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Financial Market Constraints and Private Investment in a Developing Country

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Abstract

Firms in developing countries that seek outside financing for investment must often choose their debt-equity combinations in the face of financial market constraints on debt service, on outside equity financing, and on internal finance (endowments). Inefficiencies in the allocation of available finance and in the equity-debt choices that can ensue can be prevented by appropriate policy measures to improve information on profitable investment opportunities and about firms; to directly strengthen financial intermediation; and to support appropriate credit guarantee schemes.

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I. Introduction

For structural adjustment to occur, it is usually helpful for firms in sectors that optimally should expand to have increased access to outside financing, and for financial markets to facilitate the process by diverting funds away from sectors that should contract. In such circumstances, it is not uncommon to find data indicating that in light of macroeconomic objectives total credit is "adequate," whereas firms in the sectors targeted to expand complain that credit is too "tight" for them to attain their sectoral and subsectoral investment plans. In the absence of additional measures, investment will tend to decline in the contracting sectors without substantial increase in investment taking place in the sectors where firms want to expand. Thus, understanding the way financial markets function can significantly improve policy formulation and implementation. In this regard recent developments in the economics of credit rationing by banks 1/ and the analysis of stock price behavior, when new issues are announced, 2/ as well as the discussions of mergers and takeovers, 3/ have improved our theoretical understanding of important aspects of the workings of financial markets--at least in countries where such markets are well-functioning.

During structural adjustment the efficiency of the financial sector is often affected by its state of health. More specifically, the sector is often in distress for some length of time during structural adjustment, mainly because a long history of effective taxation of the financial institutions, via interest rate and credit controls, high reserve requirements, and overvalued currencies, damaged the financial health of the institutions, restricting their ability to cope with a changed (and more appropriate) macroeconomic regime, or with external shocks. 4/ This fact, in addition to an overhang of bad loans due to mismanagement, often leave the financial sector with highly restricted lending capacity to assist the firms that should expand. The problem is only aggravated by the notion of the financial institutions being "locked-in" with old clients, and hence being under pressure to roll-over, or even extend additional loans so as to prevent bankruptcy of their established clients. Not only do these factors limit the funds available for lending to other customers but in order not to aggravate their financial distress, banks become even more cautious and conservative in their operations--notably in their lending for new ventures.

In the developing countries, outside financing for production and investment is usually dominated by banks that maintain close ties with their

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1/ See, e.g., Stiglitz and Weiss (1981, 1986); Greenwald, Stiglitz and Weiss (1984), Bester (1985); and De Meza and Webb (1990). Important to this literature have been Akerloff (1970), and Rothschild and Stiglitz (1976).

2/ See, e.g., Ross (1977), Easterbrook (1984), Myers (1984), Myers and Majluf (1984), Asquith and Mullins Jr. (1986).

3/ See for introduction, Jensen (1986, 1988) and Myers and Majluf (1984).

4/ See, e.g., Gelb and Honohan (1989), World Bank (1989).

customers--supervising and monitoring their activities on a continuous basis. In other words, unlike the Stiglitz-Weiss type of framework, in this study, banks know how the money they lend will be invested; whether or not a bank grants a loan or not will depend on its view of the firm's entrepreneurial ability and the profitability of its overall operations. Banks not only have good information about the distribution of abilities in the population of entrepreneurs but also about the ability of individual entrepreneurs. In our view such close ties and knowledge enable banks to allocate credit according to rules reflecting their judgment about debt-servicing capacity of individual firms.

Another significant element of financial markets in developing countries is that the firms that enter them for finance are often closely-held, often family-owned, nonpublic institutions. Hence, one can safely model such institutions as comprising two kinds of residual income claimants (equity holders)--viz., insiders and outsiders. Insiders are those who (or their progenitors) established an enterprise and are often involved in the day-to-day management of the firm. Outsiders are those who have equity in the firm but do not assist in its management; their interest is strictly as an investor.

A third and pertinent aspect of many developing countries is that potential equity subscribers do not have well-functioning equity markets in which to operate; also balance sheets, and profit and loss information about firms are not easily accessible. In these circumstances such equity subscribers (investors) will tend to look to banks for signals about relative profitability of investment in different enterprises. Indeed, since firms wanting to expand their capacity will often approach potential investors, to seek equity participation, the investors will, on such occasions, use the firms' relations with banks as a signal for soundness.

The corporate finance literature has documented that the decision of a firm to issue equity causes the firm's value (and hence the price of its shares) to fall. This occurs because, inter alia, markets assume equity is sold by inferior firms or that strong firms sell equity only when their shares are overpriced in relation to the market value of the firm's assets. Hence, within certain limits, equity sales give negative signals to the market while debt issues give positive signals (see Ross (1977), Myers and Majluf (1984), Asquith and Mullins Jr. (1986).

In the model presented in this paper the positive signals given by debt issues lead investors to demand that a firm issues debt before they will be willing to subscribe to its equity at a price that will be acceptable to the inside equity holders (the old shareholders). This will be in addition to the costs of issuing equity which may also include an implicit discount on the firm's shares relative to their true market value.

The model of this paper, although different, is in the same spirit as a recent model by Calomiris and Hubbard (1990) who show that external finance

(basically debt) will be differentially available to entrepreneurs--holding constant their project opportunities--according to their internal net worth. Some empirical support for this view also exists; see Calomiris and Hubbard (1990), Fazzari et al (1988). As a model involving a signal, the paper is also in the spirit of Ross (1977), and Leland and Pyle (1977). In the case of the former author, managers provide signals in the form of the face value of the debt they issue. For Leland and Pyle the signal is the fraction of the firm's equity that the managers (entrepreneurs) plan to hold. In the model of the present paper the role of the signal is merely to constrain choice of debt and equity and the firm does not search for the optimal level of the signal. In addition, the natural concern about the possibility of false signals when constructing signalling models does not detain us here; we assume that investors can easily check, and hence know, whether or not the minimum debt requirement is being met.

Obviously the paper is concerned with a world of imperfect information, underdeveloped financial markets, and investing firms in which one can safely distinguish insiders from outside investors. There is imperfect information, and hence uncertainty, about the representative firm's internal rate of return on future operations and about its future willingness and capacity to service its debt. In such a developing country, it is argued that a firm seeking outside finance will confront three basic constraints on account of bank and investor behavior in the domestic financial markets--an internal financing constraint, a debt service constraint, and a cofinancing constraint on equity. The paper focuses on the implications of these constraints and their effects on the ability of firms to finance their profitable investment projects.

The paper is organized as follows: Section II, presents the basic financial constraint model. Section III outlines the challenge to public policy, posed by the constraints and Section IV, discusses possible measures that can be taken to alleviate the constraints. Finally, in Section V some brief concluding remarks are made.

II. The Model

In the basic model of this paper, there are three sets of agents, viz., firms that are undertaking projects, banks that are granting credit, and investors who are suppliers of (outside) equity finance. The representative firm has a single project of size V (measured in money terms). The financing of this project is met partly with internal funds (W) of the firm and partly with outside funds (F). The latter can be debt (F_D or simply D), obtained from banks, or outside equity (F_E) provided by investors. This also implies that the equity (E) in the financing of V is made up of inside and outside equity.

Without loss of generality time is not explicitly treated in the model, but we can think of the model as a two-period one. At time t = o the project is planned, the financing arranged, the representative firm incurs

certain costs in raising the equity, and the investment in the project takes place. Then in time period t = 1 the project yields its fruits, given that there is full repayment of debt the banks get paid D(1 + i) where i is the rate of interest charged by the representative bank, and the investors receive their share, σ, of the profits (return) after debt has been repaid.

We deal with the issue of cost of funds to the firm in a straightforward manner. The firm has an alternative to investing W in its project which is to deposit the funds in the representative bank and earn the deposit rate r (with $r \leq i$). The cost of issuing equity to the firm has two components--a transactions cost component and a cost of equity capital component. Suppose the investors and the firm agree on profit shares of σ for the former and $1 - \sigma$ for the latter. Generally speaking, in a private transaction, σ would be negotiated explicitly; in a public issue of shares σ is the number of shares purchased for F_E divided by the total number of shares in the firm (assuming all shares are of one type). Let the actual rate of return to the investment be equal to that expected by the firm and symbolized by $\bar{\rho}$; the expectation of the investors may or may not be different. Then the marginal cost of equity capital (γ) is considered to be the following:

$$\gamma = \frac{\sigma\,[(1 + \bar{\rho})\,V - D(1 + i)]}{F_E} - 1 \qquad (1)$$

The transactions cost component can be regarded as a fixed cost; but γ will tend to vary with V and F_E because $\bar{\rho}$ and σ will change respectively as the first two parameters change (explained later on). In any event, we shall talk generally about the marginal cost (c') of issuing equity which, as has been intimated, will be virtually equivalent to γ.

Consistent with the pecking order (or financing hierarchy) framework, it is hypothesized in this paper that, up to a certain level of financing, (other things being equal), the marginal cost of equity financing is greater than that of debt financing. That is, the supply curve of outside equity lies above that of debt, up to a certain level of financing. Similarly, the marginal cost of internal financing lies below that of debt, at least up to a certain level. Hence, in the financing of their investments, firms behave as if they prefer internal to external financing and debt to equity (see, e.g., Myers (1984), Myers and Majluf (1984), Fazzari et al (1988)). In other words, this pecking order in firms' decision-making is an outcome of actions (e.g., screening, credit rationing, equity price dilution) taken by creditors and outside equity subscribers in response to agency costs, moral hazard, and significant variance of the outcomes of investments. The latter are themselves the result of imperfect and asymmetrical information, or, more generally, of substantial costs of acquiring and transmitting

information, as well as of unpredictable (policy and nonpolicy) shocks to investment. 1/

Consider now an economy comprised of private firms that find it optimal to finance their investments mainly with internal funds (W). When the firms seek external financing (F) they depend heavily on banks which are the only providers of credit--i.e., debt financing (D). But the firms can also raise equity (E), subject to the constraints discussed below. When equity financing is sought it is done either through a formal equity market or through private arrangements with friends, relatives, or acquaintances who are willing to be passive partners. In any event the equity market cannot be said to be well-functioning and lacks a high degree of efficiency. 2/ More importantly, for our purposes, the typical potential outside equity subscriber has highly limited independent knowledge of the profitability, creditworthiness, and entrepreneurial ability of the typical firm.

1. Bank credit

Banks are assumed to possess far greater knowledge about firms and their investment projects than do outside equity subscribers (investors). Banks also closely monitor and often advise customers in their financial management and investment project choices. Even so, the probability of project failure is not zero and the risk of default from moral hazard can also not be reduced to zero.

The representative bank is regarded as fixing interest rates (including commissions) and rationing credit among its clients so as to equate the expected rate of return per dollar of loan among the clients. For a given client the bank extends a certain amount of credit (D) in period $t = 0$. In the next period ($t = 1$) the client repays, net of interest, the full amount of the loan with a probability μ, or else an amount D_u which is less than D with a probability $1 - \mu$. Nothing essential is lost by assuming that these are the only two possible outcomes. D_u, for instance, can be collateral net of interest charges which the bank obtains from the client in case of default. Suppose ϕ is the bank's desired gross rate of return on its funds; ϕ, for example, can be the cost of funds to the bank plus a mark-up as a charge for its services. Then, in principle, the interest charged to a client will be:

$$i = \frac{\phi D}{\mu D + (1 - \mu) D_u} \qquad (2)$$

1/ In addition to the references given above see also Modigliani and Miller (1958), Jensen and Meckling (1976), Gertler (1988), Calomiris and Hubbard (1990).

2/ For useful introduction to the literature on capital market efficiency see Fama (1970), Tobin (1984), Summers (1986).

where μ and D_u/D may differ among clients. The bank, through its collateral policy, can affect D_u/D and, in particular, can try to equate this magnitude among its customers. The focus here is on μ the probability of full reimbursement of debt; it is posited that μ tends to decline as the ex ante debt service ratio of the firm (client) increases. Thus, μ is affected by the profitability of the firm's project, by the firm's moral rectitude (and hence willingness to repay when it can do so) as well as by the interest charged the firm (which affects its ex ante debt service). In short, the bank finds that it must fix both the interest rate and the amount of the loan (D) it offers to the firms. In fact, it is assumed throughout that the bank does not vary the interest rate charged the representative firm; rather the bank varies the credit offered.

We assume that the representative bank specifies, for the representative firm, a maximum permissible ratio of debt service (S) to projected gross receipts (Y) of the firm; in short there is a debt service constraint; this ratio is symbolized as ϵ. To simplify the analysis the gross receipts are the average annual flow during the decision-making horizon of the bank. They are, in addition, the bank's best estimates using, inter alia, information obtained from the firm.

Let E represent the equity of the firm, ρ the rate of return on the firm's investment (or capital) as projected by the bank, and i the rate of interest (including commissions) charged the firm by the bank; ρ is an expected value which we will assume exhibits diminishing marginal returns as V is increased, at least after a certain level of V. In addition, let D be the outstanding debt of the firm to the bank. For compactness, define $\hat{i} = 1 + i$ and $\hat{\rho} = 1 + \rho$. We then have:

$$S = \hat{i}.D \tag{3a}$$

$$Y = \hat{\rho}.(E + D) \tag{3b}$$

$$S/Y = \frac{\hat{i}.D}{\hat{\rho}.(E + D)} \tag{4}$$

As stated above, we also have a debt-service constraint, such that $S/Y \leq \epsilon$, where ϵ is the maximum debt-service ratio the bank is willing to allow the firm, based on risk considerations associated with agency costs (including moral hazard). The debt-service constraint has implications for the debt-equity ratio (that is, the leverage) of the firm. In brief, in the equilibrium of the firm, we would have

$$D/E \leq \alpha \tag{5}$$

where

$$\alpha = \frac{\hat{\rho}/\hat{i}}{(1/\epsilon) - (\hat{\rho}/\hat{i})}$$

and it is assumed that $1/\epsilon > \hat{\rho}/\hat{i}$. The contract offered by the bank to the firm has two arguments, namely, interest rate (i) and the debt outstanding of the customer, such that the inequality (5) is satisfied.

2. Equity

Since potential equity subscribers do not have much independent information about the representative firm, they seek guidance from the bank--an institution with comparative advantage in assessing the profitability and creditworthiness of the firm. The investor in essence uses the bank's behavior as a signal for the soundness of a firm issuing equity. As a result the representative outside equity subscriber imposes a cofinancing constraint on the firm; for every dollar of outside financing sought by the firm, it must obtain a minimum fraction, θ, from the bank. *The firm is assumed to know this* θ.

More fundamentally, we have posited that c' increases with F_E mainly because γ does. Recall that the ratio of debt to outside finance is equivalent to unity minus the ratio of outside equity to outside finance; that is, $D/F = 1 - (F_E/F)$. The point now is that γ approaches infinity as D/F approaches θ starting from unity (or as F_E/F approaches $1 - \theta$). One can visualize the ratio of σ (the investor's share in profits of the firm) to the proportion of the equity held by the investor--when computed at the correct (perfect foresight) market value of the firm--as rising with F_E/F. In our framework this comes about through explicit negotiation of σ, or, implicitly, via a fall in the price of the shares purchased by the investor in the open market relative to the market value of the assets in the firm to which they lay claim.

The firm, faced with the constraint θ may find it optimal to choose a D/F ratio which is different (i.e., greater than) θ. More specifically, as the ratio of external finance to project size (i.e., F/V) rises, the risk that the project's return (at time period $t = 1$) may fall below what is required to fully repay the debt will tend to increase with D/F. Outside equity, with its profit-sharing arrangement, does not have this risk. The firm wishes to avoid bankruptcy because of short-term bankruptcy costs and the adverse long-term implications for its ability to obtain finance through debt. Thus, as D/V increases, the firm's evaluation of the marginal cost of debt net of interest charges, tends to increase. *The effect is a tendency* for D/F to fall as F/V increases.

Due to the operation of the various factors under discussion, which affect the pecking order demand for outside finance and the cofinancing constraint imposed by the equity market, for the firm we hypothesize, the following demand relationship between debt and outside finance, at some specified interest rate:

$$\frac{D}{F} = \frac{\theta . \frac{F}{V} + 1}{(F/V) + 1} . \kappa \qquad \begin{matrix} 0 < \theta < 1 \\ 0 < F/V < 1 \\ 0 < \kappa \leq 1 \end{matrix} \tag{6}$$

where F is outside finance and V is the amount of the investment to be financed; note that F = V-W. The firm in essence chooses F/V and D/F, subject to the constraint that D/F cannot be less than θ. The parameter κ is constant given the rate of interest charged the firm and given the schedule for the marginal cost of issuing equity. A rise in i lowers κ while an upward shift of the marginal cost schedule of equity raises κ. We shall assume throughout the paper that for the representative firm i is constant, the marginal cost schedule for equity is given, and $\kappa = 1$. In short, the equilibrium demand relationship between D/F and F/V for the representative firm is given by:

$$\frac{D}{F} = \frac{\theta . F/V + 1}{(F/V) + 1} \qquad \begin{matrix} 0 < \theta < 1 \\ 0 < F/V < 1 \end{matrix} \tag{6a}$$

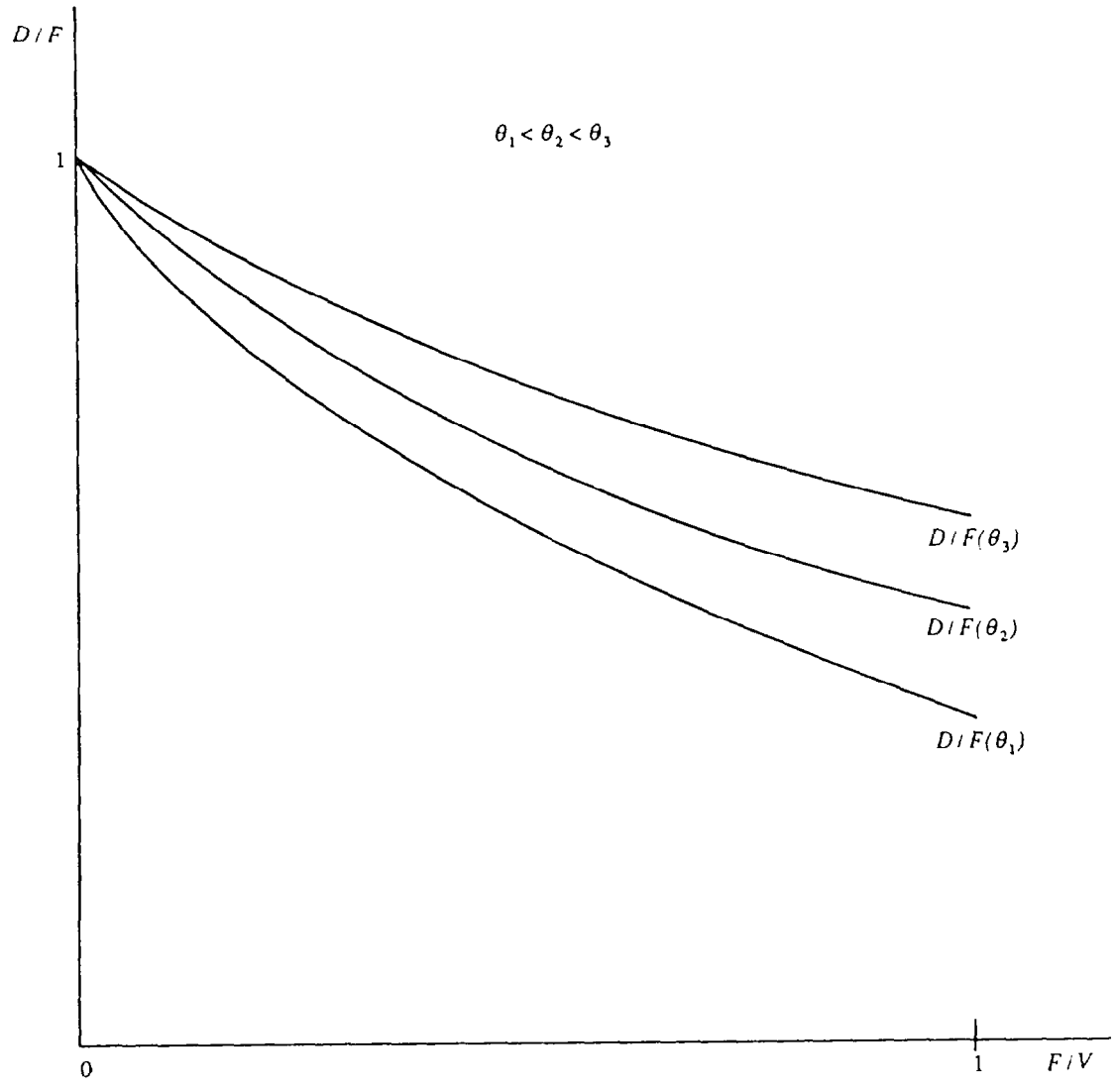
The relation (6a) would yield the equilibrium D/F as F/V changes given the constraint θ imposed by the market (or, more specifically, by outside equity subscribers).

The relation (6a) is shown graphically in Figure 1. The function is truncated at F/V = 1. The shape of the curve reflects the pecking order but the effective area for maneuver is restricted by the cofinancing constraint. D/F increases with θ but drops with F/V as illustrated in Figure 1. If increasing V is thought of as a surrogate for firm size, then it is seen that, as F/V increases, debt will rise relative to the size of the firm (i.e., D/V gets larger) even though D/F is declining. For there is both a scale factor (increasing F/V) and a substitution factor (equity instead of debt and therefore falling D/F) operating. D/V will also be increasing for any given θ, partly because of the cofinancing constraint and partly because of the pecking order choice. The rise in D/V due to the cofinancing constraint will be given by θ.F/V. 1/

There is another interesting implication of the basic relation (6a), namely, that leverage (D/E ratio) will tend to decline as outside finance increases in relation to total finance (capital) so long as, at the same time, internal finance (W) does not tend to decline rapidly in relation to debt.

1/ If we define the area under the D/F curve as Ψ then, by integration, we have $\Psi = \theta.F/V + (1-\theta)Ln(1+F/V)$ where Ln is the natural logarithm. This area approximates D/V but tends to be greater than D/V by a magnitude that increases as F/V approaches unity.

Figure 1. Relationship Between Debt Finance and Outside Finance



To establish this proposition recall that total investment is financed either by equity or by debt and that the firm's use of external finance is exactly equal to the difference between the total investments it makes and the amount of its own internal finance. Hence,

$$V = E + D \tag{7}$$
$$F = V - W \tag{8}$$

Making use of equations (7) and (8) we have

$$\frac{E}{D} = \frac{F}{D} - 1 + \frac{W}{D} \tag{9}$$

Substituting (6a) into (9) and using the inverse of F/D, if the firm is operating on its D/F schedule and its plans are realized, we have,

$$\frac{E}{D} = \frac{F/V(1-\theta)}{\theta.(F/V) + 1} + \frac{W}{D} \tag{10}$$

Thus,

$$\frac{\delta(E/D)}{\delta(F/V)} = \frac{1 - \theta}{[(\theta.F/V)+1]^2} + \frac{\delta(W/D)}{\delta(F/V)} \tag{11}$$

and we have declining leverage with increasing F/V as long as

$$\frac{1 - \theta}{[(\theta.F/V) + 1]^2} > - \frac{\delta(W/D)}{\delta(F/V)} \tag{12}$$

Since an increasing ratio of outside finance to investment tends to be one indicator of financial development, the implication is that the leverage will tend to decline with financial development if the ratio of internal finance to debt does not fall appreciably with financial development. 1/

1/ It is noteworthy that on average leverage does tend to be higher in developing country firms than in firms of industrial countries (see, e.g., Sundararajan (1985)). Although factors such as negative real interest rates on debt and favorable tax treatment of debt finance as compared to equity finance, are important reasons why this situation may occur; our analysis shows that the relatively less intensive use of outside finance may also play an important role.

3. Overall financing constraints

When both the credit market and equity market constraints are considered the overall constraints that are placed on the outside financing of the firm can be appreciated. Notice first of all that when the firm is operating on its debt demand schedule, equations (5) and (10) imply a level for the ratio of internal finance to debt, at the maximum debt-equity ratio set by the bank, as follows:

$$\frac{W}{D} = \frac{1}{\alpha} - \frac{F/V(1-\theta)}{\theta.(F/V)+1} \qquad (13)$$

Noting that W/F is equivalent to (W/D).(D/F) it is seen that in the absence of contact and cooperation between bank and investor (to be discussed later) the firm is able to increase its F/V satisfying its debt demand, the cofinancing equity market constraint, and the debt service constraint up to a point determined by its internal finance (W). That is, using (6a) and (13) the following relation between W/F and F/V is obtained:

$$\frac{W}{F} = \frac{1}{(F/V)+1}\left[\frac{1}{\alpha} + \frac{\theta}{\alpha}(F/V) - (1-\theta)\,F/V\right] \qquad (14)$$

More generally, in the absence of cooperation between bank and investor, for the firm to realize its plans for outside financing, and given its demand schedule for debt (6a), the relationship between W, F, and V, must be such that

$$\frac{W}{F} \geq \frac{1}{(F/V)+1}\left[\frac{1}{\alpha} + \frac{\theta}{\alpha}(F/V) - (1-\theta)\,F/V\right] \qquad (14a)$$

Hence, the smaller α is and the larger θ is the greater is the backing in internal finance that is expected from the firm for every dollar raised from the financial markets. Parenthetically, noting that E = V-D, we see that the actual α desired by the firm to satisfy its debt demand (equation 6a) will be an α^* such that

$$\alpha^* = 1/\beta \qquad (15)$$

where

$$\beta = \frac{V}{(D/F).F} - 1$$

and D/F in equation (15) is the solution of equation (6a) above.

Put differently, from the demand side, the firm will want outside finance (F) to equal V-W. Hence the firm will have derived levels for F and F/V given W and V. The firm will be in equilibrium--i.e., able to fulfil its desire for outside financing--if the inequality (14a) and equation (15) are satisfied by the F and F/V levels already chosen by the firm. Otherwise, the firm must negotiate to raise α or to have θ lowered if it is

going to be able to finance its chosen V, given its own internal financial resources W.

The firm has scope for choosing its desired combination of equity and debt in the outside financing of its project V, given that (14a) is satisfied. For instance, if the firm arbitrarily chooses a minimum debt strategy then its combination of debt and outside equity (F_D and F_E, respectively) as a function of V will be:

$$F_D/V = \theta.F/V \qquad (16a)$$

$$F_E/V = (1 - \theta)F/V \qquad (16b)$$

If instead the firm simply decides on a maximum debt strategy then the financing picture would become

$$F_D/V = \frac{\alpha}{1 + \alpha} \qquad (17a)$$

$$F_E/V = \frac{F}{V} - \frac{\alpha}{1 + \alpha} \qquad (17b)\ \underline{1}/$$

In general, given that the firm is not effectively constrained by its internal financing and is able to satisfy its outside financing requirements then it can choose its financing structure (the share of debt and outside equity in financing V) such that

$$\theta.F/V \leq F_D/V \leq \frac{\alpha}{1 + \alpha} \qquad (18a)$$

and

$$F/V - \frac{\alpha}{1 + \alpha} \leq F_E/V \leq (1 - \theta)\ F/V \qquad (18b)$$

where

$$F_D/V + F_E/V = F/V = 1 - W/V.$$

1/ Note that in (17a) and (17b) we use the fact that $E = V\text{-}D$ and $D/V = \frac{D}{E} \cdot \frac{E}{V} = \frac{D}{E}\left(1 - \frac{D}{V}\right)$ to derive $\alpha/(1+\alpha)$.

4. Profit maximization

The firm in the model of the paper chooses between equity and debt to help finance its investment subject to constraints imposed by the financial markets (equity and credit). In raising debt the interest and other charges per unit is i. There are also costs of raising equity. These comprise certain transactions costs of locating potential subscribers and negotiating with them and/or any undervaluation of the firm's own assets in place via the implicit or explicit share price of the new equity. We have assumed that this cost (c) is a function of F_E, the new equity obtained. There is also some cost to the firm of using its internal finance; for instance, it could take the funds involved and deposit them at a bank and earn the deposit rate. It is assumed that this deposit rate--the (marginal) opportunity cost to the firm of internal finance--is a constant denoted by r.

Now when the firm invests it anticipates a return (R) from the project, where R is gross receipts minus capital expenditure V. This implies an expected rate of return, $\bar{\rho}$ from the project; this $\bar{\rho}$ may or may not be equal to the ρ that the bank expects (from its monitoring and advice) the firm to earn from the project.

In sum, the problem of the firm can be stated as follows:

$$\text{Max } \Pi = R - C = (\bar{\rho}-r)V - (i - r)\, F_D - \left[\, c(F_E) \,\right] - rF_E \tag{19}$$

subject to

$$W \geq \frac{F}{(F/V) + 1} \left[\frac{1}{\alpha} + \frac{\theta}{\alpha} \cdot \frac{F}{V} - (1 - \theta)F/V \right] \tag{19a}$$

$$\theta.F \leq F_D \leq \frac{\alpha}{1+\alpha} \cdot V \tag{19b}$$

$$F_E \leq (1 - \theta).F \tag{19c}$$

$$F - F_D + F_E \tag{19d}$$

where $c(F_E)$ is the total cost function of F_E.

Given V, ρ, $\bar{\rho}$, W, θ, and ϵ, and given that the implied F/V and F satisfy (19a), then maximization of equation (19) will yield a solution for the optimal combination of F_D and F_E. If these values in turn satisfy (19b)-(19d), then the firm is able to satisfy all its financing requirements. At the equilibrium of the firm we may not have c' = i, where c' is the marginal cost of issuing equity for the F_E chosen. In

addition, at equilibrium, external financing in the form of equity can be zero but debt cannot be zero (given of course that there is some resort to external financing).

Consider the situation graphically in Figure 2. The horizontal axis measures V (the project size or capital of the firm) and the vertical axis shows outside finance, F. The curve S_D is the maximum debt supply schedule of the bank as faced by the firm. It is drawn for a given i and ϵ but reflects diminishing ρ as V increases. Along S_D we will have $F_D = (\alpha/(1+\alpha)).V$. The curve S_E is the equity constraint schedule given that the actual debt is that shown on the S_D schedule. It is described by the equation:

$$F_E = \frac{\alpha}{1+\alpha} \cdot \frac{1-\theta}{\theta} \cdot V \qquad (20)$$

and is drawn for a given θ. In the diagram we assume, without loss of generality, that $\theta < 0.5$. Along the 45^o line, OX, we have $F = V$.

Now suppose that the firm has a project of size $V = \bar{V}$ and internal finance $W = Z_0Z_1 = F_3F_4$. Then if $c' \geq i$ for all (F_D, F_E) combinations the firm simply borrows OF_2 of F_D and F_2F_3 of F_E such that $OF_2 + F_2F_3 + F_3F_4 = OV = W + F$. But suppose that the marginal cost of equity financing is as shown in Figure 3 where F_E is on the horizontal axis and c' is on the vertical axis. Suppose now that the fixed interest rate applied to the firm's loan is $i_o = c'_o$. Suppose also that OF^o_E of Figure 3 is equal to F_2F_3 of Figure 2, then the firm can improve its profit situation by borrowing less than the maximum allowed by the bank at $\bar{V}$. Hence it can find an amount such as OF'_E of Figure 3 that is equivalent to F_1F_3 of Figure 2 such that the cofinancing constraint is still satisfied. Therefore, in the profit maximizing equilibrium, debt financing is equal to OF_1, equity financing is F_1F_3 and internal financing is F_3F_4 such that $OF_1 + F_1F_3 + F_3F_4 = OV = W + F$. We are assuming throughout, of course, that the internal finance constraint (19a) is being satisfied. Notice that because of the cofinancing constraint the firm is unable to obtain equity financing up to the amount OF''_E in Figure 3 as would be optimal if there were no cofinancing constraint.

5. A pure outside finance solution

The internal finance constraint is a consequence of the fact that the creditor (bank) and investor (outside equity subscriber) act independently of each other. Since the creditor requires equity participation and the investor insists upon debt as a signal of repute, the firm is constrained to come up with internal equity as seed money to activate the process of generating outside finance. But if the creditor and investor can act in concert, it is possible for them to wholly finance a project, each satisfying its own constraint without the firm having to put up any funds of its own. When a firm has a long-standing relationship with a bank but finds itself with no funds for a profitable project, it can beneficially bring together a prospective investor and its bank to jointly and wholly finance

the project; in that case the return to the firm, after paying its outside financiers, would be wholly in consideration of its entrepreneurial contribution.

We have seen that a bank is willing to finance a project of size V up to a maximum of $[\alpha/(1+\alpha)]V$. We have also seen that if the firm is able to arrange bank financing for such an amount then the investor will be willing to provide up to the amount $[(\alpha/(1+\alpha))(1-\theta)/\theta)]V$. Hence, if the bank and investor can act together the former can put up an amount up to its maximum permissible in which case the investor will be willing to furnish the difference, equivalent to

$$F_E = V\left(1 - \frac{\alpha}{1+\alpha}\right) = \frac{1}{1+\alpha} V \tag{21}$$

as long as

$$\frac{\alpha}{1+\alpha} \cdot \frac{1-\theta}{\theta} \geq \frac{1}{1+\alpha} \tag{22}$$

or equivalently

$$\alpha \geq \frac{\theta}{1-\theta} \tag{22a}$$

Alternatively, the investor can start the process by volunteering to put up $(1-\theta)V$ as long as the bank agrees to provide financing of θV. This would be acceptable to the bank as long as it meets its constraint. In other words

$$\text{If } F_E = (1-\theta)V \text{ then } F_D = \theta V$$

as long as

$$\frac{\alpha}{1+\alpha} \geq \theta$$

or equivalently,

$$\alpha \geq \frac{\theta}{1-\theta}$$

Hence, we see that as long as $\alpha \geq \theta/(1-\theta)$, it is possible for the bank and the investor to wholly finance the project without any financial contribution from the firm (inside equity holder); the bank and the investor need only be willing to act in concert to make it possible. When this condition is not met then the firm must provide some internal financing.

III. Adequacy and Allocative Efficiency of Financing

We have developed a simple framework in which a firm that seeks outside financing for its investment is faced with three constraints, viz., an internal finance constraint, a debt service constraint, and a cofinancing constraint on equity; the last two constraints interact to bring about the first, particularly in a situation where the outside financiers (bank and investors) do not actively cooperate. From the viewpoint of public policy there are three sets of circumstances that would require some appropriate response. Loosely, we can characterize the circumstances as those where the

Figure 2. Equilibrium Combination of Internal Finance, Debt and Outside Equity

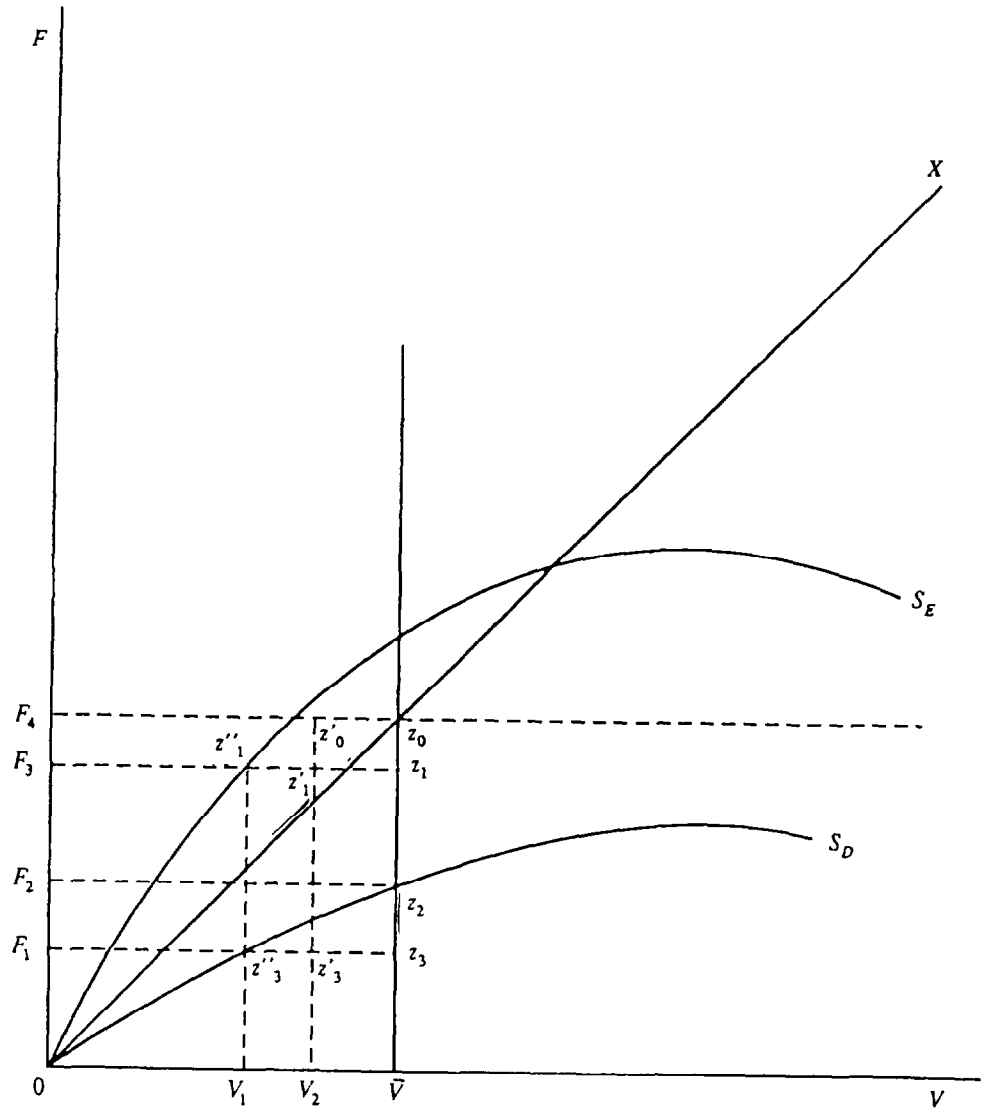
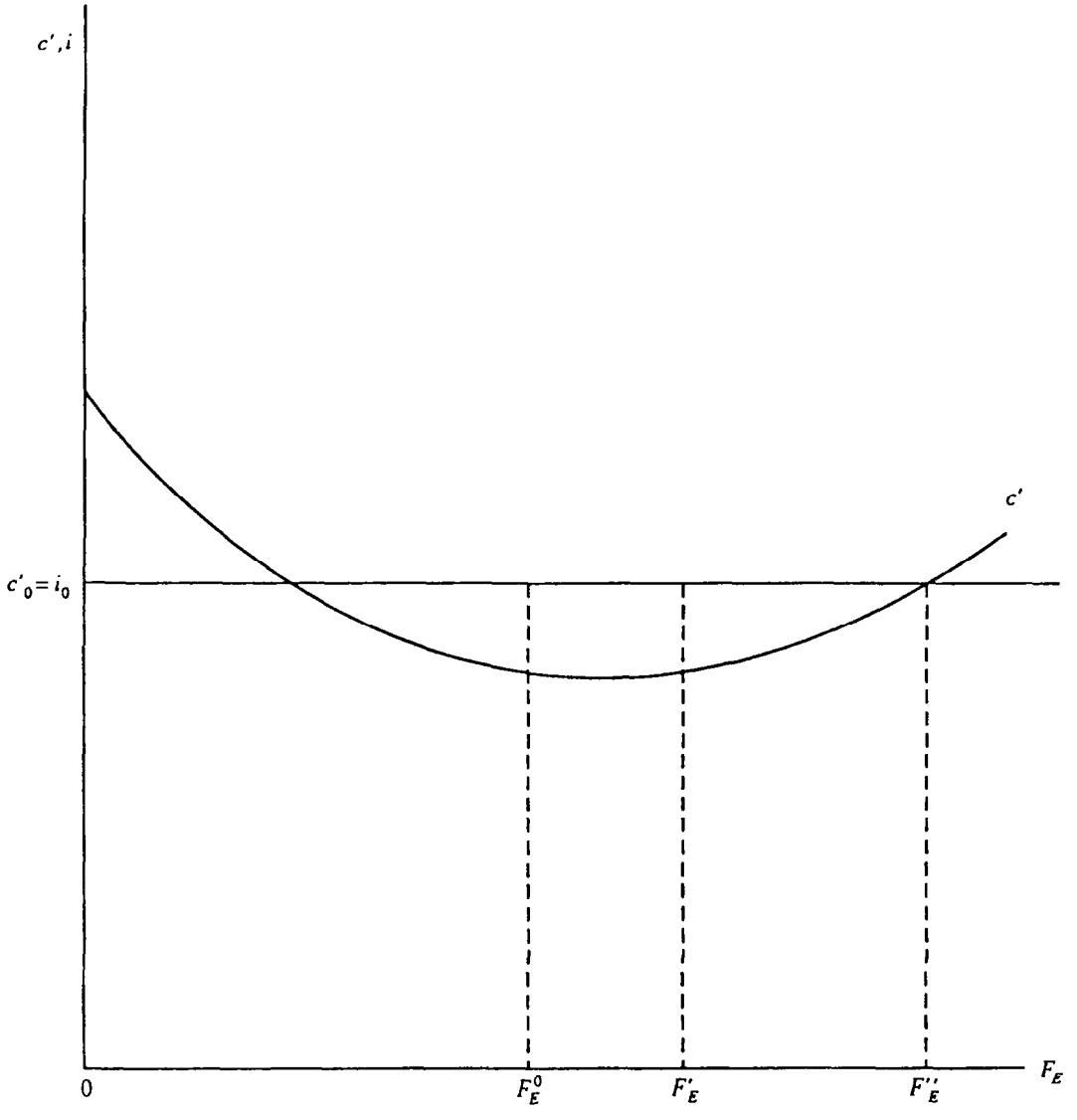


Figure 3. Marginal Cost of Outside Equity and of Debt



constraints are too tight (Case I); where there is differential tightness of constraints facing seekers of outside finance (Case II); and where constraints are based on wrong expectations and miscalculations (Case III).

1. Case I: Universally tight constraints

It is possible in our analysis to have a situation of 'financial collapse' when no outside financing is available for investment on terms that are set by banks and potential investors. In such a situation only those firms with adequate internal finance are able to meet their investment targets. Such situations are not far-fetched.

For instance, when banks are in financial distress because of nonperforming assets, or because of bankruptcies of their traditional borrowers who may in turn have been adversely hit by changed macroeconomic policies, banks may simply stop extending loans. Firms then cannot find outside financing in equity markets because of the cofinancing constraint. A situation of general restraint on credit by the monetary authorities, in an attempt to tackle inflation, can result in banks enforcing stringent debt-equity ratios (low α's) so that (19a) cannot be satisfied and no outside financing is forthcoming.

Although financial collapse is not ruled out it is perhaps more likely that when constraints are tight the average investing firm is able to obtain some outside financing even though not enough to exploit all of its profitable project opportunities. That is, the investor will be able to satisfy constraints (19a) - (19d) only at a V say V' which is less than its desired V say V*.

2. Case II: Unevenly tight constraints

The constraints imposed by the financial 'markets' may differ across firms in ways that are harmful to economic growth. In short firms may confront differential θs and αs.

In the case of θ, although we have proceeded as if $\theta > 0$, it is quite possible that potential equity providers would be willing to subscribe to the equity of some large well-established firms without imposing any cofinancing constraint. More generally, θ would tend to vary across firms according to the transparency of accounts, the age of the firms, and their size (in terms of capital). Depending on the distribution of investment opportunities across firms, it could lead to some highly profitable projects being bypassed for investment in less profitable ones.

Not all differentials are inefficient from a growth-enhancing point of view. For instance, when profit opportunities change as a result of structural adjustment policies, equity subscribers may decide to screen firms according to the sectors in which the firms are operating. Those firms in sectors where relative profitability has increased may be given θs

that are lower than the average while firms in sectors whose relative profitability has declined might be given higher θs. This is not inefficient from the viewpoint of growth, and it is desirable as an aid in the process of structural adjustment.

As far as α is concerned, there are some differentials that will be equalizing and efficient. For instance, even for the same expected mean return (ρ), because of differences in variances of possible project outcomes, and in administrative costs, interest rate charges will tend to differ. Similarly, prudence would require that the ϵ for firms that do not have a long-established record of efficiently managing projects and meeting their debt obligations be set lower than for those with such a record. Obviously equalizing differences in αs also arise from unequal expected mean profitability of firms' investments.

3. Case III. Erroneously tight constraints

Differentials in α that are suboptimal can be blamed on wrong expectations and miscalculations. For example, creditors (banks) may not properly assess the information readily available to them as regards the ρs. Consequently, some highly profitable firm may be assigned a lower ρ than a firm that is less profitable. Similarly, although using information readily available to them, banks can incorrectly deduce the variances of ρs and potential administrative costs. This could lead to overestimation of some variances and administrative costs and underestimation of others. If these are systematic enough, suboptimal (nonequalizing) differences in interest charges (i) could ensue.

It is also possible for banks and equity subscribers to exhibit excessive caution in financing some sectors and in withdrawing finance from others. As a result the banks and equity subscribers do not act in accordance with their objective risk calculations, ρ estimates, and forecasts of administrative costs. Such a situation is possible in the early stages of major structural reforms when it is not obvious that policy changes will be maintained and hence, for example, that relative price changes will persist long enough for profitable reallocations of labor and capital to take place.

IV. Possible Interventions

Certain policy interventions can be made in order to alleviate the financial market constraints on investment that we have been discussing. In general, measures can be taken to improve information flows and reduce their costs; to effectively raise internal financing (endowments of firms); and to directly strengthen financial intermediation. In addition, the lending operations of banks can be effectively subsidized.

1. Information

Given the importance of information for the efficiency with which financial markets operate and, in particular, for the tightness of the constraints discussed in this paper, this is one area where economic policy measures can be usefully introduced. Such information could greatly reduce the chances of unevenly tight constraints (Case II)b that are suboptimal (as opposed to being equalizing) or of erroneously tight constraints (Case III).

The authorities, first of all, could encourage audits and public display of balance sheets and profit and loss statements. Indeed the authorities themselves have an interest in such transparency in their quest for equity in taxation.

In the second place, the authorities could finance investigations on a regular basis, and have reports prepared on profitable investment opportunities in the different sectors and areas of the economy. The importance of this for the financial market constraints in this paper is easily seen. In addition, this approach takes cognizance of the public good nature of information of this sort and hence of the possibility of incomplete internalization of benefits (under normal property rights arrangements) with consequent social under-investment in generating the information.

If the ability to undertake projects is not highly specific or if such specific ability is fairly inexpensive to acquire, then, with improved information, less profitable projects will not be undertaken ahead of the more profitable ones, and social efficiency will be guaranteed. Firms with adequate internal finance and/or with access to outside finance will always undertake, with equal efficiency, highly profitable projects that financially-constrained firms cannot undertake. The only requirement for social efficiency is, therefore, for those with financing to know about the projects.

Similarly, if the ability to undertake some projects is highly specific and the cost of acquiring such skills high then firms that are financially well-endowed but not with very profitable investment opportunities will then find it profitable to lend funds to firms with highly profitable opportunities but with inadequate internal finance and access to normal outside finance. Again the only requirement is that the highly liquid firms have information about the profitability of investment opportunities of the illiquid firms. Or firms with greater access to outside finance can cosign with or sponsor the other firms with more profitable projects, at the bank and equity market. Alternatively, the firms with access can lend some of their own internal funds to those firms without access; the former group of firms can then go to the financial markets to satisfy any need for finance to undertake their own profitable opportunities from which they had initially diverted funds. Once again it is only necessary for the firms

with access to outside finance to know of the profitable opportunities of the firms without such access.

Apart from inducing cooperation among entrepreneurs/firms, a superior pool of information made possible through official intervention can also be used by banks and equity subscribers to relax the financial constraints discussed in this paper. Banks, for instance, can more correctly estimate ρs and equity subscribers can lower their θ requirements. In this regard it is noteworthy that the effect of entrepreneurial cooperation is to lower θ since highly liquid firms and those with above average access to financial markets, by their cooperation, effectively enter the equity market as subscribers to the equities of the more financially-constrained firms.

With an enhanced pool of information, pure outside financing solutions will also become more common place. Indeed the entrepreneurial coordination discussed earlier can be an integral part of such solutions. The authorities can also actively influence the process of pure outside financing solutions by providing effective (probably computerized) bulletin boards and other means to facilitate contacts.

2. Other measures

Other measures can be taken to alleviate the constraints discussed in this paper. First of all, there are, measures that tend to increase available internal finance. For example, during a process of structural adjustment, there could be tax relief for retained earnings used to fund investment to increase capacity in activities where relative profitability has moved favorably as a result of the policies being implemented.

Second, the authorities could intervene to augment intermediation, thereby supplementing, and enabling, the firm/entrepreneurial cooperation discussed above to take place. For instance, the authorities could issue medium term bonds--probably designated "investment bonds"--that would be fully guaranteed by the central bank or government. Some banks could then be paid a "management fee" to help assess the "creditworthiness" of firms that want to make investment in sectors that should be expanding in light of say a structural adjustment program being implemented. As we have maintained, the banks are well placed, with a substantial degree of comparative advantage, to make the required evaluations and measurements. The funds obtained from selling investment bonds could then be used to lend to the firms that pass some threshold level of "creditworthiness". Alternatively, the authorities could raise the necessary funds through concessional foreign borrowing. Such a general approach, which can ease constraints on outside financing for firms with limited access to financial markets can be especially useful under the Case II and Case III scenarios discussed in the previous section.

Finally, it may be socially efficient for the government to support lending operations of banks through credit guarantee schemes. The guarantees would be designed specifically to lower the risk to creditors of making certain loans, especially to new firms and for novel activities of old firms. Such guarantees would be provided only when the activities to be financed are in sectors where capacity should expand in relation to the rest of the economy (as evidenced by a changed structure of relative medium-term profitability). Guarantees should naturally be kept well below 100 percent so as to provide appropriate incentives for banks to make sound loans. The effect of the credit guarantees would be to raise α. 1/

V. Conclusion

In this paper we have presented a simple model in which firms seeking outside financing for investment are faced with three constraints, viz., a debt service constraint, a cofinancing constraint on equity, and an internal finance constraint. The constraints imposed by the financial markets place both a floor and a ceiling on the ratios of debt to outside finance, a ceiling to the ratio of outside equity to outside finance, and a floor to internal equity as a ratio of outside finance. Thus, the firm maximizes its profits choosing its debt and equity combination of outside finance subject to the above constraints.

In such an environment it is possible for the constraints to be so tight that no outside finance is extended; more likely, inefficiencies in the allocation of available financing could arise because of unevenness in the tightness of the constraints and misinterpretation by banks and outside equity subscribers of the information available on different firms. Suboptimal use of equity financing, and hence overutilization of debt financing, can also be a consequence. Nevertheless, if banks (creditors) and outside equity subscribers (investors) act in concert, it is possible for them, under certain conditions, to wholly finance projects of firms without any requirement for the firms to contribute internal finance. The model of the paper--especially the specification of the demand for debt finance--also indicates that leverage may be inversely correlated with relative use of outside finance in funding investment.

There are various policy measures that the authorities can take to ease the constraints. Most notably, actions that improve the flow of information on profitable investment opportunities in the different sectors and that increase the transparency of firms' accounts would help ensure that projects are undertaken by order of profitability, irrespective of the distribution of such projects among firms. Other measures could include tax relief to

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1/ Credit guarantee schemes are, of course, a common feature in developing countries and it is fair to say that their success has not been unambiguously established. What we are arguing here is basically for well-targeted schemes that operate during a period of structural adjustment and not as a permanent feature of the economic landscape.

augment the internal finance of firms in sectors that optimally should expand; active intermediation by the authorities in the financial market; and well-designed credit guarantee schemes.

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