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Foreign Borrowing and Capital Flight: A Formal Analysis*

by

Mohsin S. Khan and Nadeem Ul Haque**

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Summary

The subject of capital flight from developing countries has begun to receive a great deal of attention in recent years. At the same time that many of these countries were borrowing heavily in the international capital markets, private residents were accumulating foreign assets. Indeed some observers have argued that the build-up of gross external debt by developing countries financed private capital flight rather than productive investment. The data that are available for the major debtor countries generally tend to support this hypothesis.

The customary approaches to analyzing debt-related issues are unable, however, to explain the phenomenon of an investor simultaneously engaging in foreign borrowing, either directly or via the government, investing at home, and investing abroad. In order to explain this type of behavior one has to introduce uncertainty or risk into the picture, and furthermore, argue that the domestic and external environments are characterized by different sources of risk. In this paper an attempt is made to do precisely this, using the idea of an "expropriation risk" attached to domestic investment in developing countries -- a risk that is considered relatively small in industrial countries. This concept of expropriation risk can include nationalization, bankruptcy, or for that matter, any event that results in the investor losing both his assets and his liabilities. With this expropriation risk factor one is able to work with a standard intertemporal optimizing model, and formally derive the conditions under which an investor in a developing country will acquire external debt and invest both at home as well as abroad.

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** Nadeem Ul Haque is Assistant to an Executive Director (Mr. Finaish).

The main conclusion of this study is that the higher the risks associated with domestic investment in developing countries, the more likely is there to be capital flight. Using the results of the analysis it is conjectured that residents of developing countries were aware of the relative risks and thus chose to invest their domestic savings abroad, and used foreign financing for domestic investments. In addition, as foreign debt was perceived to carry an implicit government guarantee, the investor was assured that if the domestic enterprise went bankrupt or was expropriated, the foreign lender's claim would be assumed by the State. Given this scenario, the domestic investor was behaving in a perfectly rational fashion, and in fact subsequent events generally proved him to be correct in his assumptions. Therefore, to prevent capital flight would require changing the existing incentives through adoption of sound macroeconomic policies, and perhaps more importantly, the development of legal and institutional frameworks that reduce the relatively higher risks faced by investors in developing countries.

I. Introduction

It is well recognized that developing countries in general face a scarcity of capital, and thus should be net foreign borrowers during the development process. This concept has been formalized in a number of studies showing that countries can attain a desirable growth path by supplementing domestic savings by external borrowing, and do not have to rely solely on domestic resources. 1/ While these studies yield considerable insights into overall borrowing decisions, they provide no explanation of why residents in developing countries often choose to invest their savings abroad at the same time that they are seeking external finance. This phenomenon of simultaneous borrowing and investing by developing countries in international capital markets has become more evident in recent years, and has been the subject of analysis by, among others, Dornbusch (1984) and Cuddington (1985). Both these authors argue that the outflow of capital, or "capital flight," has caused serious economic difficulties for developing countries. For example, capital flight has been shown in a number of these countries to have caused the build-up of the gross foreign debt, an erosion of the tax base and, to the extent that there was a net real resource transfer from the country, a reduction in domestic investment.

It turns out that this phenomenon of simultaneous foreign borrowing and investing at home and abroad is not easy to rationalize within the existing theoretical debt models. In a world of complete information and perfect certainty rates of return across political boundaries would

1/ See for, example, Bardhan (1967), Hamada (1969), and Blanchard (1983).

be equalized, leaving individuals indifferent between investing either in the domestic economy or abroad. This basic result is reached by the standard growth-cum-debt models. The newer work that introduces issues of international creditworthiness of the country, 1/ or more generally, sovereign risk that creditors take into account when making loans, 2/ places limits on the total amount of external finance a country can expect, but also does not get into the question of why individuals would engage in both foreign and domestic investment while borrowing abroad. In order to explain why individuals would hold diversified portfolios one has to introduce uncertainty into the analysis, and furthermore, argue that the domestic and external environments are characterized by different sources of uncertainty. 3/ Once this asymmetry is admitted into the picture it becomes possible to show that it is perfectly rational for domestic residents to engage in foreign borrowing, use the proceeds of such borrowings to finance domestic investment, and at the same time invest their domestic savings abroad.

The analysis in this paper is based on the view that there is a relatively larger perceived risk associated with investments in developing countries than in developed countries, and furthermore that this difference in relative risks stems basically from the characteristics of developing countries which distinguish them from the more developed economies. Whereas most industrial economies have well-established political systems with constitutional arrangements that provide an institutional infrastructure for smooth and timely market transactions, developing countries in general are lacking in this respect. For example, adequate institutional and legal arrangements for the protection of private property may not exist, periods of political instability that increase transactions or insurance costs, or both, may be relatively more frequent, and there may be dramatic changes in political and economic regimes. Consequently, while residents of developing countries can expect a risk-free return on their investments abroad they would expect an uncertain, although higher, return to compensate for the risk undertaken on their investments at home. We can loosely term this risk associated with domestic investments as "expropriation risk". In other words, the domestic resident faces the possibility that his assets may be expropriated by

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1/ See Hanson (1974) and Feder and Just (1979).

2/ See Eaton and Gersovitz (1981), Sachs and Cohen (1982), and Sachs (1983).

3/ Cuddington (1985) gives a description of the factors that may lead to diversification of portfolios. These include, for example, attempts to reduce investment risk, efforts to hedge foreign exchange exposure, and maturity transformation at the international level.

the government, while the risk on similar assets held abroad is assumed to be negligible. 1/ The domestic investor would thus have an incentive to transfer resources abroad to avoid the domestic risk.

This concept of expropriation risk is introduced into the framework of an intertemporal optimizing model typically used to analyze individual consumption and investment behavior. It is shown that the allowance for this factor changes the standard results regarding foreign borrowing and investment quite significantly. Indeed it turns out that the pattern of borrowing and investing abroad is theoretically justifiable even in a rational-expectations setting. While other writers, such as Dornbusch (1984) and Cuddington (1985), have provided a number of valid justifications for such behavior, and in particular the causes of capital flight, they have not done so within an optimizing model. Furthermore, the explanations they provide, namely overvaluation of the real exchange rate, high and variable inflation rates, general financial instability, and so forth, can be incorporated into the analysis here under the overall umbrella of expropriation risk. 2/

The remainder of the paper proceeds as follows: in Section II we present and discuss some basic facts illustrating the phenomenon of the simultaneous import and export of capital. While the data relates to financial transactions, it is assumed that these flows in fact reflect real resource transfers. Section III contains the general model and analyzes the standard case, and the variant proposed here under the assumption that the government's decision rule to expropriate is not taken into account, as well as in the case when this rule is explicitly incorporated into individuals' decisions. This section also discusses the issues that arise when there is a probability of default, or repudiation of foreign debt. The concluding section brings together the main points to emerge from the study and discusses some of the policy aspects of the analysis.

1/ Although, strictly speaking, expropriation risk can be defined as the probability of nationalization of a given asset, it is possible to use the term to cover other factors that tend to reduce potential returns. Dooley and Isard (1985), for example, in a recent paper utilize a similar concept to create differences between foreign and domestic rates of return and thus explain the recent movements of the U.S. dollar in the foreign exchange markets.

2/ The key assumption in this concept of expropriation risk is that the individual loses both his assets and liabilities. Any event that satisfies this definition would be covered by the analysis.

II. Evidence on Capital Outflows

As data on investments made by residents of developing countries in international markets is not readily available, one has to rely on indirect calculations. For example, two recent studies have calculated the size of capital outflows for a sample of high-debt developing countries-Argentina, Brazil, Chile, Korea, Mexico, Peru, Phillipines, and Venezuela--using different indirect methods. The first, by Dooley, Helkie, Tryon, and Underwood (1983), estimates gross private capital outflows for the period 1973-82 by substracting from reported changes in gross external indebtedness the current account deficit and changes in net foreign assets of the central bank and commercial banks. Cuddington (1985), on the other hand, defines capital flight as gross private short-term capital flows plus the net errors and omissions items in the country's balance of payments. 1/ The cumulated changes in capital flows from 1974 to 1982 using both definitions for 8 developing countries are shown in Table 1.

Comparing the cumulated changes in external indebtedness with the cumulated current account imbalances over the period 1974-82 it is quite evident that not all the external debt was absorbed domestically. In all 8 cases the Dooley et al. (1983) estimates indicate the cumulated change in the gross external debt was greater than the cumulated current account deficit (or surplus in the case of Venezuela). This implies that, with the exception of Chile, there were private gross capital outflows from all the countries. As a proportion of the increase in external indebtedness, the estimates range from zero (for Chile) to nearly 95 percent for Venezuela; 2/ the average for all the countries is about 35 percent.

This general pattern reported by Dooley et al. (1983) is confirmed by the estimates provided by Cuddington (1985), with Argentina, Mexico, and Venezuela experiencing large amounts of capital outflows over the period. The size of the capital flight based on the Cuddington (1985) figures tends to be smaller than the gross capital outflows figures provided by Dooley et al. (1983). This difference essentially is a consequence of the fact that the gross capital outflow figures include long-term capital flows, while the capital flight figures are assumed to cover only short-term flows. While neither set of estimates are

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1/ This assumes that errors and omissions are basically unrecorded capital movements.

2/ The capital outflow for Venezuela is clearly an overestimate since it includes the increase in foreign assets of the National Petroleum Company which are not reported in official foreign assets. These foreign assets were quite sizable during the period under consideration.

Table 1. Estimates of Foreign Debt and Capital Outflows, 1974-82

(In billions of U.S. dollars)

Country	Cumulated Change in Gross External Debt 1/	Cumulated Current Account Deficits 1/	Cumulated Implicit Capital Outflows 1/	Capital Outflows as a Percentage of Change in Gross External Debt 1/	Cumulated Capital Flight 2/	Capital Flight as a Percentage of Change in Gross External Debt 2/
Argentina	32.6	10.1	20.2	62.0	15.3	47.0
Brazil	93.5	83.4	11.4	12.2	0.2	0
Chile	15.4	12.8	0	0	+1.9	+1.3
Korea	33.6	21.9	5.9	17.6	0.6	2.0
Mexico	82.6	46.4	36.3	44.4	32.7	40.0
Peru	10.7	6.6	3.1	29.0	1.2	11.0
Philippines	19.9	13.6	3.9	19.6	- 3/	- 3/
Venezuela	27.0	-7.6 4/	25.5	94.4	10.8	40.0

1/ Dooley, Helkie, Tryon, and Underwood (1983).
2/ Cuddington (1985).
3/ Not estimated.
4/ Surplus.

completely accurate in capturing total investments abroad by residents, they do nevertheless yield some useful orders of magnitude.

Somewhat more direct evidence can be brought to bear on this issue of capital flight by examining the growth of private nonbank deposits (demand and time deposits) of the major debtor countries in the U.S. banking system. 1/ A comparison of the stock of deposits at end-1974 and end-1984 is made in Figure 1. Since this data is directly available and not estimated, as was the case in the Dooley et al. (1983) and Cuddington (1985) studies, it has a greater degree of reliability. Here again, one can see that deposits in U.S. banks of the private sectors in most of the eight developing countries considered here grew fairly rapidly (with Korea being the exception) over the ten-year period. In Mexico, for example, there was ten-fold growth in such deposits, and in Venezuela the increase was even larger.

Because these data are restricted to deposits in the U.S. banking system, they obviously underestimate the total size of private capital outflows since they do not pick up investments in other financial or real assets that might have taken place. Furthermore, it should be noted that the United States was not the only country to receive such deposits. Indeed if one takes data on cross-border bank deposits of nonbanks, the 1984 numbers in Figure 1 would have to be raised from anywhere between 50 to 100 percent. 2/

Based on the data shown in Table 1 and Figure 1 it would be fair to conclude that gross private capital outflows, with one or two exceptions, were significant for the major debtor countries during the past decade. Given that the rate of domestic capital formation was also positive over the same period, there is some empirical support for the proposition that residents in a number of developing countries were simultaneously engaging in foreign borrowing, investing at home, and acquiring foreign assets. We will attempt to provide a theoretical model that describes this stylized empirical fact.

1/ The data are obtained from U.S. Treasury Bulletin, various issues.

2/ The data covering the major financial centers, including the United States, from 1981 onwards are reported in IMF, International Financial Statistics. This source indicates that, for example, the stock of deposits at end-1984 amounted to: Argentina $8.2 billion; Brazil $8.8 billion; Chile $2.0 billion; Korea $0.4 billion; Mexico $15.1 billion; Peru $1.4 billion; Phillipines $1.0 billion; and Venezuela $12.2 billion.

III. The Theoretical Framework

The theoretical structure utilized here to formalize the phenomenon of foreign borrowing and both foreign and domestic investment is a variant of the standard intertemporal optimization model for a representative consumer that allows for the possibility of expropriation risk. We begin by showing the difficulties associated with incorporating simultaneous external borrowing and investment in the standard version of this optimization model. Expropriation risk is then introduced under the assumption of when individuals do not explicitly take into account the factors that generate the risk. This model allows us to study directly the effects of expropriation risk on individual choice variables. Following this, the analysis is extended to allow individuals to be aware not only of the probability of expropriation, but also of the (arbitrarily specified) government decision rule that would lead to expropriation. The issue of debt repudiation is discussed at the conclusion of this analysis.

1. The standard model with external borrowing and investment

Consider an individual who is endowed with an initial stock of capital k_1, and facing a given technology $f(k)$, lives for two periods. Capital k_i, $(i = 1,2)$, is transformed into output via the production function $f(k_i)$, $(i = 1,2)$. However, the transformation process leaves over no capital stock for the future. Current investment, if it is made, is therefore the only form of capital available in the next period. In the first period, out of the product of his initial capital stock, the individual chooses his level of consumption, C_1, and the level of investment he wishes to make, I. To maximize the expected return from the investment in the second period, the individual must decide on how he wishes to divide his investment between the domestic market, I^i, and the external market, I^e. A risk-free rate, r, is obtained on investments in the external market. However, at the time of making such investments there is a cost that has to be incurred. Transaction costs involved in investing abroad could, for example, arise because of geographical distance and consequent difficulties in monitoring. As such, it seems reasonable to assume that such costs would vary positively with the size of the investment. Formally, we have that an investment of I^e requires a total transfer of $\psi(I^e)$ to be made, where

$$\psi(I^e) > I^e, \text{ for } I^e > 0$$

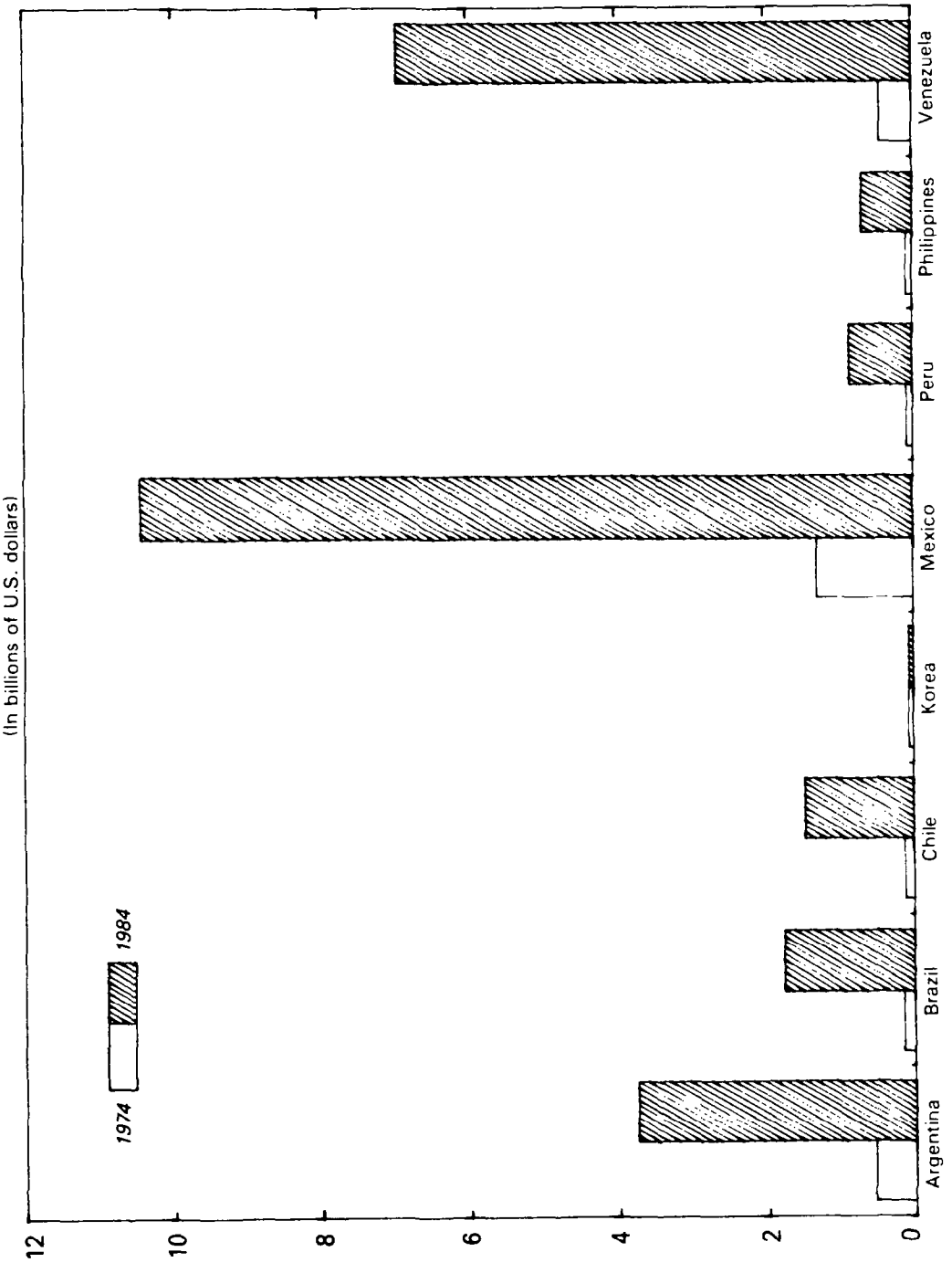
and furthermore, the above reasoning indicates a rising marginal cost of foreign investment, i.e., 1/

1/ Throughout this paper a "'" indicates a derivative, i.e., $\psi' = \frac{d\psi}{dI}$.

CHART 1

PRIVATE NONBANK DEPOSITS IN U.S. BANKS, 1974 and 1984

(In billions of U.S. dollars)



Source: U.S. Treasury Bulletin

$$\psi'(0) = 1; \quad \psi'(I^e) > 1; \quad \psi''(I^e) > 0.$$

Foreign borrowing (D) with no risk of repudiation is allowed, but it can only be used for domestic investment. In other words, there can be no borrowing in the first period for domestic consumption or for investment abroad. Borrowing for consumption purposes has been ruled out in order to highlight investment behavior. It turns out that the inclusion of borrowing for consumption purposes does not affect any of the results that are obtained below. Since all borrowing in the first period is added to the domestic capital stock, there are obvious substitution possibilities between borrowing and domestic investment. 1/ Given that default risk has been ruled out, the risk-free external rate, r, is used for servicing of the debt in the second period. Denoting the rate of time preference by ρ, i.e., $0 < \rho < 1$, the problem facing the domestic resident is to maximize the discounted sum of utility, U, over the two periods. 2/ The utility function is assumed to exhibit the usual characteristics of diminishing and positive marginal utility ($U'(C) > 0$ and $U''(C) < 0$), and non-satiation ($U'(C) \neq 0$).

$$(1) \qquad \underset{C_1, C_2, I^i, I^e, D}{\text{Max}} \quad U(C_1) + \rho U(C_2)$$

subject to

$$C_1 = f(k_1) - I^i - \psi(I^e)$$

$$I^d = I^i + D$$

$$C_2 = f(k_2) + (I^e - D)(1+r)$$

$$k_2 = I^d$$

and,

$$C_1 \geq 0; \; C_2 \geq 0; \; I^i \geq 0; \; I^e \geq 0; \; D \geq 0$$

1/ In fact, borrowing for consumption purposes will only allow for increased foreign investment possibilities, as now it is possible to substitute between borrowing and both domestic investment and consumption.

2/ C_1 and C_2 refer to consumption in the first and second periods, respectively. I^d is total domestic capital formation financed by domestic savings (I^i) and foreign borrowing (D).

The first-order necessary conditions corresponding to (1) are:

$$(2)\quad -U'(C_1) + \rho U'(C_2)f'(k_2) \quad \begin{cases} < 0 & \text{if } I^i = 0 \\ = 0 & \text{if } I^i > 0 \end{cases}$$

$$(3)\quad -U'(C_1)\psi'(I^e) + \rho U'(C_2)(1+r) \quad \begin{cases} < 0 & \text{if } I^e = 0 \\ = 0 & \text{if } I^e > 0 \end{cases}$$

$$(4)\quad \rho U'(C_2)\,[f'(k_2) - (1+r)] \quad \begin{cases} < 0 & \text{if } D = 0 \\ = 0 & \text{if } D > 0 \end{cases}$$

An examination of these conditions (2)-(4) reveals why both external borrowing and investment abroad are not more frequently incorporated in standard models. In the absence of any costs of borrowing (i.e., $\psi(I^e) = I^e$ for all I^e) the individual solution is indeterminate since the three equations are not independent. If foreign borrowing is positive ($D>0$), then equations (2) and (3) are identical since the marginal rate of return on domestic investment is equal to the return on external investment, i.e., $f'(k_2) = 1+r$, and obviously the agent would be indifferent between domestic and foreign investments. The reasons for the indeterminacy is that it is always possible to increase or reduce both D and I^e by the same amount and stay at the same level of utility (because the cost of borrowing and returns from foreign investments are the same). Borrowing abroad will only be rational when the domestic rate of return is higher than the external rate of return, in which case external investment is irrational ($I^e = 0$). In summary, with $D > 0$ we cannot have $I^e > 0$.

The inclusion of the costs of investing abroad also does not make any fundamental difference. Now one only has to define the relevant rate of return as net of the costs of making such investments, that is, $(1 + r)/\psi'$. Consequently, it remains true that if the net return on external investment is higher than the domestic rate of return, $((1 + r)/\psi' > f'(k_2))$, domestic residents will only invest abroad and the second period capital formation will constitute only debt. Conversely, as before, if the rates are equalized, $[(1 + r)/\psi'] = f'(k_2)$, then individuals are indifferent between domestic and foreign investment, and no external debt is contracted as $f'(k_2) < 1 + r$. Essentially it is because of this indeterminacy that most models of savings and borrowing can consider only the cases of net inflows or outflows of capital, along with domestic investment decisions. These models are therefore inadequate in explaining simultaneous inflows or outflows and domestic investment.

2. A model with expropriation risk

Domestic uncertainty, in the form of expropriation risk, is represented in the following way. There is a probability, π, that the domestic firm along with its debt obligations is taken over by the government. 1/ In this event, consumption in the second period relies solely on earnings from investments abroad. 2/ It should be noted that in keeping with our earlier discussion, nationalization is just one example of an event which could occur with some given probability and would have the same impact on the domestic firm. A period of domestic instability, for example, could reduce the firm to bankruptcy, and the analysis would still apply.

Denoting C_2^s and C_2^n as the levels of consumption if the investors' domestic assets are not nationalized or are nationalized in the second period, the problem facing the domestic resident is to maximize the expected value of the discounted sum of utility, U, over the two periods:

$$(5) \quad \underset{C_1,C_2,I^i,I^e,D}{\text{Max}} \quad U(C_1) + \rho[(1-\pi)U(C_2^s) + \pi U(C_2^n)]$$

subject to

$$C_1 = f(k_1) - I^i - \psi(I^e)$$

$$I^d = I^i + D$$

$$C_2^s = f(k_2) + (I^e - D)(1+r)$$

$$C_2^n = (1+r)I^e$$

$$k_2 = I^d$$

and,

$$C_1 \geq 0;\ C_2 \geq 0;\ I^i \geq 0;\ I^e \geq 0;\ D \geq 0$$

The first-order conditions of (5) after the relevant substitutions are:

$$(6) \quad -U'(C_1) + \rho(1-\pi)U'(C_2^s)f'(k_2) \quad \begin{cases} < 0 & \text{if } I^i = 0 \\ = 0 & \text{if } I^i > 0 \end{cases}$$

$$(7) \quad -U'(C_1)\psi'(I^e) + \rho(1+r)[(1-\pi)U'(C_2^s) + \pi U'(C_2^n)] \quad \begin{cases} < 0 & \text{if } I^e = 0 \\ = 0 & \text{if } I^e > 0 \end{cases}$$

1/ Correspondingly the probability that the firm is not nationalized is given by $1-\pi$.

2/ We also assume that the government offers no compensation to the domestic owners of the expropriated assets.

$$(8)\quad \rho(1-\pi)U'(C_2^s)[f'(k_2) - (1+r)] \begin{cases} < 0 & \text{if } D = 0 \\ = 0 & \text{if } D > 0 \end{cases}$$

With the introduction of expropriation risk, expressions (6), (7), and (8) show that there can exist an interior solution with $I^i > 0$, $I^e > 0$, and $D > 0$. Once again (8) suggests that external debt will be contracted up to the point where the marginal product of capital in the second period ($f'(k_2)$) is equal to the foreign rate of return ($1+r$). Both (6) and (7) indicate that investments will be made in the domestic and foreign markets up to the point where the cost of making these investments, as measured by product of the marginal value of forgone consumption in the first period and the direct marginal cost associated with the type of investment, is equated to the discounted expected marginal utility of second period consumption. Even with positive levels of debt accumulation ($D>0$), it can be seen that (6) and (7) remain independent enabling positive values for domestic and foreign investment to be possible. If both $D > 0$ and $I^i > 0$, foreign investment will be made up to the point where the difference in the marginal cost of making such investments both at home and abroad is equated to the ratio of the expected marginal utility under nationalization and under no nationalization in the second period: 1/

$$\psi'(I^e) - 1 = \frac{\pi}{1-\pi} \frac{U'(C_2^n)}{U'(C_2^s)}$$

Although we will study more closely the effects of changes in the probability of expropriation later, it can be seen from this above expression that an increase in the probability of expropriation allows portfolio shifts in the direction of foreign investments.

In a sense what we have done here is introduce a wedge between the two rates of return to prevent the emergence of a corner solution. While we term this wedge as expropriation risk, it is in fact identical to the concept of "penalties" described by Dooley and Isard (1985). These authors, for example, include in penalties any differences in formal taxation, possibilities of confiscation, destruction of private property, changes in the political or economic regimes, and so on. Clearly many plausible arguments can be made to support the concept of differences in risk between the two environments.

1/ This expression illustrates how adjustment costs on domestic investment can also be incorporated in the model. In that case it will be the difference between the two costs which will be equated to the ratio on the right hand side.

The effect of the assumption of the cost of external investment can also be studied, while maintaining the assumption of expropriation risk. Suppose these costs are zero ($\psi(I^e)=I^e$ for all I^e), and consider the situation where all three decision variables are positive--$I^i > 0$, $I^e > 0$, and $D > 0$. When (6) and (7) hold as equalities, then

$$(9)\quad \rho(1-\pi)U'(C_2^s)[f'(k_2) - (1+r)] = \pi U'(C_2^n)$$

If $D > 0$, then (9) implies $U'(C_2^n) = 0$, and if $D = 0$ then $U'(C_2^n)$ will be negative. Since satiation and negative marginal utility have been ruled out we can conclude that (9) cannot hold. Consequently, either (6) or (7) can hold as an inequality, (i.e., either $I^i > 0$ or $I^e > 0$), but not both. If $D > 0$ then we can have $I^i = I^e = 0$; $I^i > 0$ and $I^e = 0$; but not $I^i > 0$ and $I^e > 0$. If $I^i > 0$ and $I^e = 0$, we can see from (6) and (7) that an implication would be $\pi U'(C_2^n) < 0$, which has been assumed to be impossible. Having ruled out these various possibilities we can see that the first-order conditions allow only one solution, namely $I^i = 0$, $I^e > 0$, and $D > 0$.

The above analysis has, therefore, proved that in the absence of any costs associated with external investment, domestic savings are not invested at home but will tend to be fully invested abroad. All domestic investment is made by borrowing abroad. Thus, even though no debt is available to finance domestic consumption and all international borrowings are free of repudiation risk, savings will tend to flow abroad in the face of expropriation risk. Without any costs to investing abroad, the risk-free return on external investments dominates the risky but equivalent expected return on domestic investment, thereby leading individuals to invest fully their domestic savings overseas.

Returning to the case where the cost of investing abroad are positive ($\psi(I^e) > I^e$ for all $I^e > 0$), the role of the expropriation risk can be examined by totally differentiating (6), (7), and (8) to obtain:

$$(10)\quad \begin{bmatrix} U''(C_1) + \theta + \gamma & U''(C_1)\psi'(I^e) + \theta & \gamma \\ U''(C_1)\ \psi'(I^e) + \theta & U''(C_1)[\psi'(I^e)]^2 - U'(C_1)\psi''(I^e) + \theta + \beta & 0 \\ \gamma & 0 & \gamma \end{bmatrix} \begin{bmatrix} dI^i \\ dI^e \\ dD \end{bmatrix}$$

$$= \begin{bmatrix} \rho U'(C_2^s)f'(k_2) \\ \rho(1+r)[U'(C_2^s) - U'(C_2^n)] \\ 0 \end{bmatrix} d\pi$$

where,

$$\theta = \rho(1-\pi)U''(C_2^s)[f'(k_2)]^2 \quad < 0$$

$$\gamma = \rho(1-\pi)U'(C_2^s)f''(k_2) \quad < 0$$

$$\beta = \rho\pi U''(C_2^n)[f'(k_2)]^2 \quad < 0$$

Letting Δ denote the determinant of the matrix of coefficients of the left hand side variables we have from the second order conditions that:

$$\Delta < 0$$

The change in domestic investment with respect to a change in the expropriation risk is given by:

$$(11) \quad \frac{dI^i}{d\pi} = \frac{\gamma}{\Delta}\rho(1+r)\{U'(C_2^s)[U''(C_1)(\psi'(I^e))^2 - U'(C_1)\psi''(I^e) + \theta + \beta] + (U'(C_2^n) - U'(C_2^s))(U''(C_1)\psi'(I^e) + \theta)\}$$

It can be shown from (11) that

$$\frac{dI^i}{d\pi} < 0 \qquad \text{if } C_2^n < C_2^s$$

Thus if the domestic enterprise is profitable in that it contributes to consumption in the second period after payment of interest on debt, then as the risk of expropriation increases, the investment which is exposed to this risk, i.e., domestic investment, can be expected to decrease.

Similarly one can derive the expression relating external investment and expropriation risk:

$$(12) \quad \frac{dI^e}{d\pi} = \frac{\gamma}{\Delta}\rho(1+r)\{[U'(C_2^s) - U'(C_2^n)](U''(C_1) + \theta) - U'(C_2^s)[U''(C_1)\psi'(I^e) + \theta]\}$$

which would be positive if $C_2^n < C_2^s$. Consequently, an increase in expropriation risk drives individuals towards increased investment in the risk-free international market.

Finally, as has been noted above, external debt which has been contracted for investment purposes only acts as a substitute for domestic saving. Moreover, in view of the fact that repudiation risk has been ruled out, aggregate investment in the economy is made up to the point where the marginal product of capital is equated to the foreign return on investment. Under these conditions, following a rise in expropriation risk, as domestic investment declines, foreign borrowing will increase. In fact, $\frac{dD}{d\pi}$ is equal in magnitude to $\frac{dI^i}{d\pi}$, but of opposite sign, i.e.:

$$(13)\quad \frac{dD}{d\pi} - \frac{dI^i}{d\pi} = 0.$$

Adding (11) and (12) provides us with the expression for the effect of an increased expropriation risk on total investment (equal to gross domestic savings), $I = I^i + I^e$:

$$(14)\quad \frac{dI}{d\pi} = \frac{\gamma}{\Delta}\rho(1+r)\{U'(C_2^s)[U''(C_1)(\psi'(I^e))^2 - U'(C_1)\psi''(I^e) + \theta + \beta]$$

$$+ (U'(C_2^n) - U'(C_2^s))U''(C_1)(\psi'(I^e)-1) - U'(C_2^s)[U''(C_1)\ \psi'(I^e) + \theta]\}$$

The sign of this expression turns out to be ambiguous so that it is unclear whether total investment (gross domestic savings) will rise or fall with an increase in the expropriation risk. 1/ Obviously, this will depend on whether the increase in external investment as a result of increased expropriation risks is greater or less than the accompanying fall in domestic investment.

3. A model with expropriation risk and government decision rules

So far it has been assumed that the probability of expropriation π was known by the individual. Suppose now that this probability was itself derived out of a decision rule, and individuals explicitly took this rule into account in their behavior. This would be particularly relevant if the decision rule itself was endogenous, i.e, if it incorporated certain variables that the individual was choosing. In this case taking π as given and not accounting for the effects of individual actions on this probability would lead to sub-optimal choices. 2/

One such plausible rule could be that the government incurs certain costs when it expropriates private property. In the case of a pure expropriation these costs could be a mixture of both political and economic costs that result from nationalization. Since these costs are likely to change over time, or from regime to regime, they cannot be known with certainty. Defining these (unspecified) costs as W, then assuming rationality, the authorities will nationalize only if they find it profitable to do so, i.e., when:

$$(15)\quad f(k_2) - (1+r)D > W$$

1/ The first two expressions in the curly brackets are negative while the last is positive.

2/ It might be worth adding that even if individuals were not fully aware of the decision rule but could form reasonable approximations for it, the same sub-optimal results could emerge from ignoring this possibility.

This reasoning implies, of course, that when the government expropriates the asset, it takes on the (foreign) liability and is responsible for paying off the foreign lender. The probability of the occurrence of expropriation can be calculated if some distributional assumption is made for the uncertain costs. Thus the probability of expropriation can be written as: 1/

$$(16)\quad \pi^* = \Pr\,[f(k_2) - (1+r)D > W] = G[f(k_2)-(1+r)D] = G(P^*)$$

where G is a cumulative distribution function. 2/

The problem for the rational individual may now be written as follows:

$$(17)\quad \underset{C_1^*,C_2^*,I^{i*},I^{e*},D^*}{\text{Max}} \quad U(C_1^*) + \rho[(1-\pi^*)U(C_2^{s*}) + \pi^* U(C_2^{n*})]$$

subject to

$$C_1^* = f(k_1) - I^{i*} - \psi(I^{e*})$$

$$I^{d*} = I^{i*} + D^*$$

$$C_2^{s*} = f(k_2^*) + (I^{e*} - D^*)(1+r)$$

$$C_2^{n*} = (1+r)I^{e*}$$

$$k_2^* = I^{d*}$$

$$\pi^* = G(P^*)$$

$$P^* = f(k_2^*) - (1+r)D^*$$

and

$$C_1^* \geq 0,\ C_2^{s*} \geq 0,\ C_2^{n*} \geq 0,\ I^{i*} \geq 0,\ I^{e*} \geq 0,\ D^* \geq 0$$

The first order conditions corresponding to (17) are:

$$(18)\quad -U'(C_1^*) + \rho f'(k_2^*)\{G'(P^*)[U(C_2^{n*}) - U(C_2^{s*})] + (1-G(P^*))\,U'(C_2^{s*})\}$$

$$= 0 \text{ if } I^{i*} > 0$$

$$< 0 \text{ if } I^* = 0$$

1/ An asterisk (*) distinguishes the variables in the case of a specific decision rule from the variables studied in the other two models.

2/ At this level of abstraction it is not necessary to specify the exact nature of this distribution function.

$$(19)\quad -U'(C_1^*)\psi'(I^{e*}) + \rho(1+r)[(1-G(P^*))\,U'(C_2^{s*}) + G(P^*)\,U'(C_2^{n*})]$$

$$= 0 \text{ if } I^{e*} > 0$$

$$< 0 \text{ if } I^{e*} = 0$$

$$(20)\quad \{G'(P^*)[U(C_2^{n*}) - U(C_2^{s*})] + (1-G(P^*))\,U'(C_2^{s*})\}\,(f'(k_2^* - (1+r))$$

$$= 0 \text{ if } D^* > 0$$

$$< 0 \text{ if } D^* = 0$$

Assuming an interior solution, we can see that because the external risk-free rate is unchanged and because there is no repudiation risk, the marginal product of capital in this problem continues to be equated to r, leaving capital accumulation the same as in the case without an explicit decision rule. 1/ Therefore, since $k_2 = k_2^*$, we have:

$$(21)\quad I^d = I^{d*}$$

If total investment when the decision rule is known is greater than when it is unknown, or $I^* > I$, we have that

$$C_1^* < C_1 \text{ and } U'(C_1^*) > U'(C_1)$$

or using (6) and (18)

$$(22)\quad U'(C_1^*) - U'(C_1) = \rho(1+r)[G'(P^*)(U(C_2^{n*}) - U(C_2^{s*}))$$

$$+ ((1-\pi^*)U'(C_2^{s*}) - (1-\pi)\,U'(C_2^{s}))] > 0$$

The π in this expression is that which would derive from the decision rule (16) with the optimal values of investment and debt obtained when individuals did not know the decision rule. We can now see that the first expression in the square brackets is negative, and only in the extreme case of a substantially lower level of domestic investment and a substantially higher level of external investment when the decision rule is known, will the expected marginal utility of the non-nationalization levels of consumption outweigh the negative terms. It seems probable, therefore, that the right hand side of (22) will be negative. This contradiction leads us to reject the possibility of total investment under the known decision rule from being greater than total investment under a decision rule that is not explicitly known ($I^* \leq I$).

1/ For (20) to hold as an equality $f'(k_2^*)$ has to equal $(1 + r)$. Note that the expression in the curly brackets cannot be equal to zero, for if it was then (18) would imply satiation in the first period.

To see that domestic investment has to decline as well we substract (7) from (19) to obtain:

$$(23)\quad U'(C_1^*)\psi'(I^{e*}) - U'(C_1)\psi'(I^e) = \rho(1+r)[(1-\pi^*)\,U'(C_2^{s*}) + \pi^*\,U'(C_2^{n*}) - (1-\pi)\,U'(C_2^s) - \pi\,U'(C_2^n)$$

With the assumptions that $I^i = I^{i*}$ and $I^e > I^{e*}$, the right-hand side of (23) will be negative and the left-hand side positive. Since $I^* \leq I$, expected marginal utility in the second period when the rule is known is greater than that when the rule is not known. Again following from $I^* \leq I$, $U'(C_1^*) \leq U'(C_1)$. The expression (23) could hold if $\psi'(I^*)$ is substantially larger than $\psi'(I)$ to make the right-hand side positive. Consequently, $I^{e*} > I^e$ and $I^i < I^i$, and we can conclude from (21) that $D^* > D$.

The effect of incorporating a rule such as the one we have considered into individual decision-making would seem to reduce domestic investment, and thus total investment. At the same time, external borrowing appears to increase. This basic result is not too surprising since under this rule the probability of nationalization increases when additional domestic capital is accumulated. Individuals therefore tend to substitute external borrowing for their savings when investing in the domestic economy.

4. Some issues with respect to debt repudiation

Allowing for the potential of debt repudiation in the standard model, in the case of no uncertainty, leads to a ceiling on the amount of debt available to the country. If, furthermore, uncertainty is added to the picture, there is both a debt ceiling and a positive relationship between the rate of interest and the amount of the debt. 1/

Using the commonly made assumption of the costs of repudiation being equivalent to the loss of a certain fraction of domestic output, say λ ($0 < \lambda < 1$), we can write the condition for repudiation in our model as:

$$(24)\quad \lambda f(I^i + D) > (1+r)D \text{ - do not repudiate}$$

$$< (1+r)D \text{ - repudiate}$$

This relationship determines for each anticipated level of domestic investment the maximum amount of foreign debt that will be available to the country. Domestic investment in models utilizing this relationship

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1/ See, for example, Eaton and Gersovitz (1981) and Sachs and Cohen (1982).

is likely to be less than in the standard model where no external investment is possible and where there is no expropriation risk. In fact, the higher the probability of expropriation the lower is the level of investment in the domestic economy. Consequently, it is obvious the debt ceiling that foreign creditors are going to impose on a country can be expected to be lower when external investment possibilities and expropriation risk are taken into account. Moreover, a negative relationship between the debt ceiling and the probability of expropriation is likely.

Since the debt ceiling implied by (24) varies directly with the level of domestic investment undertaken, precommitments to ensure that foreign loan proceeds were utilized for domestic investments, as has been assumed in this paper, could be a way of improving individual or country creditworthiness. If this was possible, foreign credit ceilings would be raised, a higher investment profile would be realized, and social welfare would be improved. 1/ Although this remains true for the model that has been considered here, credit ceilings and levels of domestic investment in that model remain lower than they would have if there were no expropriation or domestic risk.

IV. Conclusions

There is an increasingly popular view stating that the rapid rise in the foreign debt of many developing countries financed capital flight rather than productive investment. Certainly for a number of the major debtor countries the data for recent years tend to bear this out. Even though countries were steadily building up foreign debt there were large private capital outflows. Why this happened, and what policy actions could have been taken by the respective government authorities to prevent this, are questions that are only just beginning to be addressed.

One particular hypothesis that has gained some currency is that domestic investors were aware of the differences in risks involved in investing at home and abroad, and that the risks were higher, for whatever reason, in the domestic economy. As such, it is conjectured that residents of developing countries chose to invest domestic savings in the international capital markets, and used foreign financing for domestic investments. To the extent that the investor believed that foreign debt implicitly carried a government guarantee, he was assured that if the domestic firm or enterprise went bankrupt or was expropriated, the foreign lender's claim would be assumed by the government. 2/ Savings

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1/ Sachs (1983).

2/ It can also be argued that foreign lenders also assumed that their loans carried an implicit guarantee of the government of the borrowing country so that their lending was not affected by expropriation risk.

held abroad would obviously not be at risk, so that the investor was protected if he relied as much as possible on foreign borrowing. Given this scenario the domestic investor was behaving in a completely rational fashion, and subsequent events proved him correct. In a number of developing countries, for example, the foreign debt acquired by private residents was in fact assumed by the State.

While this type of behavior appears quite plausible, it is not consistent with the models that are typically used to analyze debt-related issues. These models basically argue that, depending on whether there are costs to investing abroad, agents borrow abroad and invest either at home or abroad, but not both. What one has to do is somehow introduce differences in risk and uncertainty between foreign and domestic investments into the framework. In this paper an attempt was made to do precisely this, using the concept of an "expropriation risk" attached to domestic investment. With this factor one is able to work with a standard intertemporal optimizing model, and formally derive the conditions under which an individual will acquire external debt and invest both in the domestic economy and in foreign capital markets. The basic conclusion, namely the higher the risks associated with domestic investment and the lower the costs of investing abroad, the more likely is there to be capital flight is perhaps an obvious one. However, an important point to stress is that domestic investment may not be affected by expropriation risk if the individual believes that the government will take over both the domestic assets and foreign liabilities of the firm should it be nationalized or simply fail.

It is useful to consider what the government authorities can do in the way of policy in the situation. Obviously providing a stable financial and macroeconomic environment would go a long way towards reducing domestic uncertainty. In examining the experiences of the major debtor countries it is clear that capital flight was most pronounced in those countries that had relatively higher and more variable rates of inflation, larger fiscal deficits, and generally overvalued currencies. These factors produced the incentives for domestic investors to shift their savings abroad. Adopting sound macroeconmic policies would thus seem to be a key element in reducing resource transfers abroad and the attendant problems this phenomenon creates for capital-scarce economies.

Aside from this general policy package, one can also consider certain specific policy measures. Full compensation to domestic investors in the event of a government expropriation would be one possibility. Of course, this raises issues of credibility and confidence that are quite difficult to assess objectively. Whether domestic investors will believe that they will be compensated, in particular if there are changes in political regimes, is an open question. The imposition of capital controls is

another policy that has been mentioned in the context of capital flight. 1/ There is evidence that the amount of capital flight in a number of countries did depend to some extent on the degree of capital controls, but this evidence is by no means conclusive. Furthermore, it is well known that controls are generally effective only in the short run, and tend not only to be circumvented in the long run, but often create serious distortions and inefficiencies in the process. By and large capital controls are not really a viable substitute for a strategy designed to correct the underlying disequilibria in the economy that give rise to capital outflows. Of course, it should be recognized that it is highly unlikely that a government will be able to prevent all private capital outflows even in the best of circumstances, since many of the causes are well beyond its control. What the authorities can do is to try and change existing incentives in the economy to minimize the amount of capital flight, and thus direct more resources, both domestic and foreign, towards expanding the productive base of the economy.

1/ Insofar as the model specified in this paper is concerned, this would be equivalent to making the costs of investing abroad infinite.

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