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# COUNTRY RISK AND THE ORGANIZATION OF INTERNATIONAL CAPITAL TRANSFER

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## ABSTRACT

Foreign portfolio investment is threatened by the risk of default and repudiation, while direct foreign investment is threatened by the risk of expropriation. These two contractual forms of investment can differ substantially in: (1) the amount of capital they can transfer from abroad to capital-importing countries; (2) the shadow cost of capital and (3) their implications for the tax policy of the host. The interaction of public borrowing from abroad with investments abroad by private citizens of the borrowing country can imply multiple equilibria with very different welfare consequences. One equilibrium involves private inflows and repayment of public debt. Another is characterized by capital flight and default.

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## 1. Introduction

Carlos Diaz-Alejandro analyzed many aspects of the international transfer of capital. Among the factors that he stressed, perhaps none was given more emphasis than the way the transfer of capital is organized. It is in this cluster of issues that we find the themes for our paper.

On the side of suppliers of capital, the questions that arise most prominently in Diaz-Alejandro's writings are: (i) whether the cohesion among creditors that allows them to enforce contracts will also lead to other sorts of collusive behavior, perhaps reflected in returns to the providers of capital above their opportunity costs of funds (Bacha and Diaz-Alejandro, 1982, and Diaz-Alejandro, 1984); and (ii) whether there is sufficient flexibility in the contract under which capital is provided, given the contingencies that may arise (Diaz-Alejandro, 1984). This latter topic subsumes some important aspects of the differences between lenders and direct investors.

As for the recipients of capital, one issue is whether the public sector obtains capital and compensates its owners in a centralized fashion, or whether private entities play this role atomistically (Diaz-Alejandro, 1984). In the second case, the issue arises as to what actions the public sector takes if private agents do not fulfill their contractual obligations (Diaz-Alejandro, 1985). Another related question is the role of capital transfers abroad by private agents (so-called capital flight), especially when the public sector may be responsible for recompensing foreign suppliers of capital (Diaz-Alejandro, 1984).

All these considerations bear on the central issue of how much a country should borrow in an environment of country risk and the dual

problem of assessing the cost of capital in such circumstances. Quoting Harberger twice:

> The 'risk premium' charged on loans should not be considered as part of the cost of borrowing, so long as that premium truly reflects the probability of default, and so long as that probability, in turn, is accurately perceived by both borrowers and lenders ... In short, the default premium reflects that part of the stated interest rate that is (on average) not expected to be paid. And if it is not expected to be paid, it is not part of the cost ... The above statement holds even when the probability of default is a function of the size of the debt of the individual borrower. (Harberger, 1976, p. 1).

and later,

> [D]eveloping countries typically face an upward-rising supply curve of capital funds. The marginal cost to the country of borrowing exceeds the average cost. This is a genuine negative externality that in principle justifies a tax on foreign borrowing (that is, each additional foreign loan tends to increase the country risk premium to be paid as other foreign loans are renewed or new ones made). (Harberger, 1985, p. 236).

In Section 2 we characterize optimal borrowing in the presence of default risk, and discuss the relationships between the world interest rate, the interest rate charged the borrower, and the social cost of capital to the national economy. Our results indicate that almost any relative ordering of these magnitudes is possible.

Whether market imperfections arise when borrowing is decentralized among individual firms is a question that has been addressed by Kahn (1984). In order to compare the implications of alternative

organizational forms of capital transfer, Section 3 summarizes some of his results.

A third issue that we address (in Section 4) is the capacity of direct foreign investment, relative to the social optimum and to portfolio investment, to transfer capital to developing countries. Even when the penalty for expropriation is equivalent to that for default, different amounts of capital will be transferred. There is no necessary ordering, but we find a presumption that under laissez-faire direct investment cannot sustain as much movement of capital as portfolio investment.[1]

In these sections we also examine the optimal taxation of foreign investment with sovereign risk.[2] Portfolio and direct investment have different tax implications, and either a tax or a subsidy can be the better policy.

In section 5 we turn to the simultaneous interaction of public debt and private investment. One result is that even in a very simple framework there may be several equilibria. One is a Pareto optimum which satisfies all the standard marginal conditions and in which debt is repaid. The presence of large public debt-service obligations (and the tax obligations they foretell) implies a second, less favorable equilibrium characterized by a flight of private capital to foreign countries and nonrepayment of public debt.

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1 This result supports pessimism about the potential for refinancing the bank loans of major debtors with direct private investment, a component of the recent Baker initiative.

2 Gersovitz (1985) discusses aspects of taxation of foreign investment in developing countries.

## 2. Optimal Indebtedness

We consider a country with n potential domestic projects. Each project produces an output q (inclusive of remaining capital) determined by the production relationship

$$q_i = f_i(k_i) \qquad f_i' > 0,\ f_i'' < 0$$

where $k_i$ is the amount invested.

The national capital stock is $\bar{K}$. There is also an international capital market in which the gross safe interest rate is given exogenously to this country at r. The government automatically enforces all loan contracts among nationals. If it fails to enforce a loan contract with a foreign lender then the country experiences a penalty equivalent to a loss of income of $P(x)$.[3] We introduce uncertainty by assuming that the penalty is stochastic: x is a random variable distributed uniformly on the interval [0, 1] and $P'(x) \geq 0$. The realization of x is not known at the time loans are extended, but is learned before repayment is made.

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[3] This is a very abstract representation of the penalty that may be imposed on recipients of foreign capital who do not honor contracts. In fact, the penalties are likely to be quite indirect, such as exclusion from: (1) future borrowing (Eaton and Gersovitz, 1981a and 1981b); (2) specialized inputs or technological know-how (Eaton and Gersovitz, 1984); and (3) foreign trade (Gersovitz, 1983, Kahn, 1984, and Alexander, 1985). Eaton and Gersovitz (1983) contrast the penalties available to financial lenders and direct investors, whereas in this paper we investigate the implications of different ways of organizing the transfer of capital when the penalty is of the same type and magnitude. As argued in Gersovitz (1985) and Eaton et. al. (1986) the form of the penalty may have important consequences for comparative statics and for policy prescriptions. In this paper, we adopt the simple formulation of the penalty as a first step.

Upon learning x, the government chooses to enforce existing debt contracts with foreigners, or not, depending upon the consequence for national income.

With repayment, national income is $Y^N$ where

$$Y^N = Q - sK^f. \tag{2.1}$$

Here s is the gross interest rate charged by foreign lenders, $Q \equiv \sum_{i=1}^{n} f_i(k_i)$, domestic output exclusive of any penalty, and $K^f \equiv \sum_{i=1}^{n} k_i - \bar{K}$, foreign debt. If it chooses not to enforce contracts then national income is

$$Y^E(x) = Q - P(x). \tag{2.2}$$

The decision consequently depends upon whether

$$P(x) \gtrless sK^f. \tag{2.3}$$

The probability of default is $x^*$ where $P(x^*) = sK^f$. If $x < x^*$ then the government defaults while $x \geq x^*$ it repays.[4] We define the function

$$h(sK^f) \equiv 1 - x^* = 1 - p^{-1}(sK^f)$$

as the probability of repaying given that an amount $sK^f$ is owed.

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[4] We arbitrarily resolve ties in favor of repayment.

International loan markets determine an interest rate s, given the loan amount $K^f$, that satisfies the zero expected profit condition[5]

$$s\ h(sK^f) = r. \tag{2.4}$$

A possibility, of course, is that for some levels of $K^f$ no value of s satisfies this relationship. These levels will simply not be available.

At the time borrowing decisions are made, the penalty is not known. We assume (i) that the government's objective, at this stage, is to maximize the expectation of a function U of national income and (ii) that the government directly controls the amount invested in each project, the $k_i$'s. Substituting (2.1) and (2.2), the objective function is

$$W = \int_0^{1-h(sK^f)} U\ [Q - P(x)]\ dx + h(sK^f)\ U(Q-sK^f), \tag{2.5}$$

with $K^f$ as defined above and condition (2.4) relating s and $K^f$.

The first-order condition for a maximum is

$$\frac{dW}{dk} = \int_0^{1-h(sK^f)} U'\ [Q - P(x)]\ f_i'(k_i)\ dx$$

$$+ h(sK^f)\ U'(Q - sK^f)\ [f_i'(k_i) - s - \frac{ds}{dK^f} K^f] = 0 \quad i=1, \ldots, n. \tag{2.6}$$

From the zero expected profit condition (2.4)

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5 Either lenders' risk neutrality or the perfect diversifiability of this country's risk of defaulting is justification for this assumption.

$$\frac{ds}{dK^f} = \frac{-s/K^f}{1+1/\varepsilon} \tag{2.7}$$

where

$$\varepsilon \equiv \frac{h'(sK^f)\ sK^f}{h(sK^f)}$$

the (negative) elasticity of the repayment probability with respect to what is owed.

Using the expression for $\varepsilon$, condition (2.6) becomes

$$f_i'(k_i) = [r/(1+\varepsilon)]\ \phi \tag{2.8}$$

where

$$\phi \equiv \{h(sK^f) + \int_0^{1-h(sK^f)} U'[Y^E(x)]\ dx/U'(Y^N)\}^{-1}.$$

Note first that the right-hand side of expression (2.8) is independent of i. Not surprisingly, optimality requires equating the marginal product of capital across projects.

In the case of constant marginal utility $\phi = 1$, while risk aversion implies that $\phi > 1$. Risk-averse borrowers should borrow less than risk-neutral borrowers. The reason is that, at the optimum, an increase in borrowing raises income by $f_i'(k_i)$ in the (high-income) default state and therefore must lower it in the (low-income) no-default state. An

increase in risk aversion pushes the borrowing country toward doing just the opposite.[6]

At the optimum an increase in borrowing can never lower total debt-service obligations. Otherwise an increase in $K^f$ would raise income in all states of the world. This condition ensures that $1 + \varepsilon > 0$. Since $\varepsilon \leq 0$, condition (2.8) implies that for $\varepsilon < 0$, even risk-neutral borrowers should borrow less than what equates the marginal product of capital to the world interest rate. The reason is that borrowing more raises the probability that the country will suffer the penalty.

Three special cases illustrate various possibilities in the relationships among the nominal interest rate, the cost of capital and the amount borrowed at the optimum:

First, if the penalty is nonstochastic then credit will be available up to an amount P/r at rate r. None is available above that amount at any nominal rate. For $K^f < P/r$, $\varepsilon = 0$ and the standard equating of the marginal product of capital to the world safe interest rate is optimal. At $K^f = P/r$ credit is rationed, but competition keeps the rate charged at r.

Second, if the penalty is discretely distributed, as, for example, if $P(x) = P_1$ for x in $[0, \pi]$ and $P(x) = P_2$ for x in $(\pi, 1]$ then for $P_1/r < K^f < P_2 (1 - \pi)/r$, $\varepsilon = 0$. Equating the marginal product to the

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6 This result is sensitive to the way in which the risk of default is introduced into the model. Since it is the penalty that is unknown at the time of the borrowing decision, default occurs in the well-endowed, low-penalty state. An alternative specification (used in Eaton and Gersovitz, 1981a) is one in which the penalty is constant in utility terms and income is stochastic. Risk aversion consequently implies default in poorly-endowed states. This insurance aspect of borrowing and default could imply that risk aversion makes more borrowing optimal.

safe world interest rate is optimal for a risk-neutral country. Even though there is the possibility of default, a marginal increase in the amount borrowed does not increase its likelihood, and therefore the marginal cost of borrowing.

Third, if $P(x) = x/(1 - x)$, so that an infinite penalty is possible, then the probability of repayment is $1/(1 + sK^f)$. The zero-profit condition (2.6) implies an inverse loan supply function

$$s = r/(1 - rK^f) \tag{2.9}$$

with no capital available at a level above $1/r$. With risk neutrality optimal borrowing implies that

$$f_i'(k_i) = r/(1-rK^f) = s. \tag{2.10}$$

In general, there is no ordering of the marginal product of capital and s, the nominal interest rate, at the optimum. In the nonstochastic case $r = s$ but if credit is rationed then the marginal product of capital exceeds both r and s. In the case of the binominal distribution of the penalty and an interior value of $K^f$, $s = r/(1 - \pi) > r$, but with risk-neutrality the marginal product of capital should equal r. Finally, in the third special case we considered, optimality happens to involve <u>equating</u> the marginal product of capital to s, contrary to the first quotation from Harberger.

Note also that the marginal cost of capital does not necessarily increase monotonically in the amount borrowed. In the case of the binomial distribution of the penalty the marginal cost is r both for $K^f$

in $[0,P_1/r)$ and for $K^f$ in $(P_1/r, (1-\pi)P_2/r)$, but at $K^f = P_1/r$ the marginal cost is infinite since an infinitessimal increase in $K^f$ raises interest costs by $\pi P_1/(1-\pi)$.

## 3. Decentralized Borrowing

We now turn to the case in which each investment project is managed by a private national who borrows and invests in order to maximize his utility from the profit generated by the project.[7] This is the case considered by Kahn (1984), and our analysis largely follows his. The government's failure to enforce the loan obligations of any borrower provokes the implementation of the same penalty, and its severity is independent of the amount owed. The choice to enforce foreign debt contracts or not thus remains an all-or-nothing decision for the borrowing country. It suffers the same penalty regardless of how much is not repaid, so if it does not enforce one debt contract, there is no point in enforcing any other.

One reason for foreign lenders to adopt this attitude is their reliance on the government of the borrowing country to enforce even private contracts. Diaz-Alejandro's (1985) account of the 1982 financial crisis in Chile indicates that foreign lenders took exactly this stance when several private banks with large debts to U.S. banks declared bankruptcy. As part of its free-market orientation the Chilean government had explicitly not guaranteed these debts, but the U.S. banks threatened to embargo loans to the Chilean government if these debts were cancelled. The government chose to assume them.

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7 An incentive, of course, might arise for borrowers to merge their projects into single firms. We do not pursue this issue here.

The amount borrowed in a decentralized allocation depends, among other things, on how the government distributes the cost of default, if it should occur, among borrowers. In general, in the event of default an individual borrower suffers an additional cost $\tau^i(k_i^f,x)$.[8] If the burden is distributed among borrowers according to their share of total borrowing, for example, then

$$\tau^i(k_i^f,x) = (k_i^f/K^f)P(x).$$

Let $u_i(\pi_i)$ denote the utility of the owner of the firm as a function of firm profit, $\pi_i$. He chooses $k_i^d$ and $k_i^f$ to maximize an objective function

$$w_i \equiv \int_0^{1-h(sK^f)} u_i[f_i(k_i) - \tilde{r}k_i^d - \tau^i(k_i^f, x)]\, dx$$

$$+ h(sK^f)\, u_i\, [f_i(k_i) - \tilde{r}k_i^d - sk_i^f] \qquad (3.1)$$

where $\tilde{r}$ is the interest rate on domestic capital and $k_i = k_i^d + K_i^f$.

The two first-order conditions for a maximum are

$$f_i'(k_i) = \tilde{r} + \frac{d\tilde{r}}{dk_i^d} k_i^d \qquad (3.2)$$

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8 For some borrowers this cost could be negative. If, for example, a consequence of default is a loss of opportunities for international trade then $\tau^i$ might be negative for projects producing import substitutes.

and

$$f_i'(k_i) = \{r\ [\frac{1+\varepsilon(\bar{k}_i^f/K^f)}{1+\varepsilon}] + \int_0^{1-h(sK^f)} u_i'(x)\ \tau_k^i(k_i^f,x)dx/\bar{u}_i'$$

$$- \frac{h(sk^f)}{K_f}\ \frac{\varepsilon}{1+\varepsilon}\ \frac{\bar{u}_i^r - \bar{u}_i^d}{\bar{u}_i'}\}\ \phi_i \qquad (3.3)$$

where

$$\phi_i \equiv [h(sK^f) + \int_0^{1-h(sK^f)}\ u_i'(x)\ dx/\bar{u}_i']^{-1}$$

$$u_i'(x) \equiv u_i'[f_i(k_i) - \tilde{rk}_i^d - \tau^i(k_i^f,x)]$$

$$\bar{u}_i' \equiv u'[f_i(k_i) - \tilde{rk}_i^d - sk_i^f]$$

$$\bar{u}_i^d \equiv u_i[f_i(k_i) - \tilde{rk}_i^d - \tau^i(k_i^f,\ sk^f)]$$

$$\bar{u}_i^r \equiv u_i[f_i(k_i) - \tilde{rk}_i^d - sk_i^f]$$

and

$$\bar{k}_i^f \equiv \sum_{j\neq i}\ k_j^f,$$

foreign borrowing by other firms.

The conditions that $1 + \varepsilon > 0$, that $\varepsilon$ not increase as $K^f$ rises, and that $\tau_{kk} \geq 0$ ensure that the second-order conditions for a maximum are satisfied.

Whether there is too much or too little borrowing under laissez faire, in comparison with the social optimum, depends on four factors:[9]

(i) Risk. If the tax system distributes the burden of the penalty in proportion to income, and private and public attitudes toward risk coincide, then $\phi_i = \phi$. Greater risk aversion on the part of the private sector than on the part of the public leads to less borrowing than is socially optimal. If the government is more risk averse then there is too much borrowing.[10]

(ii) The "Commons" Nature of Interest Costs. An increase in the foreign debt of any single borrower reduces the probability of repayment (if $\varepsilon < 0$), raising the likelihood that others will experience the penalty. This cost is not internalized by any single borrower. This effect acts to raise borrowing above the socially-optimal level. It is more important the larger $\varepsilon$, the elasticity of the repayment probability with respect to debt-service obligations, and the smaller $k_i^f/K^f$, the firm's share of total borrowing.

(iii) The Redistribution of the Penalty. If $\tau_k > 0$ then an individual borrower increases his share of the total burden of the penalty by borrowing more. This effect acts to discourage borrowing. This disincentive to borrow may outweigh the effect of additional borrowing on the cost of capital to other borrowers. In this case, relative to the social optimum there is underborrowing as long as private borrowers are at least as risk averse as the public.

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9 All but the first play a role in Kahn's analysis. He assumes risk neutrality.

10 Again, alternative specifications of the source of uncertainty imply different results.

(iv) The Incidence of the Penalty. Whether an individual borrower benefits or loses from a decision to default depends upon whether $sk_i^f \gtrless \tau^i(k_i^f, sK^f)$. To the extent that private borrowers as a group bear less than the full penalty of default, more will be borrowed than is socially optimal. The opposite is the case if private borrowers suffer more from default than the nation as a whole.

Note that under laissez-faire, borrowing does not typically equate the marginal product of capital across sectors. It is relatively lower in projects that contribute only a small share to total foreign borrowing, since here the external effect associated with borrowing is greater. It will also be lower in projects whose owners bear less of the burden of the penalty of default. A tendency may emerge, for example, for more to be invested in production of import substitutes or non-traded goods; see Gersovitz (1983), Kahn (1984) or Alexander (1985).

In summary, decentralization of borrowing decisions can lead either to under or to overborrowing. The effect on different projects can vary. Either taxation or subsidization of borrowing may be optimal. In one particular case (if $\phi_i = \phi$, $\varepsilon = 0$ or $k_i^f/K^f = 0$, $\tau^i(k_i^f, sk^f) = sk_i^f$, and $\tau_k^i = 0$) the laissez-faire allocation corresponds to the social optimum. With $\phi_i = \phi$, the sign of the optimal tax on foreign borrowing by firm i is the sign of the expression

$$-\frac{r\varepsilon}{1+\varepsilon}\left(\frac{\bar{k}_i^f}{K^f}\right) - \int_0^{1-h(sK^f)} u_i'(x)\ \tau_k^i(k_i^f, x)dx/\bar{u}_i' + \frac{\varepsilon}{1+\varepsilon}\frac{h(sK^f)}{K^f}\frac{u_i^r - u_i^d}{\bar{u}_i'} \qquad (3.4)$$

## 4. Direct Foreign Investment

We now turn to the case in which foreigners invest directly in domestic projects. Foreign investors can borrow in the world capital market at the safe interest rate, r, and always repay their loans in this market.

In the absence of expropriation foreign investors earn the after-tax profit on their investment, $\pi_i$, net of interest payments to foreign lenders. National income equals total output, less payments to foreign investors (equal to profits plus loans from abroad). Like default, expropriation imposes a cost P(x) on the country where again $P'(x) \geq 0$ and x is perceived as uniformly distributed on [0,1] at the time investments are made. Its exact value is known at the time of the expropriation decision, however.

For purposes of comparison with our analysis of default, we treat expropriation here as an all-or-nothing event. This assumption may be less appropriate for expropriation, since it is more likely to occur on a selective basis, with expropriation of each project provoking a separate penalty.[11]

If expropriated, foreign investors receive nothing from their investment in this country. They do not pay any local factors of

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11 The contrast between the reactions of foreign investors to expropriation and to default was notable in the case of Peru in the 1970's. See Eaton and Gersovitz (1983).

production, but do repay loans from abroad.[12] In the absence of expropriation the investor remits an amount

$$s_i = \pi_i + rk_i^f, \tag{4.1}$$

profit plus the payment on foreign loans. In contrast, portfolio investors providing an amount $k_i^f$ would receive $sk_i^f$ in the absence of default. The fact that remittances of direct investors depend directly upon output, while those of portfolio investors do not, is the basic difference between these contractual forms.

Defining total remittances with no expropriation as $S \equiv \sum_{i=1}^{n} s_i$ and total domestic output (less any penalty) as $Q \equiv \sum_{i=1}^{n} f_i(k_i)$, national income without expropriation is

$$Y^N = Q - S \tag{4.2}$$

while in the event of expropriation it is

$$Y^E(x) = Q - P(x). \tag{4.3}$$

The government will choose to expropriate or not as

$$S \gtrless P(x). \tag{4.4}$$

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12 If expropriation led to default on the borrowing of direct investors, then direct investors would transfer all risk to foreign lenders. The analysis would be the same as that of the previous section, only with foreign investors replacing domestic owners of firms as borrowers.

## 4.1 Laissez-faire Investment

The expected profit from an investment in project i is

$$\pi_i^e = -rk_i^f + h(S)\ [f_i(k_i) - y_i]. \tag{4.5}$$

Here, as before, $h(S) \equiv 1 - P^{-1}(S)$; $y_i$ is payment to local factors of production. A risk-neutral foreign investor will choose a $k_i^f$ that satisfies the first-order condition

$$f_i'(k_i) = \{r - h'(S)\ \frac{dS}{dk_i^f}\ [f_i(k_i) - y_i]\} \ / \ h(S). \tag{4.6}$$

Competition among potential risk-neutral foreign investors will bid $y_i$ up to the point at which $\pi_i^e = 0$, so that

$$y_i = f_i(k_i) - rk_i^f \ / \ h(S). \tag{4.7}$$

If there is no expropriation then the foreign investor remits

$$s_i = f_i(k_i) - y_i = rk_i^f \ / \ h(S). \tag{4.8}$$

Summing across potential investments,

$$S = rK^f \ / \ h(S), \tag{4.9}$$

which implicitly defines S as a function of $K^f$. Differentiating this relationship with respect to $k_i^f$ indicates that

$$\frac{dS}{dk_i^f} = \frac{r}{h'(S)\ S + h(S)} = \frac{r/h(S)}{1+\varepsilon} \qquad (4.10)$$

where, parallel to the case of portfolio investment

$$\varepsilon \equiv h'(S)\ S/\ h(S)$$

the (negative) elasticity of the probability of non-expropriation with respect to remittances.

Substituting these relationships back into the first-order condition

$$f_i'(k_i) = r\ [\frac{1 + \varepsilon(\bar{k}_i^f/K^f)}{1+\varepsilon}]\ /\ h(S) \qquad (4.11)$$

where

$$\bar{k}_i^f \equiv \sum_{j \neq i} k_i^f$$

foreign borrowing by other foreign investors.[13]

A comparison of the marginal products of capital under laissez-faire direct foreign investment and under laissez-faire foreign borrowing (for the risk-neutral case), assuming that default and expropriation provoke equivalent penalties, indicates no necessary ordering. Two effects operate in different directions:

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13 Again, the conditions that $1 + \varepsilon > 0$ and that $\varepsilon$ not rise as $K^f$ rises insure that the second-order condition for a maximum is satisfied.

(1) If the marginal unit of foreign borrowing raises the share of the penalty of default born by the individual borrower then the flow of capital under direct investment tends to exceed that under portfolio investment. To the extent that the penalty of default is borne by those making the borrowing decision, while those making the investment decision avoid the penalty of expropriation, more capital is transferred under direct investment.

(2) The term

$$\rho_i \equiv r\,[1 + \varepsilon(\bar{k}_i^f/K^f)] \;/\; (1 + \varepsilon)$$

is the expected marginal cost of an additional unit of foreign borrowing both for a domestic firm (less any penalty assessment) and for a foreign investor. Domestic firms earn a return $f_i'(k_i)$ regardless of whether or not there is default, but foreign investors earn this return only if there is no expropriation. Consequently, with risk neutrality, no marginal penalty assessment, and $\tau^i\,(k_i^f,\, sK^f) = sk_i^f$,

$$f_i'(k^i) = \rho_i$$

with borrowing, but

$$h(S)\; f_i'(k^i) = \rho_i$$

with direct investment. To the extent that this effect is relevant, portfolio investment can sustain more movement of capital.

## 4.2 Taxing Foreign Investment

We now introduce taxes on income remitted by foreign investors. To simplify things we assume that all projects are identical (that is, that $f_i(k) = f(k)$ for all i) and that there is no national capital ($K = 0$). In addition, we assume that $\varepsilon$ is constant, implying that

$$P(x) = k(1 - x)^{1/\varepsilon} \qquad k > 0.$$

The expected profit to a foreign investor who invests k in a typical project is now

$$\pi^e = -rk + h(S)(1 - t)[f(k) - y] \tag{4.4'}$$

where t is the tax rate on income remitted. The first-order condition for a maximum is

$$(1-t)h(S)f'(k) - r + h'(S)\frac{dS}{dK}(1-t)[f(k) - y] = 0 \tag{4.6'}$$

and the zero-profit condition is

$$y = f(k) - rk / h(S)(1-t). \tag{4.7'}$$

Expressions (4.9) and (4.10) continue to apply; taxing foreign investment does not affect the relationship between investment and after-tax remittances. Substituting (4.10) into (4.6') and invoking symmetry, the first-order condition becomes

$$(1-t)\, h(S)f'(k) = r[1 + \varepsilon(n-1)/n] \,/\, (1+\varepsilon). \qquad (4.6'')$$

This condition, along with the aggregate zero-expected profit condition

$$rnk = h(S)S, \qquad (4.9')$$

determine k and S.

An increase in the tax rate t affects k and S as follows;

$$\frac{dk}{dt} = \frac{h(S)k(1+\varepsilon)}{\Delta} \qquad (4.12)$$

$$\frac{dS}{dt} = \frac{rnk}{\Delta} \qquad (4.13)$$

where

$$\Delta \equiv (1-t)\, h(S)\, [\eta(1+\varepsilon) + \varepsilon]$$

and

$$\eta \equiv f''(k)\, k/f'(k).$$

As long as $1+\varepsilon > 0$, so that increasing remittances in the no-expropriation state raises expected remittances overall, $\Delta < 0$. Under this condition, an increase in the tax on remittances reduces both foreign investment and after-tax remittances should expropriation not occur.

4.3 Optimal Taxation

We posit, as in section 2, a government seeking to maximize the expectation of a function U of national income. The objective function may be written

$$W = \int_0^{1-h(s)} U[nf(k) - P(x)]dx + h(S)\, U[nf(k) - S]. \tag{4.14}$$

Differentiating the expression with respect to t gives

$$\frac{dW}{dt} = [\phi\, nf'(k)\, \frac{dk}{dt} - h(S)\, \frac{dS}{dt}] \cdot \bar{U}' \tag{4.15}$$

where, as in section 2,

$$\phi \equiv [h(S) + \int_0^{1-h(S)} U'(Y^E(x)) \,/\, U'(Y^N)]^{-1}.$$

Incorporating (4.12) and (4.13) into (4.15), using (4.6")

$$\frac{dW}{dt} = \frac{rnk}{\Delta} \{\phi[1+\varepsilon(n-1)/n] - h(S)\}. \tag{4.15'}$$

With $\Delta < 0$, from an initial situation in which $t = 0$, an increase in t raises or lowers expected welfare depending upon whether

$$h(S) \gtrless \phi[1 + \varepsilon(n-1)/n]. \tag{4.16}$$

If a firm's investment has a negligible spillover onto other firms ($\varepsilon = 0$ or $n = 1$) and if the government is risk neutral (so that $\phi = 1$) then a subsidy on direct foreign investment is optimal. The reason is simply that the country benefits from an additional unit of capital if it

should expropriate, and this benefit is not captured by the firm undertaking the investment.

To the extent that investment by a single borrower raises the expected cost of capital for other firms, more investment takes place under laissez-faire, given the underlying probability of expropriation.

If the country is risk neutral then condition (4.16) becomes

$$-\varepsilon\,(n-1)/n \gtrless 1 - h(S)$$

with the "commons effect" in the left-hand side and the probability of expropriation on the right-hand side. To the extent that the externality effect is large, too much capital is invested. If the probability of expropriation is low, then the likelihood of the country benefitting from an increase in its capital stock in the event of expropriation is low. In this case a tax on foreign investment is appropriate. If expropriation is likely, but externalities small, then a subsidy is optimal.

Risk aversion tilts the argument in favor of a tax. A tax shifts income from the high endowment states (expropriation) toward the low endowment state (protecting property rights). A subsidy does the opposite.[14]

To summarize the results of the last two sections, decentralized investment, whether it takes the form of borrowing by domestic firms or direct investment by foreigners, may generate an externality by raising

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[14] Again, alternative specifications of the nature of uncertainty can imply different results.

the interest costs of other firms. This is Kahn's "commons effect," and it leads to overborrowing relative to the social optimum.

Both decentralized borrowing and decentralized investment, however, are subject to forces that could lead to underborrowing. An increase in a borrower's share of the burden of the default penalty, should default occur, is a disincentive to borrow that does not reflect a social cost of borrowing. The possibility of expropriation is a disincentive to invest that does not reflect a lower social return on an investment.

If loans to individual firms or if individual investment projects stand alone in terms of the penalties that default or expropriation provoke, then there is no externality across projects. The commons problem disappears. If, in addition, borrowers suffer the full penalty of default on their own loans then, with risk neutrality, the private and socially-optimal levels of portfolio borrowing coincide. The amount of foreign direct investment that takes place will be too low, relative to the optimum, however, since investors lose their return in the event of expropriation.

As argued above, investors seem more likely to adopt a stand-alone principle in the case of direct foreign investment. This is an additional reason that decentralized direct foreign investment can sustain less capital movement than portfolio investment, under laissez-faire.

## 5. Public Borrowing and Private Investment: The Capital Flight Phenomenon

A number of countries with large public debts to foreign banks seem also to have large amounts of private capital invested abroad, a

phenomenon referred to as capital flight. Cuddington (1985) and Dooley et al. (1983) provide alternative estimates of these flows for several countries. To some extent standard portfolio diversification motives can explain these two-way flows. What is peculiar about capital flight from large debtors is that capital inflows largely take the form of public and publicly-guaranteed debt while outflows are private.

Khan and Haque (1985) explain this phenomenon on the basis of an asymmetric risk of expropriation: Nationals investing domestically face a risk of expropriation by their own government that exceeds the risk of default on foreign loans. This risk is avoided by investing abroad.

Their analysis does not relate the government's expropriation decision to outstanding debt. In fact, prospective external debt-service obligations may contribute to the private sector's fear of expropriation, or other forms of taxation, as a means for the government to raise funds to service debt. If capital located abroad escapes taxation and is free of expropriation risk, then capital flight can emerge as a consequence of heavy foreign borrowing.

The same phenomenon may explain the hesitation of foreign private investors to invest directly in the country. Investors can negotiate ex ante with the borrowing government a promised return on publicly-guaranteed portfolio loans. Failure to pay the promised return constitutes default, and investors can invoke the associated penalty straightforwardly. In contrast, the host-country government can affect the return on direct private investment through myriad tax, exchange control, minimum wage and other types of policy. It is difficult to draft and to adjudicate a binding contract that specifies contingencies under which a government may or may not adopt various policies that

affect the return on a direct investment. Investors consequently would find it difficult to demonstrate that a host-country government has renegged on any ex ante guarantee. Informational asymmetries between the host-country government and foreign firm might expose one side or the other to severe moral hazard problems if a contract were entered into and enforced.

In this section we explicitly introduce two forms of capital, public and private, into the production process. Total domestic output is a function of the domestic supplies of public capital P, private capital K, and L, other factors of production that are internationally immobile and in fixed supply domestically. These are called labor here. Output Q is determined by the relationship

$$Q = F(P,K,L). \tag{5.1}$$

Production is at constant returns to scale.

Marginal productivity conditions do not determine factor rewards, however. Payments to private factors (K and L) exhaust output. The government cannot capture the contribution of public investment to output by charging directly for the use of its capital. The (pre-tax) returns to private capital, $\tilde{r}$, and labor $\tilde{w}$, are homogenous-of-degree-zero functions

$$\tilde{r} = g^K(P,\ K,\ L),\ g^K_K < 0 \tag{5.2}$$

$$\tilde{w} = g^L(P,\ K,\ L),\ g^L_L < 0 \tag{5.3}$$

that satisfy the relationship

$$g^K (P, K, L)\, K + g^L (P, K, L)\, L = F (P, K, L). \qquad (5.4)$$

Hence payments to <u>private</u> factors alone exhaust output. The safe world interest rate is r and the national supply of capital is $\bar{K}$. At this point we assume that the penalty for default on public debt is too large to make this option attractive.

## 5.1 The Centralized Solution

Standard marginal productivity conditions dictate the centralized optimum; optimal values of P and K, denoted $P^*$ and $K^*$, satisfy

$$F_P (P^*, K^*, L) = F_K(P^*, K^*, L) = r. \qquad (5.5)$$

Total external indebtedness D is

$$D = P^* + K^* - \bar{K}.$$

## 5.2 Decentralized Solutions

We now assume that the government cannot allocate private capital directly, and must borrow to finance public investment. It can tax income from labor, and from capital invested <u>domestically</u>. It cannot tax the wealth of its nationals directly, but only the income that this wealth generates after it is invested. Hence $\bar{K}$ is not directly available as a tax base to finance P.

The optimal allocation can be supported by choosing proportional tax rates $t_K^*$ for capital and $t_L^*$ for labor that satisfy

$$r = F_K(P^*, K^*, L) = (1-t_K^*)\, g^K(P, K, L) = (1-t_K^*)\, \tilde{r} \qquad (5.5)$$

$$w = F_L(P^*, K^*, L) = (1-t_L^*)\, g^L(P, K, L) = (1-t_L^*)\, \tilde{w} \qquad (5.6)$$

where w is the after-tax wage. Multiplying (5.5) by $K^*$ and (5.6) by L, adding the results and invoking homogeneity ensures that

$$Q - wL - rK^* = F_p P^* = rP^*, \qquad (5.7)$$

The tax revenue exactly pays for the debt-service obligation on public debt.

This equilibrium is compatible with competitive behavior of private investors since the after-tax return on private investment equals the world interest rate.

## 5.3 Capital Flight and Country Runs

A difficulty arises with the sequencing of decisions. We assume that the government cannot undertake public investment subsequent to private investment. If it attempts to implement the optimal allocation it must first borrow and invest $P^*$, generating a debt-service obligation $rP^*$.

We assume that there is a limit on the revenue that can be raised from taxing labor income. We specify the limit as a function $T^L(P,K,L)$, and assume here that

$$T^L(P^*,K^*,L) \geq t_L^* g^L(P^*,K^*,L)L; \qquad (5.8)$$

the optimal tax rate is feasible. In the extreme, all labor income is taxed, meaning that $T^L = g^L L$.

We impose two restrictions on this function. The first is that revenue extracted from labor income can never repay fully the public debt if the optimal amount is borrowed, i.e.,

$$T^L(P^*, K, L) < rP^*. \tag{5.9}$$

The second is that an increase in the capital stock cannot generate a more than proportional increase in $T^L$, i.e.

$$T^L_K \, K/T^L \leq 1. \tag{5.10}$$

Given $P^*$ and L, if the government services its debt then the tax burden on private investors will equal at least

$$T^K(P^*,K,L) = rP^* - T^L(P^*,K,L). \tag{5.11}$$

The maximum after-tax return on capital as a function K is

$$\psi(K) = g^K(P^*,K,L) - [rP^* - T^L(P^*,K,L)]/K. \tag{5.12}$$

We now demonstrate the potential for multiple equilibria. One equilibrium is the social optimum just derived, in which $K = K^*$, $t_K = t_K^*$ and $(1-t_K^*)\, g^K = r$. Tax revenue covers debt-service obligations, and debt is repaid.

Another equilibrium is one with zero private investment. Since $\psi(0) < r$ the country cannot attract only a small but strictly positive amount of private capital. The government will have an incentive to tax any such amount at such a high rate that the after-tax return is noncompetitive. In this case tax revenues do not cover debt-service obligations. The country is insolvent. A certain threshold level of private investment is needed to generate a competitive after-tax return.

Other equilibria with private capital in the range $(0, K^*)$ are also possible, with an after-tax return on capital equal to the world rate.

The potential for multiple equilibria can be modelled most starkly by eliminating the fixed factor, labor, assuming that $t_L^* = T^L(P^*, K\ L) = 0$ so that private capital income is the only tax base. The function

$$\psi(K) = g_K^K - rP^*/K \tag{5.13}$$

is the actual after-tax return on capital. At the optimum,

$$\psi(K^*) = r$$

while

$$\lim_{K \to \infty} \psi(K) = g_K^K\ (P^*, \infty, L) < r$$

and

$$\lim_{K \to 0} \psi(K) = -\infty.$$

Continuity of $g^K$ ensures that there are at least two equilibria in which $\psi(K) = r$ (unless, by coincidence, $\max_K \psi(K) = r$) and one in which $K = 0$. If we posit the Marshallian adjustment mechanism

$$\dot{K} = \lambda [\psi(K) - r], \quad \lambda > 0.$$

then both the equilibrium with the maximum amount invested and that with $K = 0$ are stable. Figure 1 provides a simple illustration of this result. Stable equilibria are at $K = K^*$ and $K = 0$; $K = \tilde{K}$ is an unstable equilibrium.

In conclusion, the interaction of public and private borrowing gives rise to situations of multiple equilibria, some of which Pareto-dominate others. If the government must incur public debt before capital is allocated then the tax burden implied by that debt leads to ranges in which the after-tax return to private capital <u>increases</u> with the total amount invested. One equilibrium is the Pareto-optimal one, with a substantial amount of private investment earning a competitive return and public loans repaid. No private investment (or a low level if capital controls keep some capital from escaping) and insolvency characterize another equilibrium.[15]

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15 Diamond and Dybvig (1983) explain the potential for bank runs in a framework that is formally similar to this one. In their model a nonconvexity in dynamic technology, along with the existence of deposit contracts, leads to the possibility of runs.

The model sketched here illustrates the potential for multiple equilibria in a very simple context. The result survives several modifications. Introducing the potential for willful default, rather than insolvency, in particular, would not change the character of the results as long as the temptation to default grows as the domestic tax base falls.

## 6. Conclusions

A frequent subject of Carlos Diaz-Alejandro's writings is the complex and often stormy interactions of foreign capitalists, domestic governments and local entrepreneurs. An analysis of foreign investment that ignores the imperfect nature of property rights and contract enforcement in international markets cannot explain these relationships. Furthermore, the way that recipients and suppliers of capital organize capital transfer has important implications for the functioning of markets and for optimal policy in capital-importing countries. Recognizing these features of the world economy makes evident the fragility of the institutions that sustain movements of capital between countries, and the potential for instability and conflict that they generate.

In this paper we have considered the implications of alternative institutional arrangements for transferring capital between nations in the presence of country risk. The effort has been an exploratory one and the source of risk itself has not been discussed. Introducing uncertainty about the production process as well as the penalty would change the nature of the insurance that the option to default or expropriate implicitly provides. It would also, of course, introduce

additional reasons why direct and portfolio investment would allocate risks differently.

Another issue is the interaction of foreign capital with domestic factor markets. What, in particular, happens, when default is an option domestically as well? Third, we have treated the stock of national capital as given. What implication do our results have for accumulation patterns in a dynamic context?

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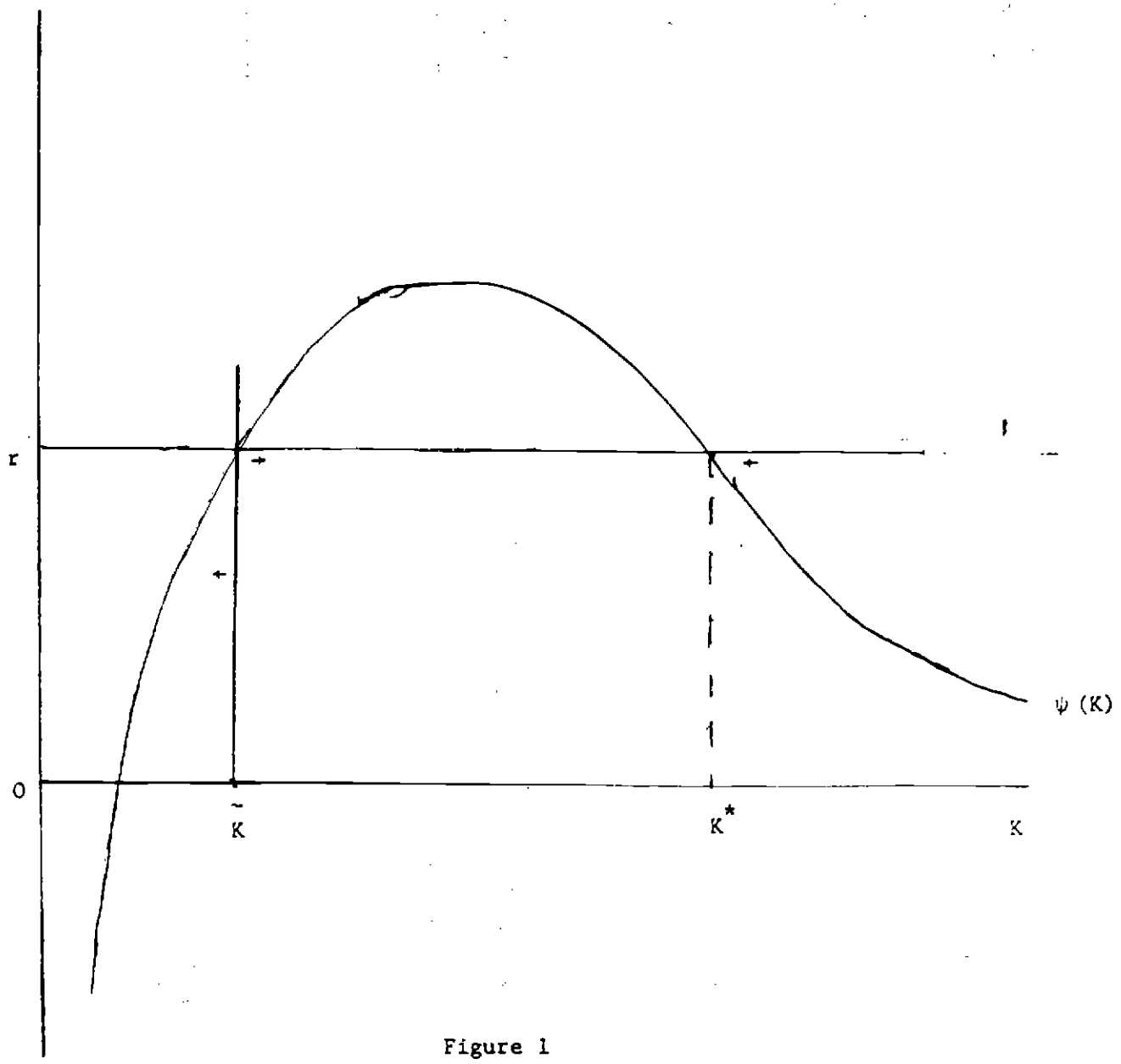


Figure 1

The Anticipated After-Tax Return on Private Investment
And Multiple Equilibria