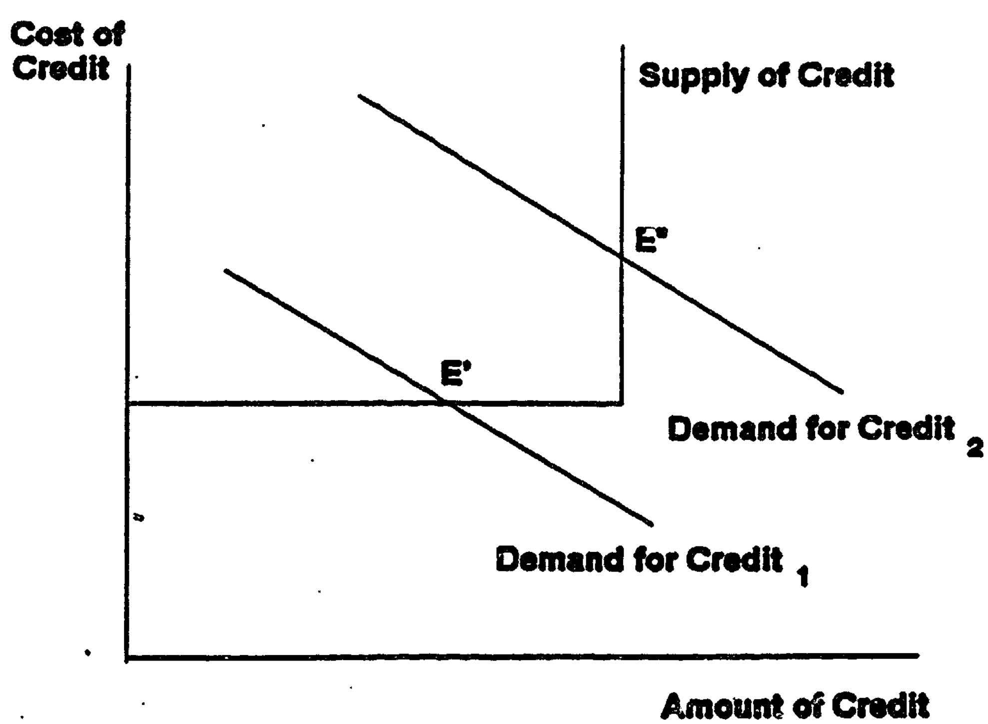


Figure 2: Firm's Equilibrium With Credit Ceilings



$$\frac{\partial L}{\partial I}=-q(s)+\lambda(s)=0 \qquad (6.d)$$

$$\Omega(s)\,(\psi(\upsilon(s);\delta(s))-b(s))=0 \qquad (6.e)$$

simplifying the above equations, we obtain the following two basic equations:

$$(1-\tau)\,\frac{\partial\pi}{\partial K(s)}=q(s)\,[\rho+\delta-\hat{q}(s)-\Omega(s)\,\psi_{\upsilon}] \qquad (7)$$

$$\hat{\Omega}(s)=[\rho+\alpha+\psi_{\upsilon}]\,\Omega(s)-[\rho((1-\tau)\,r(s)-x(s))] \qquad (8)$$

$\hat{q}$ is the rate of inflation in the price of capital goods.

Equation (7) describes the equilibrium condition for the firm's optimum level of real capital. It states that, at equilibrium, the firm's after-tax marginal profitability of capital [left-hand side of (7)], has to be equal to its cost of capital. Note that the cost of capital depends not only on the usual depreciation, discount and inflation rate but also on an extra term, which captures the effect of the credit ceiling on the firm's investment behavior; it describes the value of having an extra unit of capital today as a way of relaxing the borrowing constraint in the future (because, ceteris paribus, more capital accumulation today means more net worth tomorrow). Naturally, if the credit ceiling constraint (3) is not binding, $\Omega(s)=0$; and in that case the supply of credit facing the firm would be horizontal at the current rate of interest, and credit policy could affect investment only through the interest rate channel. But it is not difficult to see that so far a $\rho>(1-\tau)r-x$, or the real return on equity is greater than the after-tax real cost of debt; the credit constraint (3) must be binding. In that case, $\Omega(s)\neq 0$, which from equation (8) can be solved to yield;

$$\Omega(t)=\int_t^{\infty}\exp\left(-\int_t^{s}(\rho+\alpha+\psi_0(u))\,du\right)[\rho-(1-\tau)r(s)-x(s))]\,ds \qquad (9)$$

which is the capitalized difference in the real after-tax cost of debt and equity per unit of bank credit. To the extent that $\rho>(1-\tau)r-x$ or the real cost of debt falls short of the real cost of equity, a condition which is rather prevalent in most developing countries, debt is subsidized, and a measure of such subsidy is given by $\Omega(s)$ in equation (9).

From this equation it is also evident that the value of $\Omega(t)$ the shadow price of credit, depends on the future evolution of both interest rate and credit market conditions. Thus, if credit policy is expected to be tightened in the future, i.e. relatively low values of S(s); for s = t, t+1, t+2..., the firm would prefer to invest more today;[8] in this way, it will be holding a larger capital stock (and net worth) tomorrow, allowing easier access to credit when it is more scarce. Likewise, the prospect of rising interest rates accelerates investment today.

Finally, substituting for $\Omega(t)$ from equation (9) into equation (7) and solving that equation for the firm's optimum level of capital stock yields a function which would depend on the determinants of the firm's profits, the current and future values of interest rate, and other variables describing the

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[8] Of course, we are assuming that the "tighter" credit conditions do not affect the investment opportunities (and profits) of the firm. Also, notice that we are assuming away time-consistency and credibility problems. The government could promise a "loose" credit policy path (i.e. big $\Omega(t)$ for t = 0,1,2,..), get private firms to invest "a lot," and then tighten credit (say, for price stabilization purposes). If private agents know the government's objective function (they probably do over time), firms' investment plans will not be independent of the government's course of credit and, presumably, macro policy

future evolution of the state of credit market.

Thus, it can be concluded that, as long as the firm's discount rate is higher than its cost of debt, (i.e., profitable investment opportunities are available), the current level of investment depends on the future evolution of both interest rate and credit market conditions. This hypothesis provides the basis for our empirical analysis presented in the next section.

III. EMPIRICAL FINDINGS

In this section we will examine empirically the relationship between credit market conditions and private investment behavior for a sample of five developing countries, i.e. Brazil, Colombia, India, Korea, and Turkey, using annual data from 1965 to 1985. The main objective is to test for the partial and the joint influence of credit availability and interest rates (i.e. quantity and price constraints) on the behavior of aggregate, private investment in that sample of countries.

A preliminary plot (Charts I to V) of actual domestic credit and actual private investment (both as percentages of GDP) does not reveal any obvious link. In fact, aggregate private investment seems to exhibit its own independent pattern. It has declined steadily since the second half of the 70s in the two Latin-American cases, while domestic credit availability has tended to grow. Private investment remained flat both in India and Turkey, in the face of growing, albeit fluctuating, domestic credit supply. Korea is indeed the only country in the sample that exhibits an upward trend in aggregate private investment, although at a much slower pace than domestic credit.

Of course, our charts do not control for other factors affecting private investment decisions, most notably growth in real economic activity and expected real interest rate. A more thorough regression analysis is needed. Following our model's conclusions in the previous sections, we will specify a basic estimating equation that expresses the ratio of private fixed investment to GDP (noted by RIGDP), as a function of three variables: (i) the rate of growth in real GDP, (RGDPG); (ii) the expected future value of the ratio of total domestic credit to GDP (EDCGDP); and (iii) the expected future value of the real rate of interest (ERINT). That is:

$$PIGDP_{it} = \alpha_{0i} + \alpha_{1i}\ RGDPG_{it} + \alpha_{2i}\ EDCGDP_{it} + \alpha_{3i}\ ERINT_{it} + u_{it} \qquad (10)$$

where α_0, α_1, α_2 and α_3 are parameters to be estimated and u_t is an error term, and where the credit and interest rate variables indicate their expected, future values as of time "t". Subscript "i" denotes the country (i= Brazil, Colombia,...).

There exist several methodological problems with the straightforward, ordinary least squares (OLS) estimation of (10) on a country-by-country basis. First, the use of aggregate data makes the right-hand side variables endogenous, creating simultaneous-equation bias. For instance, in any given year "t", an unexpected macroeconomic shock (imbedded in the error term "u_t") is likely to drive not only aggregate private investment (the dependent variable) but also the rate of growth of real GDP (an independent one); in this case, the OLS regression coefficient for RGDPG will not only capture the direct effect of movements in this variable but also the indirect effect of random macro shocks. In other words, our estimate of the influence of RGDPG on its own right will be (in general) inaccurate.

Second, expected series are unobservable as we do not know what expectation formation mechanism (if any) agents employ. We need a way to proxy for those series.

Third, although we have succeeded in compiling consistent time series data on aggregate <u>private</u> investment for each country, they are still quite short.[9]

Fourth, the structure of the shocks affecting private investment have probably changed over the last two decades (most notably in Korea), raising the possibility of intra-country heteroskedasticity. For instance, the development of more active stock markets could have changed the structure (i.e. the distribution) of informational shocks affecting investment decisions.

To overcome (at least partially) those problems, we have pooled the country <u>equations</u> (not their data time series) and have estimated expression (10) as a simultaneous equation system (for i=Brazil, Colombia,...) by means of the three-stage least squares technique, constraining cross-country parameters to be zero. Specifically, we have estimated the following system:

$$\begin{aligned} PIGDP_{bt} &= \alpha_{0b} + \alpha_{1b}\, RGDPG_{bt} + \alpha_{2b}\, EDCGDP_{bt} + \alpha_{3b}\, ERINT_{bt} + u_{bt} \\ PIGDP_{ct} &= \alpha_{0c} + \alpha_{1c}\, RGDPG_{ct} + \alpha_{2c}\, EDCGDP_{ct} + \alpha_{3c}\, ERINT_{ct} + u_{ct} \\ PIGDP_{nt} &= \alpha_{0n} + \alpha_{1n}\, RGDPG_{nt} + \alpha_{2n}\, EDCGDP_{nt} + \alpha_{3n}\, ERINT_{nt} + u_{nt} \\ PIGDP_{kt} &= \alpha_{0k} + \alpha_{1k}\, RGDPG_{kt} + \alpha_{2k}\, EDCGDP_{kt} + \alpha_{3k}\, ERINT_{kt} + u_{kt} \\ PIGDP_{qt} &= \alpha_{0q} + \alpha_{1q}\, RGDPG_{qt} + \alpha_{2q}\, EDCGDP_{qt} + \alpha_{3q}\, ERINT_{qt} + u_{qt} \end{aligned} \qquad (11)$$

9/ Twenty-one observations per country, from which lead and lags are to be discounted.

where: "b"=Brazil, "c"=Colombia, "n"=India, "k"=Korea, "q"=Turkey. As before, "t" stands for time period.

It is worth noting that we have pooled the countries' equations, not their time series; for example, Brazil's and Korea's real GDP growth rates are treated as different variables and, hence, will have different estimated regression coefficient. Accordingly, we have generated a regression coefficient for each variable in each country[10].

This econometric set-up is particularly useful as it allows us to profit from the existence of cross-country contemporaneous correlation of the disturbances[11]. That correlation has probably been generated by international macroeconomic developments; for example, in each country, the oil shocks affected the observations for the years 1973 and 1979.

As for the estimation itself, we have used three-stage least squares; this technique has allowed us to incorporate enough instrumental variables in order to deal with the problem of the endogeneity of the right-hand side

10/ Other commonly-used pooling techniques pool variables according to their economic meaning, with no consideration for country differences. Thus, for example, real GDP growth in Brazil is pooled together with Korea's in a single series. Then, only one regression coefficient is generated per "pooled" variable.

11/ In a separate exercise, we estimated each country's equation individually through two-stage least squares. The corresponding Breusch-Pagan test on the residuals has shown significant contemporaneous correlation, suggesting the suitable joined estimation of the equations. Also, no statistically significant coefficient was obtained whatsoever; in that sense, the much better performance of the simultaneous-equation approach points to the shortness of the series as the probable cause for the initial lack of precision.

variables. The latter feature has been particularly relevant as we have proxied expected values by actual ones, instrumenting them with their first (respect to expectation formation time) lag. At the same time, we have estimated heteroskedasticity-consistent standard errors (of the White-Chamberlain type).

Our findings are contained in Panels A, B and C of Table 1. When current (i.e. at time "t"), actual credit and interest rate series are used as proxies (and their first-lags as their instruments) for those variables own future path, the results are mixed. In three out of five countries the expected credit availability variable shows up positive and significant (very much so in Korea and Turkey), while it remains insignificant for the rest. Quite a similar pattern for interest rates: negative and significant in Brazil and Turkey, insignificant in India and Korea, but surprisingly positive and significant in Colombia. (See Panel A, Table 1).

The results improve considerably when one-year-forward, actual credit and interest rate series are employed (instrumented by their first lags). The credit variables are now statistically significant, implying a positive role for credit availability in the determination of private investment in all countries. As for interest rates, they are also significant throughout, but with counter-intuitive signs both in Colombia and India (See Panel B, Table 1).

In Panel C of Table 1, we combine the proxies that appeared most suitable in the previous Panels. That is, we use one-period-forward credit and current interest rates (both actual ones, and instrumented by their respective first lags). The results are quite conclusive. The credit variables are again positive and (very) significant in all countries, while interest rates are either significantly negative or statistically irrelevant.

We have so far concentrated in the statistical significance of individual parameters in our "system" of equations; traditional t-statistics suffice for that purpose.[12] We next test for the joint significance of credit and interest rate variables in each country. In other words, we want to compare the results from the full estimation of (11) with those of the estimation of (11) after the credit and interest rate variables of a given country are removed (i.e. their regression coefficients are restricted to be equal to zero). For that purpose, we have compared successively the residual performance of the unrestricted estimation of the whole system with its restricted counter-parts, being the restriction applied to one country's equation at a time.[13] The results were straightforward: for none of the specifications in Panel A through C of Table 1, and for no country, could we accept the hypothesis that the credit and interest rate variables are not relevant (See Table 2). In other words, both the credit supply and the interest rate matter, jointly, for private investment outlays.

12/ See, for instance, Judge et.al. (1985) Chapter 15.

13/ See Judge et.al., op.cit., Chapter 15 for the specification of the corresponding χ^2-distributed statistic.

TABLE 1
Regression of aggregate private investment rate on real growth of output, real interest rate and credit supply
(Annual data 1965-1985)

$$PIGDP_{it} = \alpha_{0i} + \alpha_{1i} * RGDPG_{it} + \alpha_{2i}\ EDCGDP_{it} + \alpha_{3i} * ERINT_{it} + u_{it}$$

Parameter	Brazil	Colombia	India	Korea	Turkey
		Panel A			
α_0	0.144	0.142	0.088	0.165	0.018
	(3.90)	(7.00)	(25.3)	(9.22)	(1.24)
α_1	0.249	0.159	0.064	0.029	0.135
	(3.44)	(1.59)	(1.16)	(0.42)	(4.53)
α_2	0.264	-0.091	0.013	0.140	0.142
	(2.56)	(-1.04)	(1.21)	(5.60)	(4.13)
α_3	-0.210	0.112	-0.013	-0.001	-0.056
	(-2.13)	(2.61)	(-0.36)	(-0.02)	(-4.30)
		Panel B			
α_0	0.080	0.061	0.085	0.122	0.040
	(3.48)	(2.60)	(23.4)	(7.52)	(3.12)
α_1	0.054	0.075	0.026	0.089	0.006
	(1.41)	(0.61)	(1.89)	(1.31)	(0.22)
α_2	0.409	0.299	0.026	0.220	0.110
	(4.42)	(3.18)	(2.81)	(8.8)	(3.33)
α_3	-0.155	0.093	0.029	-0.129	-0.061
	(-2.35)	(2.15)	(3.04)	(-2.41)	(-5.22)
		Panel C			
α_0	0.70	0.063	0.083	0.130	0.026
	(2.80)	(2.76)	(23.0)	(7.63)	(1.63)
α_1	0.169	0.144	0.040	0.067	0.098
	(3.34)	(1.37)	(1.24)	(0.98)	(2.91)
α_2	0.406	0.258	0.30	0.207	0.126
	(4.02)	(2.69)	(3.47)	(8.21)	(3.08)
α_3	-0.121	0.059	0.006	-0.005	-0.062
	(-2.10)	(1.28)	(0.27)	(-0.09)	(-3.65)

Heteroskedasticity-consistent t-statistics in parenthesis

TABLE 2

Are the Capital Market Variables Jointly Significant in each Country?

H_o: $\alpha_{2i} = 0$, $\alpha_{3i} = 0$ **for i = Brazil, Colombia...**

(Critical X^2 at 95% confidence and 2 degrees of freedom: 5.99)

PROXIES ARE:	BRAZIL	COLOMBIA	INDIA	KOREA	TURKEY
$DCGD_t$ $RINT_t$	11.59	6.86	1.93	32.47	25.24
$DCGD_{t+1}$ $RINT_{t+1}$	38.09	21.90	10.85	85.25	33.98
$DCGD_{t+1}$ $RINT_t$	23.31	11.50	13.25	68.61	18.41

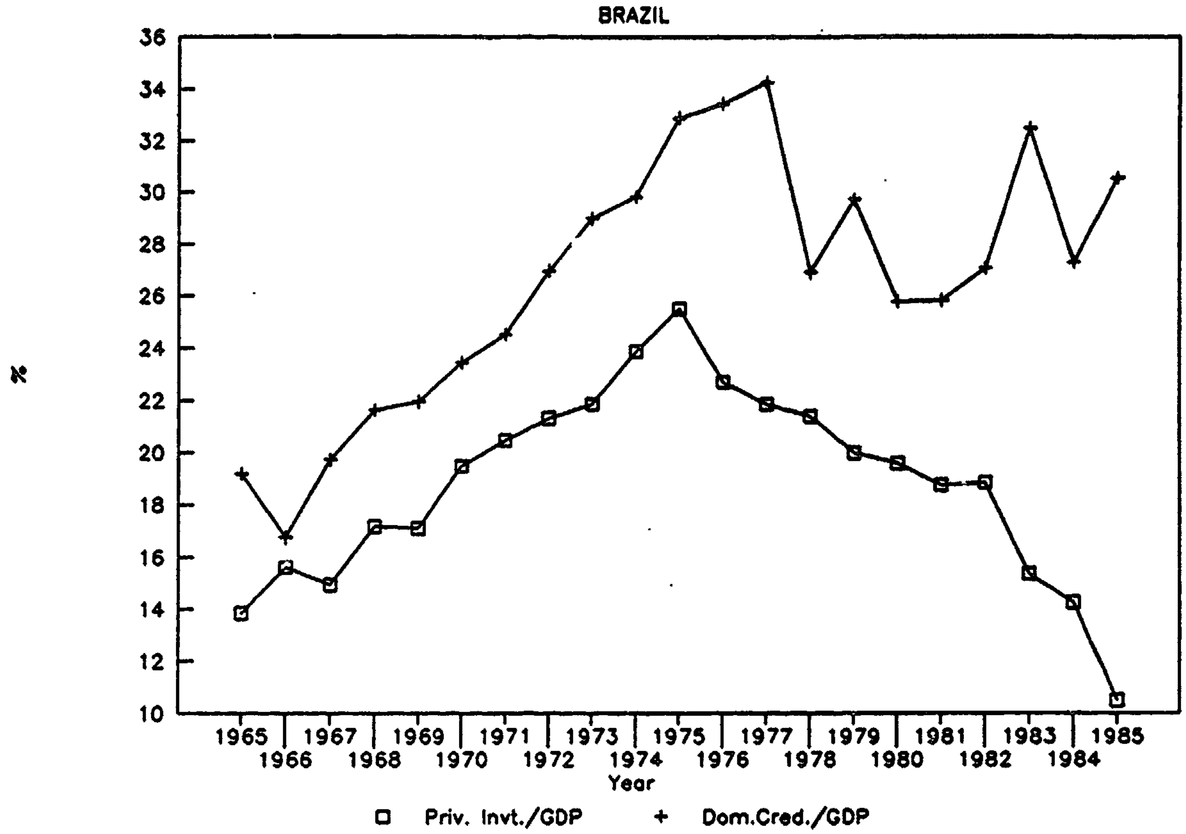
IV. CONCLUSION

In their decisions to extend loans, banks are known to be concerned not only with the creditworthiness of the individual borrower, but also with broader issues relating to the stance of credit and interest rate policy, regulatory and supervisory practices, and market sentiments. These factors are often referred to as determining the state of the credit market, and their significance lies in their influence on banks' degree of conservatism and credit rationing. They thus affect the banks' loan supply decisions independently of the creditworthiness; i.e. net-worth of individual borrowers. Thus, in times of tight money, or in "bad times," borrowers that otherwise would have been considered eligible are likely to face a more stringent credit evaluation process or simply be denied loans. As a consequence, firms' investment plans may have to be postponed or cut back.

Motivated by this phonomenon, this paper has developed a simple model of firms' investment behavior in an economy with exogenous, time-varying borrowing constraints. A particular form of credit ceiling linked to the firm's net-worth and to the state of credit market is introduced. The model suffices to illustrate the main theoretical message of the paper: It is the joint impact of both the volume of credit and its price, i.e. interest rate, which is relevant to firms' investment decisions. Thus, focusing on the impact of interest rate changes in assessing the role of credit policy on investment and growth is misleading to the extent that such changes are accompanied by changes in the volume of credit as well.

The model is then used to specify an equation relating aggregate private investment to aggregate output, and two credit market variables; real interest rate and aggregate credit. The equation was estimated, using annual data (1965-85) for a sample of five developing countries, i.e. Brazil, Colombia, India, Korea, and Turkey, and the joint significance of both interest rate and credit supply conditions are tested. The evidence strongly supports the joint influence of interest rates and credit volume on the behavior of private investment in these countries. This supports the theoretical conclusion of the paper that effective credit policy in the context of developing countries must acknowledge the influence of both the credit supply and the interest rate channels. This provides a useful point of convergence between previous approaches to credit policy and its role in the stabilization and adjustment processes of developing countries, which have either emphasized the role of the availability of credit, or its price; i.e., the interest rate.

Chart I


BRAZIL
%
36
34
32
30
28
26
24
22
20
18
16
14
12
10
1965
1966
1967
1968
1969
1970
1971
1972
1973
1974
1975
1976
1977
1978
1979
1980
1981
1982
1983
1984
1985
Year
Priv. Invt./GDP
Dom.Cred./GDP

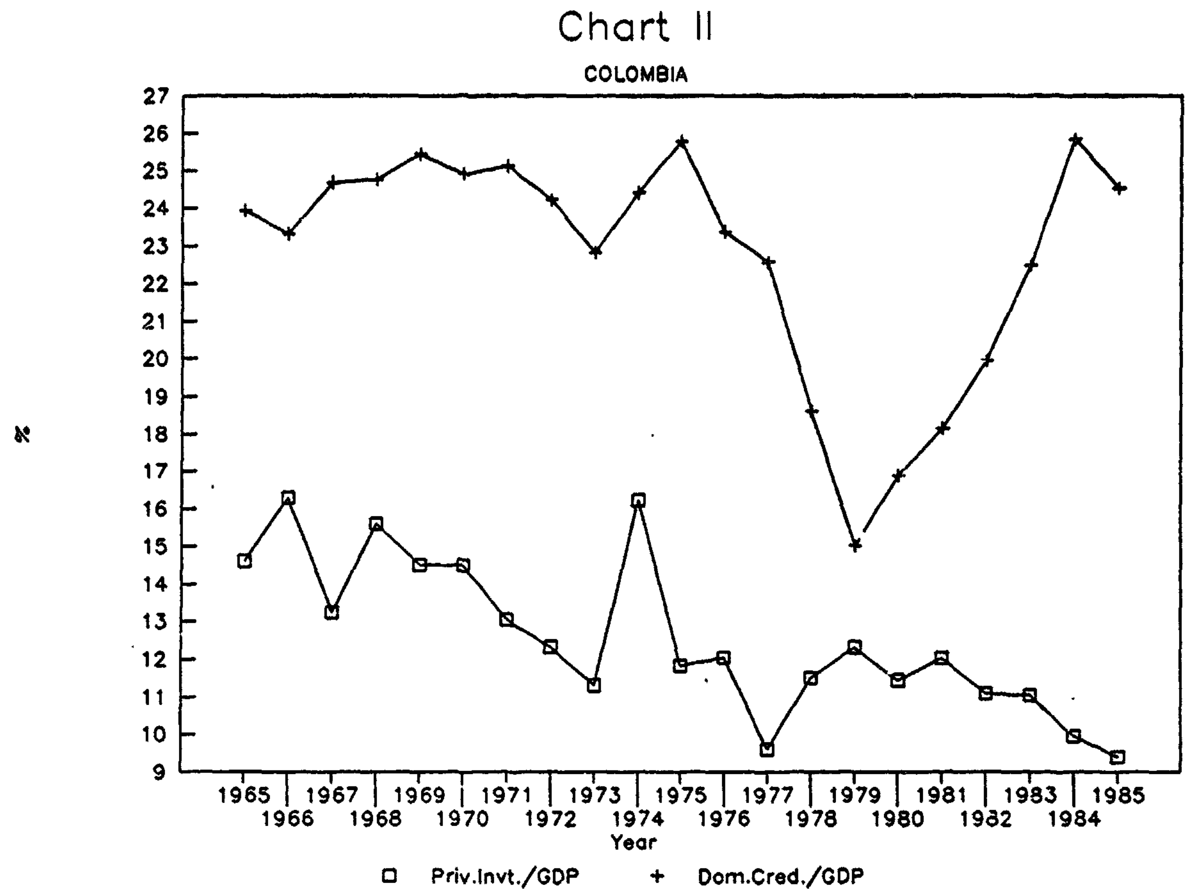


Chart II
COLOMBIA
27
26
25
24
23
22
21
20
19
18
17
16
15
14
13
12
11
10
9
%
1965
1966
1967
1968
1969
1970
1971
1972
1973
1974
1975
1976
1977
1978
1979
1980
1981
1982
1983
1984
1985
Year
Priv.Invt./GDP
Dom.Cred./GDP

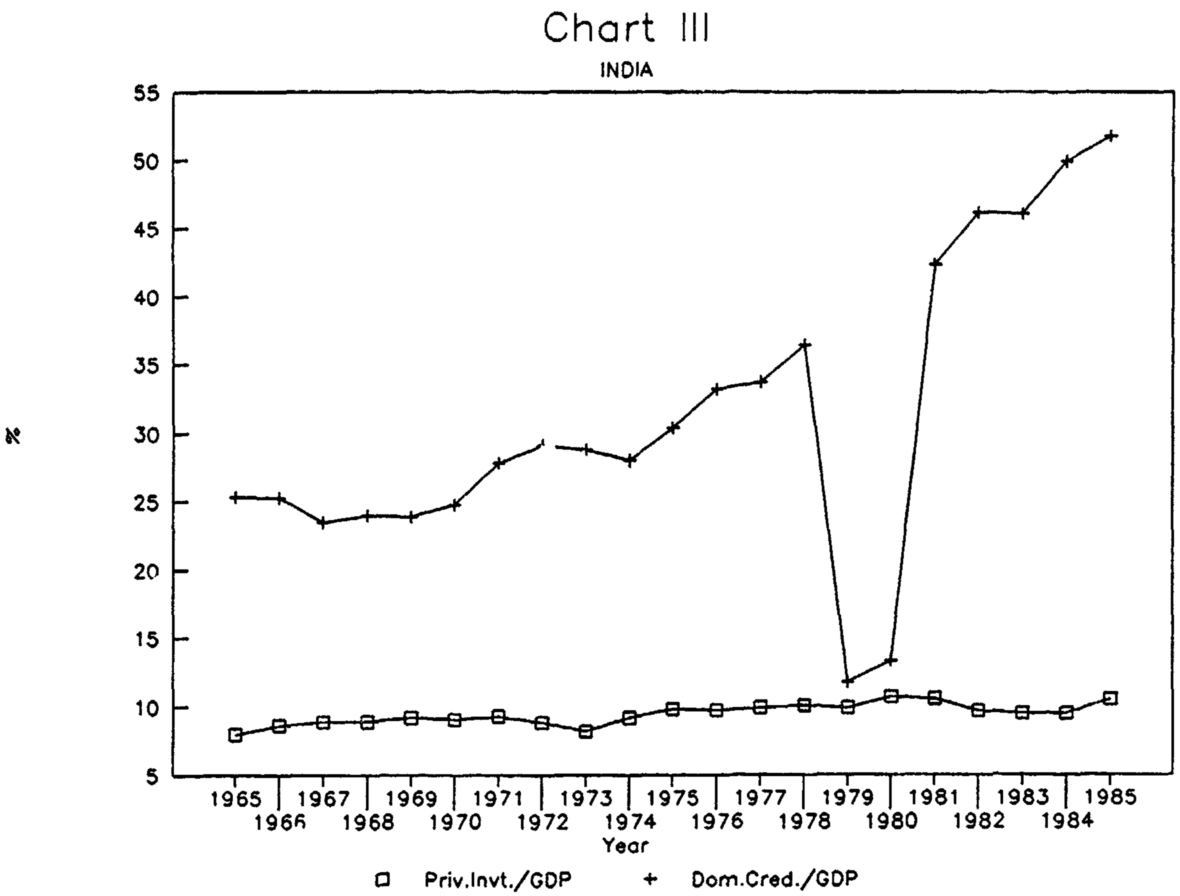


Chart III
INDIA
55
50
45
40
35
30
25
20
15
10
5
%
1965
1966
1967
1968
1969
1970
1971
1972
1973
1974
1975
1976
1977
1978
1979
1980
1981
1982
1983
1984
1985
Year
Priv.Invt./GDP
Dom.Cred./GDP

Chart IV

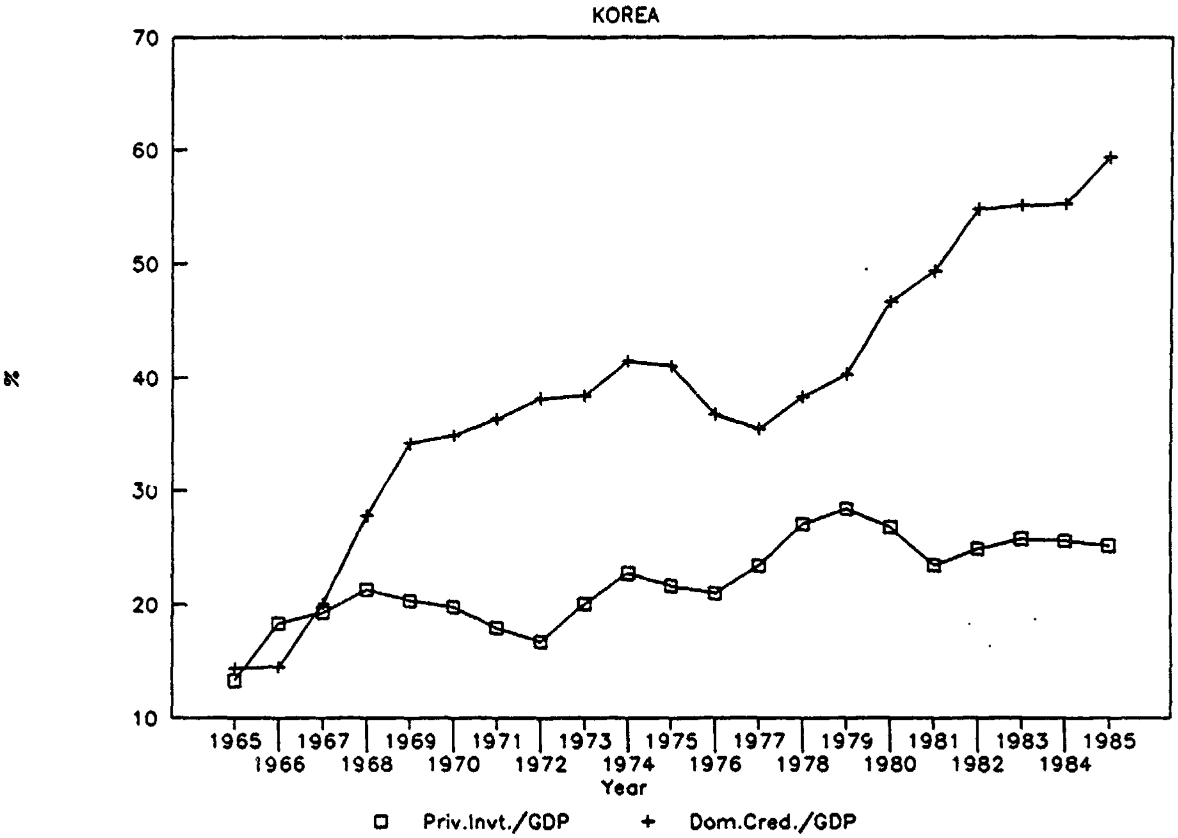
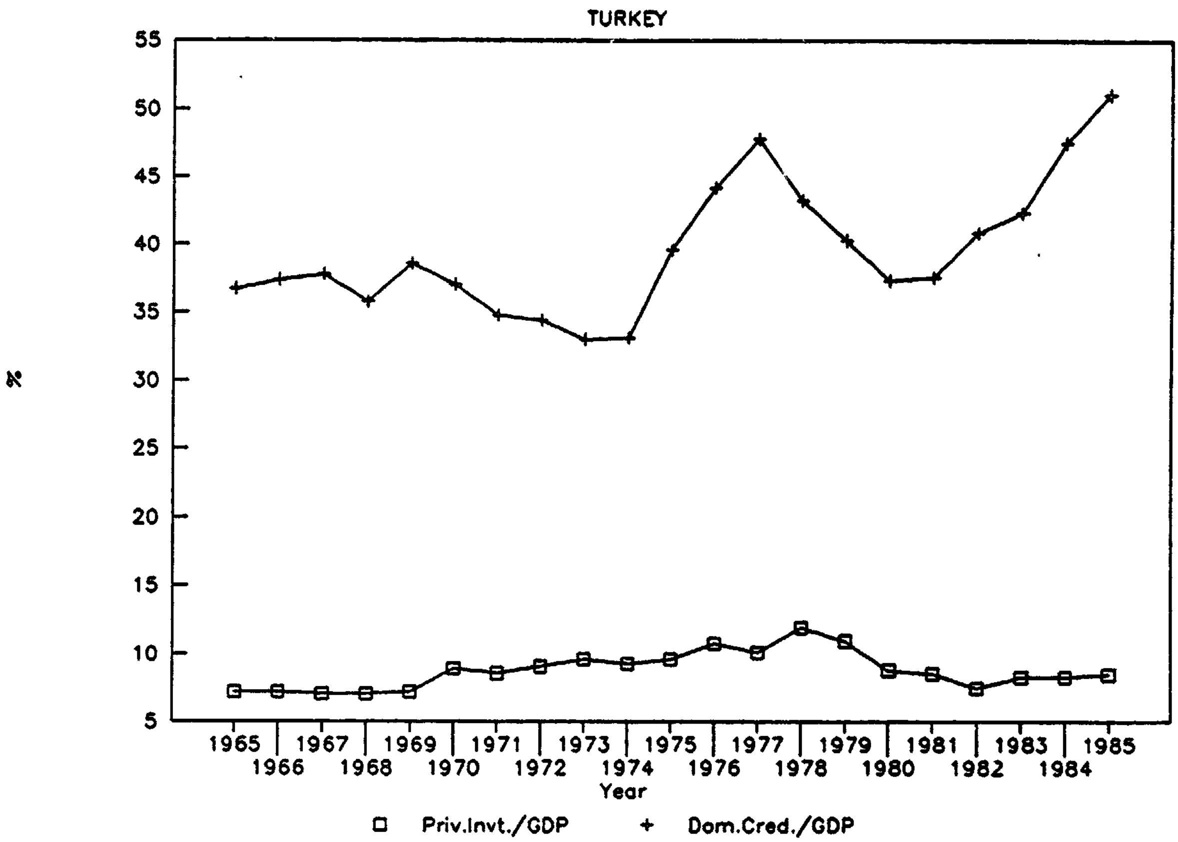

KOREA
70
60
50
40
30
20
10
%
1965
1966
1967
1968
1969
1970
1971
1972
1973
1974
1975
1976
1977
1978
1979
1980
1981
1982
1983
1984
1985
Year
Priv.Invt./GDP
Dom.Cred./GDP

Chart V


TURKEY
55
50
45
40
35
30
25
20
15
10
5
%
1965
1966
1967
1968
1969
1970
1971
1972
1973
1974
1975
1976
1977
1978
1979
1980
1981
1982
1983
1984
1985
Year
Priv.Invt./GDP
Dom.Cred./GDP

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