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Do Debt Flows Crowd Out Equity Flows or the Other Way Round?

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In the presence of asymmetric information, the stage at which financing decisions are made about investment projects in a small open economy is crucial for the composition of international capital inflows as well as for the efficiency of channeling savings into investment. This paper compares the implications of two extreme cases regarding the information possessed by the firms at their financing stage for whether inflows of foreign debt may crowd out foreign equity or the other way round. The scope for corrective tax policies is examined. We also provide a welfare comparison between the two mechanisms of capital flows.

Key Words: Debt and equity flows; Asymmetric information; Bankruptcy cost; Market failures; Corrective taxation.

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1. INTRODUCTION

Financial markets today are being rapidly integrated with large amounts of capital flowing across national borders. Among others, the Maastricht Treaty for establishing the European Monetary Union is an outstanding example of such integration. There is nonetheless strong evidence on a home bias in international portfolio investment, whereby people have the tendency to invest more heavily in assets originating from their own countries. Even among states that are fully integrated into one federal system such as the United States, one may still find substantial home bias. As reported by Huberman (1997), investors prefer to invest in companies with headquarters stationed in their own states or in companies where they work.

One major explanation for the home bias is an informational asymmetry which confers a "home court" advantage to the domestic residents over the foreign residents. This asymmetry may lead to failures of the equity market in financing investment projects in a small open economy, and may thus call for corrective policies. These issues are first addressed by Gordon and Bovenberg (1996) and later extended by Razin, Sadka, and Yuen (1998a, 1999). The main focus of the analysis in these studies is the design of a corrective tax-cum-subsidy policy package. Here, we explore an alternative solution which relies on the idea of extending the scope of the financial markets by mixing debt and equity finance.

Another feature of the international capital market is the prevalence of imperfections in the debt market. The analysis of credit market imperfections in closed economy contexts goes back to Townsend (1979) and Stiglitz and Weiss (l981). It has recently been applied to the study of macroeconomic cyclical fluctuations by Bernanke, Gertler, and Gilchrist (1998). Using a framework similar to this line of literature, we also explore the interactions between equity and debt flows in the open economy context with imperfect markets.

Apparently, the information possessed by the firm at the time it makes its decisions about investment and finance is an important determinant of the composition of international capital flows as well as the efficiency of channeling savings into investment. The sequencing of investment and financing decisions may have to do with a potential agency problem between the board of directors and the managers and with other corporate governance problems. Here, we draw the implications of two extreme cases regarding the information possessed by the firm at its financing stage for whether foreign debt flows may crowd out foreign equity flows or the other way round.

The organization of the paper is as follows. Section II considers equity-only markets and the mix of equity and debt finance when the financing

decisions are made *after* the idiosyncratic productivity shocks are realized and revealed to the firms. Section III considers the debt market as well as the debt-equity mix when the financing decisions are made *before* the realization and revelation of these shocks to the firms. Summary and conclusion are provided in Section IV.

2. INVESTMENT AHEAD OF FINANCING

In this section, we consider the scenario under which firms make investment decisions at a stage *before*, and financing decisions at a stage *after*, the realization of their random productivity levels. A possible rationale behind this sequence of firm decisions whereby the investment choice is made *ex ante* while the financing of the pre-committed investment is decided *ex post* has to do with a potential agency problem between the board of directors (representing the owners) and the managers (responsible for making these decisions). Loosely speaking, the latter are less interested in the net worth of the firm than the former. In the absence of full information about the firm's productivity, the owners will have to set investment guidelines for the managers so as to protect their own interests. In particular, we can think of these guidelines as involving a delegation of power to pick investment projects to the managers, subject to the final approval of the owners before the managers are allowed to search for the appropriate method of finance and to actually undertake the project. The time gap between the investment and financing choices may therefore leave room for useful information to creep in before the project is finally launched. This agency problem is not modeled explicitly here. What is captured in our theoretical framework described below is the spirit of these investment guidelines in terms of the sequencing of the firm's investment and financing decisions and the timing of arrival of information about firm-specific shocks.

2.1. Equity Flows and Market Failure

Let us begin by describing our analytical framework for a small open economy with equity flows as first developed by Gordon and Bovenberg (1996) and later extended by Razin, Sadka, and Yuen (1998a, 1999). Here, we assume that capital flows are channeled solely through portfolio equity investment (FPEI).[1]

[1]Officially, FPEI is defined as buying less than a certain small fraction (say, 10-20%) of shares of a firm. However, from an economic point of view, the critical feature of FPEI is the lack of control of the foreign investor over the management of the domestic firm, because of the absence of foreign managerial inputs. For our purposes, we shall simply assume that foreign investors buy shares in existing firms without exercising any form of control or applying their own managerial inputs.

Suppose there is a very large number (N) of *ex ante* identical domestic firms. Each firm employs capital input (K) in the first period in order to produce a single composite good in the second period. For simplicity, we assume that capital depreciates fully at the end of the production process. Output in the second period is equal to $F(K)(1+\varepsilon)$, where $F(.)$ is a production function exhibiting diminishing marginal productivity of capital and ε is a random productivity factor. The latter has zero mean and is independent across all firms. (ε is bounded between -1 and 1, thus output is always non-negative.) We assume that ε is purely idiosyncratic, so that there is no aggregate uncertainty. As a result, consumer-investors will behave in a risk-neutral way.

In the first period, firms determine their investment rules in the planning stage while the actual investment and its funding are delayed to the implementation stage. These investment rules are approved by the owners of the firms before realization of their productivity shocks. The management then implements these rules by seeking funds, either at home or abroad, to finance the investment after ε is known.

For simplicity, we assume that the original owners of the investment sites do not have any retained earnings to finance their investment outlays, and will have to resort to the equity market instead.[2] At the implementation and financing stage, the managers of the firms and the domestic suppliers of funds are equally informed about the true value of ε. However, the foreign fund-providers are totally uninformed. That is, there is a home court advantage for domestic savers and owner-managers of the firms over the foreign savers. Being "close to the action", the former group observes ε before the managers implement the investment rules and make their financing decisions; but the latter, being "far away from the action", do not.[3]

Since ε is unknown to them at this stage, all (*ex ante* identical) firms choose the same level of capital in the first period. We shall denote this level by K^- in this equity-only scenario. After this investment choice is made, the value of ε is revealed to the domestic savers, but not to the foreign savers. The latter buy shares in the existing firms at a total amount

[2]In this equity-only scenario, we assume that all firms are originally owned by domestic savers, who equity-finance the *existing* investment projects undertaken by the firms. Implicitly, we are assuming that the equity market is closed to foreigners—-i.e., portfolio equity flows are restricted—-in the initial period. Any profits made by the firms in this initial period ($t = 0$) will be fully distributed back to their owners (i.e., the domestic savers), thus implying the non-existence of retained earnings. When the next period ($t = 1$) comes around, the equity market is opened up to domestic and foreign people alike—-i.e., ban on portfolio equity flows is lifted. *New* investment projects popping up in this period can then be financed by issuing new equity shares to both domestic and foreign savers.

[3]For a parallel analysis under an alternative kind of informational asymmetry between "insiders"(owner-managers or fund-demanders) and "outsiders" (domestic and foreign savers or fund-providers) of the firms, see Razin, Sadka and Yuen (1998b).

of FPEI. They expect their investment to appreciate in the second period to an amount of FPEI$(1 + r^*)$, where r^* is the world rate of interest representing the alternative rate of return they can earn when they invest in their own countries.

Being unable to observe ε, foreign savers will offer the same price for all firms reflecting the average productivity for the group of low-productivity firms they purchase. On the other hand, domestic savers who do observe ε will not be willing to sell at this price the firms which have experienced high values of ε. In other words, domestic savers will outbid foreign savers for these firms. There will be a cutoff level of ε, say ε_0, such that all firms which experience a lower value of ε than the cutoff level will be purchased by foreigners. All other firms will be retained by domestic investors. The cutoff level of ε is then defined by

$$F(K^-)[1 + e^-(\varepsilon_0)]/(1 + r^*) = F(K^-)(1 + \varepsilon_0)/(1 + r), \tag{1}$$

where r is the domestic rate of interest and $e^-(\varepsilon_0)$ is the mean value of ε realized by the low-productivity firms, i.e., the conditional expectation of ε, given that $\varepsilon \leq \varepsilon_0$:

$$e^-(\varepsilon_0) \equiv E(\varepsilon/\varepsilon \leq \varepsilon_0) = \int_{-1}^{\varepsilon_0} \varepsilon \left(\frac{\Phi'(\varepsilon)}{\Phi(\varepsilon_0)} \right) d\varepsilon, \tag{2}$$

where $\Phi(.)$ is the cumulative probability distribution of ε.

The value of a typical domestic firm in the first period is equal to the present value of its output in the second period, i.e., of $F(K^-)(1 + \varepsilon)$. Because foreign equity-investors will buy only those firms with $\varepsilon \leq \varepsilon_0$, the expected second-period cash flow of a firm they buy is $F(K^-)[1 + e^-(\varepsilon_0)]$, which they then discount by the factor $1 + r^*$ to determine the price they are willing to pay in the first period. At equilibrium, this price is equal to the price that a domestic investor is willing to pay for the firm which experiences a productivity value of ε_0. The cutoff price is equal to the output of the marginal firm, $F(K^-)(1 + \varepsilon_0)$, discounted at the domestic rate of interest. This explains the cutoff condition (1).

As $e^-(\varepsilon_0) < \varepsilon_0$, an equilibrium with both foreigners and residents having nonzero holdings in domestic firms requires that the foreigners' rate of return (r^*) be lower than the residents' rate of return (r). In some sense, this means that foreign investors are overcharged for their purchases of domestic firms. They outbid domestic investors that are willing to pay *on average* only a price of $F(K^-)(1 + \varepsilon_0)/(1 + r)$ for the low-productivity firms.

Consider now the capital investment decision of the firm that is made before ε becomes known. The firm seeks to maximize its market value, net of the original investment (K^-). With probability $\Phi(\varepsilon_0)$, it will be sold to

foreign investors, who pay $F(K^-)[1+e^-(\varepsilon_0)]/(1+r^*)$, With probability $1-\Phi(\varepsilon_0)$, it will be sold to domestic investors, who pay on average $F(K^-)[1+e^+(\varepsilon_0)]/(1+r)$, where $e^+(\varepsilon_0)$ denotes the mean value of the productivity factor for the high-productivity firms, i.e.,

$$e^+(\varepsilon_0) \equiv E(\varepsilon/\varepsilon_0 \geq \varepsilon_0) = \int_{\varepsilon_0}^{1} \varepsilon \left(\frac{\Phi'(\varepsilon)}{1-\Phi(\varepsilon_0)} \right) d\varepsilon. \tag{3}$$

Hence, the firm's expected market value, net of the original capital investment, is

$$-K^- + \Phi(\varepsilon_0) \left(\frac{F(K^-)[1+e^-(\varepsilon_0)]}{1+r^*} \right) + [1-\Phi(\varepsilon_0)] \left(\frac{F(K^-)[1+e^+(\varepsilon_0)]}{1+r} \right). \tag{4}$$

The firm's investment problem is to maximize this expression with respect to K^-, where ε_0 is determined by the cutoff condition (l). The necessary and sufficient first-order condition is given by:

$$\Phi(\varepsilon_0) \left(\frac{F'(K^-)[1+e^-(\varepsilon_0)]}{1+r^*} \right) + [1-\Phi(\varepsilon_0)] \left(\frac{F'(K^-)[1+e^+(\varepsilon_0)]}{1+r} \right) = 1, \tag{5}$$

with $1+r = (1+r^*)(1+\varepsilon_0)/[1+e^-(\varepsilon_0)]$, as implied by (1).

As the firm knows, when making its capital investment decision, that it will be sold to foreign investors at a "premium" under low-productivity events, it tends to over-invest relative to the domestic rate of return—-which will be equated to the intertemporal marginal rate of substitution by the domestic consumer-savers, thus resulting in over-saving. On the other hand, knowing that they will be overcharged for their purchase of equity shares issued by the firm, the foreigners will only supply a less-than-efficient amount of equity funds–i.e., the firm will under-invest relative to the world rate of interest, thus resulting in under-investment. Formally, these two results imply

$$1+r^* < F'(K^-) < 1+r. \tag{6}$$

(See the Appendix for the proof of these two inequalities.) Since first best efficiency calls for

$$1+r^* = F'(K) = 1+r, \tag{6'}$$

the two inequalities in (6) imply foreign under-investment and domestic over-saving. As derived by Gordon and Bovenberg (1996) and reaffirmed

by Razin, Sadka, and Yuen (1998a, 1999), the efficient allocations can be restored by a Pigouvian policy package consisting of a subsidy to foreign investment (to correct the foreign under-investment) and a tax on corporate income (to correct the domestic over-saving).

2.2. Introducing Debt Flows

In this subsection, we explore whether the market failure uncovered in the previous section is due to a missing market for investment-financing such as a loan/debt market.

Consider the introduction of domestic and foreign debt securities or bank loans. As in Stiglitz and Weiss (1981), we allow for the possibility of default. However, since the manager and the domestic savers can both observe the realized value of ε before the former proceeds with the actual implementation of the pre-determined level of investment (denoted by K), the latter will not be willing to provide loans to the firm if its realized ε-value is low. In other words, *ex post* low-productivity firms will not be able to cheat the well-informed domestic savers by borrowing from them and defaulting later. What about borrowing from the less informed foreign savers? It does not pay to borrow from the foreigners if the manager knows that the firm will not be able to repay its loans in the end (i.e., it does not pay to default). This is because in case of default, all its post-investment output (i.e., $F(K)(1+\varepsilon)$) will be seized, leaving the firm pennyless. Instead, the firm can in principle equity-finance investment in low-ε events instead of borrowing-and-defaulting. Below, we shall argue that, in those cases, the firm will resort to domestic equity finance.

Having ruled out the default possibilities, we can deduce that the firm will borrow from both the domestic and foreign savers whenever it chooses to debt-finance its investment (i.e., when the realized value of ε is high). A simple no-arbitrage argument from the perspective of the firm implies that the domestic and foreign rates of interest must be equal, i.e.,

$$r = r^*. \tag{7}$$

Recall that the coexistence of foreign and domestic equity finance in the previous section depends crucially on the rate-of-interest differential between domestic and foreign savers (see equation (1)). The interest rate equalization here will bring us back to the familiar "lemons" problem *a la* Akerlof(1970) in the equity market, whereby the uninformed foreign equity-buyers will be driven out completely from the domestic equity market. This is because, at the price offered by these buyers, which reflects the average productivity of all firms (i.e., the average value of ε) in the market, the

owner-manager of a firm experiencing a higher-than-average value of ε will not be willing to sell its shares. [4]

The new equilibrium is characterized as follows. The group of high-productivity firms will debt-finance their investment from either domestic or foreign savers or equity-finance it from the domestic savers alone. Here, since these firms are indifferent between the two forms of finance, we shall simply assume that they will choose debt finance from both domestic and foreign sources in what follows. The group of low-productivity firms will rely on equity finance, which is supplied only by the domestic savers. [5,6]

Under this equilibrium, there will be a cutoff level of ε, denoted by ε^0, such that all firms that realize a value of ε below ε^0 will equity-finance (from domestic sources), and all other firms will debt-finance (from both domestic and foreign sources) their investment. This cutoff level of ε is given by

$$F(K^+)(1+\varepsilon^0) = K^+(1+r^*), \tag{8}$$

where K^+ is the post-investment stock of capital in this mixed debt-equity case. The left-hand side of (8) represents the cash flow of the marginal firm that debt-finances new investment; while the right-hand side represents the value for that firm of the principal and interest of the loan. Firms with a value of ε below ε^0 will not be *able* to issue debt to the informed domestic savers and will not be *willing* to issue debt to the uninformed foreign savers in the first place, only to default and forfeit their properties altogether later.

Consider now the capital investment decision of the firm that is made before ε becomes known. Since their individual values of ε are not known to them at this stage, all firms will choose the same level of investment

[4] Another way to see the crowding out of foreign equity by the opening of the debt market is to note that interest rate equalization (equation (7)), which provides a level playing field for both domestic and foreign savers in the credit market, is incompatible with the necessary condition for the existence of foreign equity flows, viz., the rate-of interest differential (as implied by equation (1)), which generates an information rent to the better-informed domestic savers.

[5] Even though it is a well-defined equilibrium from the perspective of the economy as a whole, it is a matter of indifference from the perspective of an individual firm whether it debt-finances or equity-finances its investment. Similarly, it is a matter of indifference from the perspective of an individual domestic saver whether she purchases debt or equity from the firms.

[6] In Razin, Sadka, and Yuen (1998b), we give the manager the option of cancelling the investment plan when the realized value of ε turns out to be low. In that scenario, if there exist firms whose values are lower than the average price offered by the uninformed equity-buyers when they choose not to make new investment (so that no financing is required), then they will still resort to foreign equity flows to finance their investment. As a result (similar to the economy-wide equilibrium capital structure derived in that paper), there will be two subgroups of firms within the group of "bad" firms—-i.e., those (the better ones) that will not make any new investment and those (the worst ones) that will equity-finance their investment from foreign sources.

(K^+) to maximize their market values net of their original investment, given the same technology and same probability distribution of ε across firms. With probability $\Phi(\varepsilon^0)$, it will be sold to domestic savers through the equity market, who pay on average $F(K^+)[1+e^-(\varepsilon^0)]/(1+r)$. With probability $1-\Phi(\varepsilon^0)$, it will borrow from both domestic and foreign sources an amount K^+ at the interest rate r^* in order to generate an average cash flow of $F(K^+)[1+e^+(\varepsilon^0)]$ in the second period. Hence, the firm's expected market value, net of the original capital investment, is

$$\begin{aligned} & -K^+ + \Phi(\varepsilon^0)\left(\frac{F(K^+)[1+e^-(\varepsilon^0)]}{1+r^*}\right) + [1-\Phi(\varepsilon^0)]\left(\tfrac{F(K^+)[1+e^+(\varepsilon^0)]}{1+r^*}\right) \\ = \; & -K^+ + \frac{F(K^+)}{1+r^*}, \end{aligned} \tag{4'}$$

since $\Phi(\varepsilon^0)e^-(\varepsilon^0)+[1-\Phi(\varepsilon^0)]e^+(\varepsilon^0)=0$. Maximizing this expression with respect to K^+ yields the familiar marginal productivity condition:

$$F'(K^+) = 1 + r^*. \tag{5'}$$

Together with (7), (5′) coincides with the first best efficiency conditions (6′), which implies that the introduction of debt inflows will eliminate both foreign under-investment and domestic over-saving. In other words, the same efficient allocations can be generated by introducing a debt market or through the Pigouvian tax-subsidy package as discussed in the previous section (in the absence of such market).

Compared to the laissez faire equity-only market equilibrium condition (6), it is obvious that

$$K^+ > K^-.$$

That is, the efficient stock of capital in the mixed debt-equity case is larger than the corresponding stock in the equity-only case.

3. ALTERNATIVE SEQUENCING OF INVESTMENT AND FINANCING DECISIONS

The sequencing of firm decisions whereby *ex ante* investment (when information is symmetric between the firm and its fund-suppliers) precedes *ex post* financing (when information is asymmetric) as assumed in the previous section is an important aspect of corporate governance. In this section, we would like to explore an alternative sequencing (due perhaps to an alternative corporate governance structure) whereby both investment and financing decisions are made simultaneously before the realization and revelation of the idiosyncratic productivity shocks. We start with the analysis of debt flows and introduce equity flows later.

3.1. Debt Flows

This sequencing implies that firms can no longer sign default-free loan contracts with the lenders (both domestic and foreign). We therefore consider an alternative kind of loan contract which allows for the possibility of default.

We adopt the "costly state verification" framework *a la* Townsend (1979) in assuming that lenders make firm-specific loans, charging an interest rate of r^j to firm j ($j = l, 2, ..., N$). The interest and principal payment commitment will be honored when the firms encounter relatively good shocks, and defaulted when they encounter relatively bad shocks. The loan contract is characterized by a non-default loan rate (r^j) and a threshold value ($\bar{\varepsilon}^j$) of the productivity parameter as follows:

$$F(K^j)(1 + \bar{\varepsilon}^j) = K^j(1 + r^j). \tag{8'}$$

When the realized value of $\varepsilon^j > \bar{\varepsilon}^j$, the firm is solvent and will thus pay the lenders the promised amount, $K^j(1 + r^j)$, as given by the right-hand-side of (8′). If, however, $\varepsilon^j < \bar{\varepsilon}^j$, the firm will default. In the case of default, the lenders can incur a cost in order to verify the true value of ε^j and to seize the residual value of the firm. This cost, interpretable as the cost of bankruptcy, is assumed to be proportional to the firm's realized gross return, $\mu F(K^j)(1 + \varepsilon^j)$, where $\mu(< 1)$ is the factor of proportionality. Net of this cost, the lenders will receive $(1-\mu)F(K^j)(1+\varepsilon^j)$.[7] This bankruptcy cost is assumed to be a *general* cost of default that applies to all bankrupt firms and their debt-holders (whether local or foreign) alike rather than a *specific* cost of state verification that applies only to the less informed foreign lenders.[8]

From the foreign lender's perspective, the expected returns from the loans must equal the opportunity costs:

$$[1 - \Phi(\bar{\varepsilon}^j)]K^j(1 + r^j) + \Phi(\bar{\varepsilon}^j)(1 - \mu)F(K^j)[1 + e^-(\bar{\varepsilon}^j)] = K^j(1 + r^*). \tag{9}$$

[7]Recall from the previous section when the financing decision is made after firm j observes its ε^j, it will never default. It is therefore immaterial whether we consider this bankruptcy cost in those cases.

[8]This implies that, so far as the bankruptcy cost is concerned, the information asymmetry between the locals and the foreigners is irrelevant. Here as in Razin, Sadka, and Yuen(1998b), we could have assumed an information asymmetry between the owner-managers ("insiders") on the one hand and domestic and foreign lenders ("outsiders") on the other—-so that all lenders are equally uninformed—-without altering the analysis in this section. If, however, the bankruptcy cost is interpreted narrowly as the cost of verifying the realized productivity levels of those firms that declare bankruptcy, then it need not be incurred by the better informed domestic debt-holders, who can observe the true value of ε^j. Under that interpretation, we may end up with domestic debt flows driving out foreign debt flows. In other words, similar to the home bias in portfolio equity investment we alluded to in the introduction, there can exist a home bias in portfolio debt investment as well.

The first term on the left-hand side of (9) is the contracted principal and interest payment, weighted by the no-default probability. The second term measures the net residual value of the firm, weighted by the default probability. The right hand side is the alternative return the lender can get on his or her funds in the world capital market. This no-arbitrage condition applies also to the domestic lenders since they, in principle, have access to the same foreign funds as the domestic firms. Observe that (8′) and (9) together imply that

$$\{[1-\Phi(\bar{\varepsilon}^j)]+\Phi(\bar{\varepsilon}^j)(1-\mu)[1+e^-(\bar{\varepsilon}^j)]/(1+\bar{\varepsilon}^j)\}(1+r^j)=1+r^*.$$

Since $e^-(\bar{\varepsilon}^j)<\bar{\varepsilon}^j$ and $0\leq\mu<1$, the term in curly brackets is less than unity. It follows that $r^j>r^*$, the difference being a risk premium (which depends, among other things, on $\bar{\varepsilon}^j$ and μ).

As the loan contract is firm-specific, the firm should take the lenders' no-arbitrage condition (9) as well as its own cutoff condition (8′) as constraints in choosing its level of investment K^j as well as in negotiating the contract parameters (r^j and $\bar{\varepsilon}^j$). We can combine these two conditions to eliminate r^j to obtain the following:

$$\{[1-\Phi(\bar{\varepsilon}^j)](1+\bar{\varepsilon}^j)+\Phi(\bar{\varepsilon}^j)(1-\mu)[1+e^-(\bar{\varepsilon}^j)]\}F(K^j)=K^j(1+r^*). \quad (9')$$

The firm's objective at this stage is to maximize its expected net cash flow in the second period, given by

$$EV^D\equiv[1-\Phi(\bar{\varepsilon}^j)]\{F(K^j)[1+e^+(\bar{\varepsilon}^j)]-K^j(1+r^j)\}. \quad (10)$$

Notice that the firm will enjoy a positive net cash flow of $F(K^j)(1+\varepsilon^j)-K^j(1+r^j)$ only when $\varepsilon^j>\bar{\varepsilon}^j$. It will default and be left with zero cash flow when $\varepsilon^j<\bar{\varepsilon}^j$. The expression for EV^D in (10) follows since the probability of not defaulting is $1-\Phi(\bar{\varepsilon}^j)$ and the average value of ε^j in this case is $e^+(\bar{\varepsilon}^j)$.

EV^D is maximized by choice of K^j, r^j, and $\bar{\varepsilon}^j$ subject to constraints (8′) and (9), or their combination (9′). Substituting the constraint (9) into the objective function reduces the firm's maximization problem to one of choosing K^j and $\bar{\varepsilon}^j$ so as to maximize

$$EV^D\equiv F(K^j)-\{K^j(1+r^*)+\mu\Phi(\bar{\varepsilon}^j)F(K^j)[1+e^-(\bar{\varepsilon}^j)]\}.$$

As the firm realizes that the contract rate of interest (r^j) is set so as to cover both the risk-free interest (r^*) and the expected default cost ($\mu\Phi(\bar{\varepsilon}^j)F(K^j)[1+e^-(\bar{\varepsilon}^j)]$), it follows that its total cost of capital is given by the curly-bracketed term in (10′). Being *ex ante* identical, all firms will choose the same K^j and $\bar{\varepsilon}^j$ (hence r^j).

There are three potential sources of deviations from Pareto efficiency in this setup. First, the domestic stock of capital may be different than what domestic consumer-savers are willing to pay for in terms of forgone present consumption (i.e., production-consumption inefficiency). Second, the capital stock may be different than what the economy at large would accumulate at a world cost of capital r^* (i.e., aggregate production inefficiency). Third, there is the deadweight cost of bankruptcy.

In the debt market equilibrium, production-consumption inefficiency does not exist since there is no wedge between the world rate of interest faced by domestic consumer-savers and their intertemporal marginal rates of substitution in consumption. Second, there is no production inefficiency because the objective (viz., (10)) and the constraints (viz., (8′) and (9)) guiding the firm are the same as those applying to the economy as a whole in this debt finance case. Third, bankruptcy costs are (*pseudo-*) institutionally unavoidable.

Thus, given that the economy is resorting to debt financing, in which case the default cost is inherent to the asymmetric information setup, the competitive allocation is Pareto-efficient. [9]

3.2. Equity Flows

In the case of equity finance under simultaneous investment and financing decisions, the firm cannot enjoy any informational advantage over its suppliers of funds. This is because the value of ε^j is not revealed to it when it tries to raise funds from the equity market. As a result, we are back to the world of symmetric information. The objective function of the firm is to maximize its expected net future value, i.e.,

$$EV^E \equiv F(K^j) - K^j(1 + r^*),$$

since the unconditional mean of ε^j is zero. Again, all firms will choose the same K^j. Evidently, the competitive allocation in this equity-finance case is Pareto-efficient.

In contrast to the debt case, the equity case is free of default costs. Therefore, equity ranks ahead of debt. In both cases, there is no need for corrective tax policy. If both means of financing are available, equity will completely crowd out debt.

[9] Observe that the first order condition for K^j is given by $F'(K^j) = (1 + r^*)/\{1 - \mu\Phi(\bar{\varepsilon}^j)[1 + e^-(\bar{\varepsilon}^j)]\}$, which reduces to the familiar marginal productivity condition as μ gets small.

4. SUMMARY AND CONCLUSION

International capital markets are notoriously imperfect. Under asymmetric information, the equity market may be plagued by the Akerlof-type lemons problem and the credit market by the Stiglitz-Weiss-type default possibilities. The welfare ranking and the pecking order of the two kinds of capital flows hinge crucially on the amount of information possessed by the firm managers at the financing stage, which is in turn related to the structure of corporate governance within the firm. In this paper, we consider two extreme cases: (l) the financial manager observes the idiosyncratic shock while some of the fund-providers do not; and (2) although the idiosyncratic shock is observable only to the financial manager, the financing decision takes place at a stage before its true value is revealed to him or her. Evidently, which case is valid depends on the responsibility and leeway given to the manager by the board of directors.

The paper demonstrates that, in case (1), there is a severe "home bias" problem concerning equity flows. The relevance of this result is underscored by the evidence that the degree of capital mobility is significantly limited by the home bias phenomenon even though financial markets today show a high degree of integration with large amounts of capital flowing across international borders to take advantage of rates of return and risk diversification benefits. For example, Tesar and Werner (1995) find that despite the recent increase in U.S. equity investment abroad, the U.S. portfolio remains strongly biased towards domestic equity. One possible explanation for the home bias lies in an information asymmetry between domestic and foreign savers, and this asymmetry is indeed the crucial assumption we make in this paper.

In case (1), the informational problem gives rise to foreign under-investment and domestic over-saving under pure equity finance. While these inefficiencies can be corrected by a Pigouvian tax package, the introduction of foreign borrowing blended with equity financing is shown to be an alternative solution, which may be more incentive-compatible and more manageable than the tax solution. This is because the market solution relies on the self interests of the private agents and the natural forces of the markets while the tax solution depends on the discretion of a well-intentioned government.

In case (2), the unfettered credit market is efficient if debt is the only capital flow mechanism in existence. However, the outcome is inferior to the equity market outcome because of the presence of default costs under debt finance. Therefore, when the two mechanisms are blended, equity flows will crowd out debt flows.

While the results from case (1) seem to be more consistent with the pecking order between debt and equity flows for developing countries that we

allude to in Razin, Sadka, and Yuen (1998a,1999), the information structure considered in case (2) is also very real in industrialized countries. The sharp contrast in the relative superiority of debt and equity flows between two cases points to the importance in understanding how the structure of corporate governance is determined and how it affects the sequencing of investment and financing decisions as well as information-gathering at different stages. These important issues are left for future research.

APPENDIX

In this Appendix, we prove the two inequalities stated in equation (4), i.e.,

$$1 + r^* < F'(K^-) < 1 + r.$$

Proof: First, observe that the cutoff condition(1) implies the following:

$$\frac{1+r}{1+r^*} = \frac{1+\varepsilon_0}{1+e^-(\varepsilon_0)}. \tag{A1}$$

Multiplying the opimial invesiment condition under equity-only finance (5) throughout by $1 + r$, then substituting (A1) into the resulting expression and rearranging terms, we get

$$1 + r = F'(K^-)\{\Phi(\varepsilon_0)(1+\varepsilon_0) + [1-\Phi(\varepsilon_0)][1+e^+(\varepsilon_0)]\} > F'(K^-),$$

since $\Phi(\varepsilon_0)(1+\varepsilon_0) + [1-\Phi(\varepsilon_0)][1+e^+(\varepsilon_0)] > \Phi(\varepsilon_0)[1+e^-(\varepsilon_0)] + [1-\Phi(\varepsilon_0)][1+e^+(\varepsilon_0)] = 1$, given $\varepsilon_0 > e^-(\varepsilon_0)$. This proves the rightmost inequality.

Similarly, (A1) can be re-expressed as

$$\frac{1+r^*}{1+r} = \frac{1+e^-(\varepsilon_0)}{1+\varepsilon_0}. \tag{A2}$$

Multiplying (5) throughout by $1 + r^*$, then substituting (A2) into the resulting expression and rearranging terms, we get

$$\begin{aligned} 1 + r^* &= F'(K^-)\{\Phi(\varepsilon_0)[1+e^-(\varepsilon_0)] \\ &+ [1-\Phi(\varepsilon_0)][1+e^+(\varepsilon_0)][1+e^-(\varepsilon_0)]/(1+\varepsilon_0)\} \\ &< F'(K^-), \end{aligned}$$

since $\Phi(\varepsilon_0)[1+e^-(\varepsilon_0)] + [1-\Phi(\varepsilon_0)][1+e^+(\varepsilon_0)] = 1$ and $\varepsilon_0 > e^-(\varepsilon_0)$ imply that the term in curly bracket is less than unity. This proves the leftmost inequality as well. ∎

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