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**Working Paper — Digitized Version**

## The effects of debt versus equity inflows on savings and growth in developing economies

Kiel Working Paper, No. 276

**Provided in Cooperation with:**

Kiel Institute for the World Economy – Leibniz Center for Research on Global Economic Challenges

*Suggested Citation:* Lächler, Ulrich; Nunnenkamp, Peter (1987) : The effects of debt versus equity inflows on savings and growth in developing economies, Kiel Working Paper, No. 276, Kiel Institute of World Economics (IfW), Kiel

This Version is available at:

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The Effects of Debt Versus Equity In-  
flows on Savings and Growth in  
Developing Economies\*

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## I. Introduction

Since the onset of the international debt crisis, various new schemes and innovative financial arrangements have been proposed with the purpose of alleviating the external debt problems currently experienced by many developing countries; see World Development Report (1985). A common element in many of these proposals is the intent to alter the external capital structure of developing countries toward claims based on some form of risk and profit sharing (i.e., equity participation), away from claims involving debt. This applies, for example, to recent measures designed to promote foreign direct investments (as the Multilateral Investment Guarantee Agency), debt-equity swap arrangements (introduced in Chile), the promotion of mutual funds containing stocks of developing country industries (such as the Korean Fund), and contingency arrangements, such as commodity-linked bonds, with clauses that index their returns to the price of key commodities exported by the borrower (recent debt renegotiations involving Mexico and Venezuela included such clauses).

A shift in the external capital structure, as projected by these measures, would yield the obvious benefit of reducing the extremely heavy debt burden of some developing countries. From a broader welfare perspective, however, can it be claimed that a developing country would be better off with a lower external debt-equity ratio? This question has recently been addressed in terms of a choice-theoretic model based on an agent-principal approach (Lächler, 1985). That analysis arrived at the familiar result that both a first-best "cooperative" or a second-best

"non-cooperative" equilibrium are possible outcomes of the capital transfer negotiations between foreign principals and the managing authorities of a developing country; the outcome attained depends on what information is available to the principals. It was then shown that if conditions conducive to a cooperative equilibrium pertain, a shift from debt financed to equity financed transfers, leaving the total capital inflow the same, would yield an unambiguous welfare improvement from the viewpoint of the capital importing nation. With a non-cooperative environment, however, the answer to the question posed above is less clear cut. In that case, the choice between equity or debt financed inflows can be shown to involve a "risk-return" tradeoff between income stability and expected growth. That is, with a higher proportion of equity financed inflows, the variability of residual income generated and retained in the developing economy would decline, but the domestic savings incentives and hence the future growth prospects of that economy would also be reduced.

In view of these conclusions, it is of considerable interest for the purpose of formulating policy recommendations to determine whether the actual environment in which capital transfers to developing countries take place is more accurately characterized by a cooperative or non-cooperative process. This essay seeks to provide some evidence on this issue, using data from a sample of 36 developing countries over the period 1976-1979. Cross-country regression analyses are applied to test several competing hypotheses concerning the domestic savings and growth response of developing nations to alternative sources of capital inflows. These hypotheses are explicitly derived from the agent-principal model mentioned previously, and to be discussed next.

## II. A Discussion of the Basic Model

The theoretical framework on which the preceding statements are based originates from the modern literature on the firm that focuses on the agency relationships, or moral hazard problems, arising from the separation of ownership and control when monitoring costs are non-negligible (e.g., Jensen and Meckling, 1976; Ross, 1977; Stiglitz, 1974). In contrast to the traditional profit-maximizing postulate, this literature builds on the assumption that the incentive structure governing the behavior of decision-makers in a firm varies with the rules that determine how the proceeds from that firm are distributed. Since those rules are intimately connected to the firm's financial structure, a change in the debt-equity ratio, for example, is likely to affect the firm's performance. With this approach, the Modigliani-Miller Theorem holds only as a special case, when various market imperfections are removed.

Several authors have adopted a similar approach to explain different aspects of the international credit market, with an emphasis on the debt related problems of developing countries (Eaton and Gersovitz, 1981; Folkerts-Landau, 1985; Sachs, 1982). In this context, the decision-making authorities of a capital-recipient country can be visualized as agents in an economic enterprise vis-à-vis foreign principals. Lächler (1985) has extended this work by developing a choice-theoretic model that simultaneously incorporates both equity and debt instruments as alternative sources of foreign capital. The basic assumptions made in that model are:

(i) Aggregate future output of a small developing economy is a function of current investment and an exogenous random element, whose value is realized after the investment decision has taken place.

(ii) The aggregate investment decision is made by a social planner, characterized as a risk-averse agent maximizing a well-behaved social expected utility function with domestic consumption as its argument.

(iii) Foreign capital owners supplying external funds are modelled as rational risk-neutral principals, who are indifferent to whether a capital transfer takes place in the form of debt or equity participation as long as the expected return on both claims is the same. From their viewpoint, the claims on this economy represent only one of many investment opportunities in a diversified asset portfolio.

(iv) Foreign capital inflows are perfectly "fungible", whether they appear in the form of debt, equity or foreign aid (treated here as an unrequited gift). In other words, once a transfer of capital has taken place, the agent obtains total control in disposing of these funds for current investment or consumption purposes<sup>1</sup>.

In this stylized setting, a moral hazard situation arises once a transfer of capital has occurred. This situation is due to an informational asymmetry: The principal, unlike the agent, does

not know how much is effectively invested after the capital transfer takes place. All he observes is the level of output generated in the future, which is only partly a function of investment and in part stochastic. That rules out the possibility of setting up contingency contracts, that link the terms of transfer to the ex post level of investment undertaken (see, e.g. Haque and Mirakhor, 1986). Consequently, the following disincentive problems emerge: If the transfer takes place in the form of equity participation, entitling the principal to a pre-negotiated share of future output, the agent has an ex post incentive to invest a smaller portion of the currently available funds (and hence consume more) than if the same transfer had been made as a gift. Alternatively, if the transfer is made in exchange for debt claims entitling the principal to a fixed sum in the future, then in making his investment decision, the agent has an ex post incentive to accept more risk than in the case of a gift-transfer, which translates into a greater intertemporal variability of domestic consumption. Both types of behavior on the part of the agent would, ceteris paribus, reduce the expected value of claims held by the principal. Rational principals, however, would anticipate such behavior before effecting the transfer, and demand commensurate adjustments in the terms and conditions at which the transfer is made.

A cooperative outcome of this transfer process is conceivable if the agent "cooperates" with the principals and complies with all previously negotiated commitments, including the amount of investment to be undertaken, in spite of the disincentives noted above. Perhaps more realistically, this outcome could be



achieved if the principal has the ability to monitor the agent directly or to impose penalties on the agent for not responding in this cooperative manner. That would eliminate the moral hazard problem. However, if the costs of monitoring are sufficiently high, due to information barriers or limited legal enforcement capabilities, only a non-cooperative outcome may be feasible, which generally leaves the agent in a less favorable position relative to the hypothetical cooperative outcome.

Since it is difficult to say, a priori, whether the transfer negotiations are more likely to converge to a cooperative or non-cooperative equilibrium, both solutions were investigated, yielding the basic conclusions reported in the introduction. These were, to repeat, that in a cooperative environment the risk-averse agent would always prefer equity over debt financed inflows, while in a non-cooperative environment he would choose some optimal combination of both types of claims, corresponding to a preferred point on an implicit tradeoff between domestic income variability and expected future consumption. Alone on the basis of this conclusion, one might infer that a non-cooperative equilibrium is more representative of actual transfer processes, since most countries usually receive foreign loans as well as direct investments. This outcome, however, could as easily be due to the fact that those countries have faced supply-constraints in terms of the types of transfers made available by foreign principals.

A stronger and more interesting set of competing hypotheses emerges when both equilibria are subjected to a comparative statics analysis. This was done in Lächler (1985, section 5) to

derive the equilibrium investment response to a foreign capital inflow from alternative sources. The results reveal an important difference: In a non-cooperative environment, the equilibrium change in aggregate investment,  $I$ , resulting from an increase in foreign transfers,  $T$ , obeys the following pattern:

$$1) \quad \left. \frac{dI}{dT} \right|_{\text{Equity}} \leq \left. \frac{dI}{dT} \right|_{\text{Aid}} \leq \left. \frac{dI}{dT} \right|_{\text{Debt}}$$

and  $0 \leq \left. \frac{dI}{dT} \right|_{\text{Aid}} \leq 1$ . Aid, once again, is simply considered as a gift that raises the initial endowment of the capital recipient. It turns out, here, that  $\left. \frac{dI}{dT} \right|_{\text{Equity}}$  may be negative, while  $\left. \frac{dI}{dT} \right|_{\text{Debt}}$  is always positive.

On the other hand, in a cooperative environment the following pattern results:

$$2) \quad \left. \frac{dI}{dT} \right|_{\text{Aid}} \leq \left( \left. \frac{dI}{dT} \right|_{\text{Equity}}, \left. \frac{dI}{dT} \right|_{\text{Debt}} \right),$$

such that, also  $0 \leq \left. \frac{dI}{dT} \right|_{\text{Aid}} \leq 1$ . Expression (2) states that in a cooperative situation the agent would always invest more in response to transfers entailing future repayment obligations, be they in the form of equity or debt, than in response to a gift. Whether in this case,  $\left. \frac{dI}{dT} \right|_{\text{Equity}} \geq \left. \frac{dI}{dT} \right|_{\text{Debt}}$ , is considered indeterminate, since that depends among other things, on the initial level of outstanding obligations<sup>2</sup>.

A corollary of this result is that domestic savings and output growth should exhibit the same order of response behavior in respective environments. That is because domestic savings,  $S$ , are

defined as total minus foreign savings,  $I-T$ , so that  $dS/dT = dI/dT - 1$ . The only necessary modification to be made in expressions (1) and (2) is that the expected response to an aid inflow would then be bounded by,  $-1 \leq dS/dT \Big|_{\text{Aid}} \leq 0$ . Similarly, on the assumption that a nation's growth rate is positively related to the amount of investment, the same pattern of growth responses to foreign inflows as described by the preceding expressions should result. Our purpose next is to devise some tests that may help us to discriminate which of the two patterns given by expressions (1) and (2) best characterizes actual transfer processes.

### III. Equation Specification and Statement of Hypotheses

The basic equation to be estimated below using cross-country data is of the form:

$$(3) \quad X_i = a_0 + a_1(\text{FDI/GDP})_i + a_2(\text{AID/GDP})_i + a_3(\text{DEBT/GDP})_i$$

The exogenous variables on the right hand side of this expression represent the net foreign capital inflows per annum received by country  $i$  in the form of foreign direct investment, aid, and through debt-related channels, each expressed as a share of GDP. The proxies used for these variables are discussed later. Suffice it to note here that FDI represents our measure of foreign capital introduced in form of equity participation.

Three variables are used separately for the endogenous variable,  $X_i$ . These are (i) the domestic savings rate, DSR, also

expressed in shares of GDP, (ii) the aggregate investment rate, IR, and (iii) the annual per capita growth rate of GDP, denoted GR<sup>3</sup>.

Our maintained hypothesis is that capital transfers to developing countries are best described by a non-cooperative process. From expression (1), we would therefore expect to obtain coefficient estimates in eq. (3) that obey the following pattern:

$$(4) \quad a_1 \leq a_2 \leq a_3 .$$

Furthermore, with regard to the individual coefficient estimates, the theory states that these should satisfy the following constraints:

- (5) a)  $-1 \leq a_2 \leq 0$ , when the endogenous variable is DSR.  
b)  $0 \leq a_2 \leq 1$ , " " " " " IR.  
c)  $a_2 \geq 0$ , " " " " " GR.  
d)  $a_3 \geq 0$ , " " " " " IR or GR.

Our first step, then, is to see whether any of these constraints can be statistically rejected.

Our primary concern, however, is less with the absolute size of the individual coefficients. For purposes of theory validation, it is their relative size that mainly interests us. With that focus in mind, we can set up the general counterhypothesis, proposing that there is no significant difference in the responses to alternative forms of capital inflows. This counterhypothesis may be supported or rejected by testing the simultaneous con-

straint,

$$(6) \quad a_1 = a_2 = a_3 .$$

Continuing along these lines, we can proceed to make pair-wise comparisons, and examine whether the data permits us to reject the following restrictions:

$$(7) \quad a) \quad a_2 = a_3$$

$$b) \quad a_1 = a_3$$

$$c) \quad a_1 = a_2$$

It is important to note here that the crucial test for supporting or rejecting the assumption of a non-cooperative environment against the counterhypothesis, that a cooperative environment applies, concerns restriction (7.c). By comparing expressions (1) and (2), we observe that in both cases it would be predicted that  $a_3 \geq a_2$ , and further, that it is left indeterminate, whether  $a_3 \geq a_1$  in a cooperative environment. What is clear, however, is that in a cooperative environment we would observe that  $a_1 \geq a_2$ , while in the non-cooperative environment,  $a_1 \leq a_2$ .

Having performed these tests, two further issues are addressed below. Since the coefficient estimates are made by ordinary least square methods, it is necessary to discuss the simultaneity biases that might be involved in this procedure. The other issue concerns the sample homogeneity. Is it possible that in some developing countries a cooperative relationship with foreign principals has developed, but not in others? This

question is examined by performing separate analyses for "problem" countries that encountered debt-servicing difficulties during, or shortly after, the relevant sample period, and for the remaining countries.

The impact of foreign inflows on domestic savings and growth has been a subject of controversy for many years in the development literature. This has led to a substantial body of empirical research (as surveyed, e.g., in Bhagwati, 1978), some of which bears a resemblance to the regressions reported on here. Much of this work, however, is mainly concerned with the effectiveness of foreign aid. One major bone of contention is whether aid raises total domestic investment by an equal amount, as assumed in early applied development models (Chenery and Strout, 1966; Leontief, 1965); or is fungible enough to be treated as a general increment to income (Mosley, 1980; Papanek, 1972; Weisskopf, 1974); or is downright deleterious, for various socio-political reasons, as argued in Griffin and Enos (1970). While various attempts were also made to differentiate between alternative sources of foreign inflows, such as private versus other official inflows (e.g., Papanek, 1973; Dowling and Hiemenz, 1983), none have addressed the central equity-versus-debt distinction emphasized in this essay. Another contrast with most earlier research emerges from the fact that the estimated coefficient values in equation (3) by themselves reveal little about whether a developing country is better off receiving one form of inflow or another. To arrive at such welfare conclusions it is necessary to place the regression estimates in a specific choice-theoretic context, such as we have described earlier. Previous related empirical studies have generally not provided such an explicit context.

#### IV. The Empirical Results

##### A. The Data Base - Some Explanatory Remarks

To perform our cross-country analysis, we began with an initial sample of about 50 developing economies, for which the required data was available. This sample was then reduced to 36 countries by eliminating those that reported net financial out-flows of direct investment, debt or development aid for the entire period, 1976-79. Since our study concerns the impact of foreign financial inflows on economic performance, this sample restriction seems appropriate; see Weisskopf (1974), who employs a similar procedure. The data base for the remaining 36 countries is presented in Table A1 of Appendix A, along with an explanation of the sources and definitions of the individual variables. This sample, though considerably reduced, still covers a wide spectrum of developing economies in terms of income levels, economic performance, overall dependence on foreign resource inflows, and the structure of capital imports.

Before presenting the regression results, it is necessary to explain why the analysis is restricted to the period 1976-79. To begin, comparable time series on the structure of net capital imports were not available until 1976. On the other hand, statistical information on most of our variables was available up to 1984, except for domestic savings. Nevertheless, we decided to concentrate on the second half of the 1970s because, later on, both the volume and structure of international capital transfers to developing countries was significantly affected by severe economic shocks. At the turn of the decade, the second oil price

shock induced a new round of enormous financial recycling of OPEC surpluses, which drastically altered the previous pattern of financial flows of the late 1970s. This was followed in the early 1980s by another shock to the international capital markets: With the eruption of severe repayment crises in some important debtor countries, Western commercial banks abruptly halted the provision of fresh money to the problem-ridden Latin American region. That also altered the flows to developing countries, both in terms of regional distribution and structural composition. To avoid statistical noise on this account, we chose 1979 as our endpoint date. Finally, we added all flows within each category over the period 1976-79, so that the sample points reported in Table A1 represent period aggregates or averages.

Table 1 reports the correlation coefficients between all variables used in the subsequent regression analyses. In view of the fairly small correlation between the independent variables, we should not expect any serious multicollinearity problems to arise.

#### B. Estimation Results

The coefficient estimates obtained from the regressions described by equation (3) are presented in Table 2. The most remarkable feature of these results is that in all cases the estimated coefficient values clearly follow the characteristic pattern of a non-cooperative equilibrium. That is,  $\hat{\alpha}_1 < \hat{\alpha}_2 < \hat{\alpha}_3$ . We also observe that none of the conditions implied by our main-



Table 1 - Correlation among Savings, Investment, Growth and Foreign Resource Inflows

	DSR	IR	GR	FDI/GDP	Aid/GDP	Debt/GDP
Domestic Saving Rate	1	0.72	0.41	-0.06	-0.49	0.45
Investment Rate		1	0.18	-0.05	-0.20	0.61
Growth Rate/Capita			1	-0.45	-0.24	-0.03
Foreign Direct Investment/GDP				1	-0.09	0.12
Foreign Aid/GDP					1	-0.08
Foreign Debt Inflows/GDP						1

Table 2 - Regression Equations (3); all Countries

Endogenous	Exogenous				R <sup>2</sup>	$\bar{R}^2$	F-Statistic	SSR
	$\hat{a}_0$	(FDI/GDP) $\hat{a}_1$	(AID/GDP) $\hat{a}_2$	(DEBT/GDP) $\hat{a}_3$				
1. DSR	16.60 (1.87)	-2.51 (2.16)	-0.99 (0.28)	1.63 (0.51)	0.44	0.38	8.29	993
2. IR	19.20 (1.63)	-1.74 (1.86)	-0.30 (0.24)	1.95 (0.44)	0.41	0.36	7.27	712
3. GR	4.26 (0.81)	-2.89 (0.93)	-0.23 (0.12)	0.002 (0.22)	0.28	0.21	4.15	184

Terms in brackets are standard errors. See text for definitions. Equations (1) and (3) were estimated with a sample of 36 countries, equation (2) with a sample of 35 (data on IR was not available for Nepal). All estimations were made by OLS.

tained hypothesis, and outlined earlier in expressions (5.a)-(5.d), can be rejected with much confidence. Although the point estimates of  $a_2$  in regressions (2) and (3) of Table 2 violate conditions (5.b) and (5.c), this deviation from the predicted range is not significant at the 5% level<sup>4</sup>. We can conclude from these results that the basic behavioral responses suggested by our model, along with the hypothesis that capital transfers take place in a non-cooperative environment, are not rejected by the empirical evidence.

The next logical step, in view of this outcome, is to examine whether any alternative hypotheses can be rejected. This is done by testing the parameter restrictions described in expressions (6) and (7.a)-(7.c). Toward that purpose, we use a standard F-test procedure of estimating the restricted form of regression equation (3) and comparing the resulting sum of squared residuals with those obtained from the unrestricted estimations, presented in Table 2. Table 3 reports these test results. From the first column of F-statistics we observe that the counterhypothesis, which claims that all forms of external finance are alike in their impact on economic performance, is unanimously rejected. In other words, there does appear to be a significant difference in the savings and growth response to alternative sources of finance. With regard to the other (pair-wise) constraint tests, the results are not quite as powerful. We may note, however, that each of the restrictions, (7.a)-(7.c), is rejected at least once in the relevant series of tests.

Table 3 - Constraint Tests

Endogenous Variable	Parameter Restrictions			
	$a_1 = a_2 = a_3$	$a_2 = a_3$	$a_1 = a_3$	$a_1 = a_2$
DSR	SSR = 1674	SSR = 1671	SSR = 1096	SSR = 1009
	$F_{3,32} = 7.3^*$	$F_{1,32} = 21.9^*$	$F_{1,32} = 3.31$	$F_{1,32} = 0.52$
IR	SSR = 1198	SSR = 1193	SSR = 794	SSR = 726
	$F_{3,31} = 6.7^*$	$F_{1,31} = 20.9^*$	$F_{1,31} = 3.6$	$F_{1,31} = 0.61$
GR	SSR = 235	SSR = 188	SSR = 235	SSR = 234
	$F_{3,32} = 3.0^*$	$F_{1,32} = 0.7$	$F_{1,32} = 8.9^*$	$F_{1,32} = 8.7^*$

SSR denotes the sum of squared residuals obtained by estimating equation (3) with the respective constraints imposed. These values are then compared with the SSR of the unconstrained estimations, reported in Table 2, to derive the F-statistic values here. A \* indicates that the restriction can be rejected at the 5% significance level.

As argued earlier, the test of restriction (7.c) is the decisive one in terms of pitting the non-cooperative hypothesis against the cooperative counterhypothesis. Given that the previous estimations yielded  $\hat{a}_1 < \hat{a}_2$ , a rejection of the constraint,  $a_1 = a_2$ , is sufficient for rejecting the cooperative hypothesis, which states that  $a_1 \geq a_2$ . From the last column of Table 3 we observe that while restriction (7.c) cannot be rejected when DSR and IR are used as dependent variables in the regression equations, it is rejected when GR is employed.

### C. Simultaneous Equations Problems

The overall results obtained so far give fairly strong support to our maintained hypothesis. But since the estimation technique we used involves single-equation ordinary least squares, some doubts are bound to arise with regard to the unbiasedness of the estimated coefficients. Such doubts have been frequently voiced in criticism of similar studies addressing the effectiveness of foreign aid (e.g., Over, 1975; Papanek, 1972). The main thrust of these critiques is that domestic savings and growth not only are determined by the amount of foreign aid inflows, but in turn they also determine how much aid flows in. Consequently, AID would not be fully exogenous in equation (3), which violates the orthogonality principle and leads to biased estimates.

With respect to the two-way causation argument between AID and domestic savings or growth, an underlying premise is that foreign assistance is largely given (for altruistic reasons) to countries in need. That by itself, however, is not enough to

generate biased estimates. A further necessary assumption for that result is that "needy" countries are more likely to exhibit lower savings (or growth) rates. Should that assumption be valid, then the estimated relation between aid and savings or growth will reflect both the response of aid recipients and the motives of aid donors.

To account for the possibility of two-way causation in the case of AID, we reestimated equations (3) using a two stage, instrumental variable technique, such that DEBT/GDP, FDI/GDP and GDP/capita were specified as the exogenous instruments. In spite of this adjustment, all three regressions yielded the same basic results as were obtained by OLS. The 2SLS regression involving GR provides a representative example:

$$(8) \text{ GR} = 3.79 - 2.81 (\text{FDI/GDP}) - 0.11 (\text{AID/GDP}) + 0.02 (\text{DEBT/GDP})$$

(1.52) (0.96)                      (0.35)                      (0.23)

SSR = 190 (standard errors in parentheses)

By comparing this result with the third regression in Table 2, we note that the relative order of the estimated coefficients is the same in both cases. That is,  $\hat{\alpha}_1 < \hat{\alpha}_2 < \hat{\alpha}_3$ , as hypothesized for a non-cooperative environment.

The two-way causality argument applied to AID is much less plausible in the case of FDI and DEBT inflows. Consequently, we did not attempt to explore this possibility further. If the negative coefficients obtained for (FDI/GDP) in our previous regressions are to be blamed on simultaneity bias, the logical corollary would have to be that FDI (but not DEBT) is systematically

channeled to low-saving or slow-growing economies. It is difficult to find a persuasive argument to justify this type of behavior among foreign capital owners.

#### D. Sample Homogeneity

When some firms, or countries, go bankrupt or encounter debt-servicing problems, and others do not, it is difficult to say, offhand, whether this outcome is simply due to random draws of fate or also to alternative patterns of conduct among the relevant decision-makers, which influenced their luck differently. One reason for supposing the latter is that some agents may have developed a cooperative relationship with their outside principals, while others remained in a non-cooperative relationship. One result to emerge from the earlier theoretical considerations is that the level of investment undertaken in response to a debt-financed transfer is always less in a non-cooperative equilibrium than in a cooperative one. At the same time, the terms of a transfer (e.g., interest rate) are always less favorable for the capital recipient in a non-cooperative environment relative to a cooperative environment. I.e., the agent bears the agency costs of finance. Consequently, the likelihood that a borrower would run into debt-servicing difficulties is always higher in a non-cooperative environment.

To investigate this issue, we separated our cross-country data into two subsamples on the basis of whether or not a country was engaged in multilateral debt renegotiations during the period 1975-1984, as stated in the World Development Report (1985, fig.

2.4A). Under the assumption that some countries developed a cooperative relationship, in contrast to others, we would expect these to be more highly concentrated among the sample of countries that have not experienced debt-servicing problems. Separate regressions of equation (3) were then performed over each subsample, to see if any difference in the pattern of responses emerged. When DSR and IR were used as dependent variables, the separate estimation results (not shown here) were both fairly close to those obtained from the combined sample regressions, shown in Table 2. This was also reflected in the F-tests, that compare the SSR's from both subsample regressions to the respective (constrained) SSR's in Table 2. In the case of DSR,  $F_{4,28} = 1.65$ , and in the case of IR,  $F_{4,27} = 0.95$ . Both are insignificant.

In the case of GR as the dependent variable, however, we obtain an F-statistic value of  $F_{4,28} = 3.22$ , which is significant at the 5% level. The subsample regressions that yield this result are:

Countries that renegotiated (n = 17)

$$(9) \text{ GR} = 3.98 - 2.30 (\text{FDI/GDP}) - 0.68 (\text{AID/GDP}) + 0.06 (\text{DEBT/GDP})$$

(0.98) (0.84) (0.25) (0.37)

$$R^2 = 0.58 \quad \bar{R}^2 = 0.48 \quad \text{SSR} = 53 \quad F_{3,13} = 6.0$$



Countries that did not renegotiate (n = 19)

$$(10) \text{ GR} = 4.08 + 3.46(\text{FDI/GDP}) - 0.18(\text{AID/GDP}) + 0.03(\text{DEBT/GDP})$$

(1.20) (4.51)                      (0.14)                      (0.25)

$$R^2 = 0.18 \quad \bar{R}^2 = 0.01 \quad \text{SSR} = 74 \quad F_{3,15} = 1.07$$

(standard errors in parentheses)

From equation (9), we observe that the countries encountering debt-servicing difficulties exhibit the typical response pattern characteristic of a non-cooperative environment. Furthermore, the overall  $R^2$  of the regression is quite high. A noticeable contrast emerges in the case of countries that did not renegotiate. In equation (10), the estimated coefficient values obey a pattern that is more consistent with a cooperative environment, giving some support to the notion that a different transfer relationship, involving different response patterns, may have developed in some countries. With that interpretation, the low  $R^2$  of regression (10) is to be expected, since the data sample in question contains a more heterogeneous group of countries, in terms of cooperative and non-cooperative behavior, than the sample used for regression (9).

## V. Conclusions

We propose that our preceding estimation results be interpreted within a specific choice-theoretic context. That context was provided by an agent-principal model of capital transfers, where both a cooperative and a non-cooperative equilibrium are possible. A central prediction of that model is that the aggregate savings and investment responses to alternative forms of capital inflows are systematically different, depending on whether a cooperative or non-cooperative setting applies. The purpose of this analysis has been to determine which of the two response patterns best describes the observed behavior among developing countries. Our empirical estimations and hypothesis test results suggest that, with some possible exceptions, most developing countries were engaged in a non-cooperative relationship with foreign suppliers of capital during the period analyzed.

The consequence of a non-cooperative equilibrium is that capital recipients face a tradeoff between less income variation and faster growth, when confronted by the alternative of receiving equity or debt financed inflows. Whereas debt financed transfers exert a relatively stronger positive influence on domestic savings and growth, equity financed transfers provide the benefit of lower fluctuations in domestic consumption. This means that neither form of capital inflow can be judged unambiguously superior to the other, and thus recommended for all countries, independent of social attitudes towards risk.

An unambiguous welfare improvement can only result from a shift of this tradeoff toward less risk and more growth. How to bring such shifts about is beyond the scope of this essay. Broadly speaking, this would require some fundamental institutional changes (e.g., improved communication channels, a better defined and uniform allocation of legal rights, and effective legal enforcement), especially within many developing countries, to reduce monitoring costs and thereby provide a more conducive setting for attaining cooperative equilibria. Our previous sample homogeneity test gives a partial indication that some countries may have evolved further in this regard than others. Those countries, once identified, can provide suitable examples for further study and possible emulation.

## Appendix A: Definition of Variables

The data for the explanatory variables, aid, debt, and direct investment, is taken from OECD, Geographical Distribution of Financial Flows to Developing Countries.

- Aid consists of grants and net official development assistance (ODA) loans provided by the member countries of the OECD Development Assistance Committee (DAC), multilateral agencies, and OPEC member countries. The figures do not include financial flows from the IMF (except loans by the IMF Trust Fund), member countries of the Council for Mutual Economic Assistance, other developing countries, and grants by private voluntary agencies. Grants cover gifts, in money or in kind, for which no repayment is required as well as grant-like flows, i.e. loans repayable in the recipients' currencies. ODA loans carry maturities of over one year and contain a grant element (as a measure of the concessionality of a loan) of at least 25 per cent. Official loans with a grant element of less than 25 per cent appear under the heading "other official flows (OOF)" and are classified in our study as debt creating financial flows.
- In addition to net OOF, our debt figures include net private sector flows in the form of export credits and portfolio investment (as defined in the OECD source) from DAC members. Portfolio investment largely corresponds to transactions by the private monetary sector (bank sector loans). Loans by branches in offshore centres of banks resident in DAC countries are omitted. The portfolio investment figure is a

direct measurement of new bank transactions with more than one year maturities, less repayments of principal, converted to US-\$ at the average annual exchange rate.

- The data on direct investment is from the OECD figures on net private sector flows from DAC member countries to developing countries.

Table A1 presents aid, debt, and direct investment both in absolute amounts for 1976-79 and as a percentage share of the recipient country's GDP over this period. To calculate the latter figures, the developing countries' nominal GDP (published in IMF, International Financial Statistics) is converted to US-\$ by applying annual average exchange rates. Data on the economic performance variables (apart from domestic savings which are not reported there) are also from International Financial Statistics. Average annual economic growth rates in 1976-79 refer to GDP per capita in constant prices while investment ratios refer to the average share of gross fixed capital formation in GDP. Information on gross national savings (excluding net current transfers from abroad) is from World Bank, World Tables, and is expressed as a share of GDP, as reported in the same source. It should be remembered that, within the system of national account statistics, gross national savings are calculated as a residual, i.e. gross domestic capital formation minus the current account deficit. However, since our figures for DSR and IR appear from different sources, they may not be exactly related in this indicated manner.

Table A1

Economic Growth, Domestic Savings, Investments, and Foreign Capital Inflows of the 36 Sample Countries, 1976-79<sup>a</sup>

	Per capita income, average (US-\$)	Real economic growth per capita (per cent)	Domestic savings rate (per cent)	Investment ratio (per cent)	Foreign Capital Inflows						
					Mill. US-\$			Per cent of GDP <sup>b</sup>			
					Debt	Direct investment	Aid	Debt	Direct investment	Aid	Total
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	
Algeria	1 378	5.1	37.8	45.4	8 996	75.4	503	9.39	0.079	0.52	10.0
Bangladesh	104	3.7	2.4	11.5	50	2.6	3 447	0.14	0.007	9.93	10.1
Bolivia*	695	1.1	17.1	18.6	480	10.0	467	3.31	0.069	3.22	6.6
Brazil*	1 704	4.1	18.5	24.7	9 944	5 459.7	410	1.29	0.708	0.05	2.1
Burma	144	3.7	13.0	14.8	245	0.1	810	1.35	0.001	4.47	5.8
Cameroon	489	2.3	17.9	20.5	724	9.6	762	4.64	0.062	4.88	9.6
Costa Rica*	1 538	3.7	13.7	23.5	264	16.4	147	2.03	0.126	1.13	3.3
Dominican Republic*	919	1.8	14.9	21.6	97	1.0	194	0.52	0.005	1.03	1.6
Ecuador*	941	3.4	20.5	23.9	827	13.2	245	2.85	0.046	0.85	3.7
Egypt	508	6.8	24.0	25.2	2 015	85.4	8 130	2.52	0.107	10.16	12.8
El Salvador	695	1.1	18.9	20.1	109	7.2	190	0.93	0.062	1.63	2.6
Greece	3 197	3.9	22.2	23.5	1 046	199.8	97	0.88	0.168	0.08	1.1
Guatemala	851	3.1	15.2	19.6	316	8.5	266	1.38	0.037	1.16	2.6
Guyana*	595	-3.2	11.3	25.7	75	0.1	129	3.93	0.005	6.77	10.7
Haiti	208	3.4	5.1	16.1	31	5.6	345	0.77	0.140	8.63	9.5
Honduras*	520	4.7	14.1	22.5	138	13.4	286	1.95	0.190	4.05	6.2
Indonesia	337	6.0	19.7	20.6	2 227	704.6	2 540	1.20	0.379	1.37	2.9
Israel	4 090	0.4	4.3	25.4	1 590	26.2	3 525	2.66	0.044	5.89	8.6
Ivory Coast*	935	3.2	25.4	26.2	1 593	52.2	507	5.70	0.187	1.81	7.7
Kenya	321	3.0	16.9	22.4	973	82.4	923	5.02	0.425	4.76	10.2
Korea, Rep.	1 223	8.6	26.2	28.8	4 896	295.8	755	2.72	0.165	0.42	3.3
Mexico*	1 578	3.3	20.8	21.3	7 157	1 704.6	206	1.75	0.418	0.05	2.2
Morocco*	664	2.3	14.9	27.7	2 024	31.1	1 385	4.09	0.063	2.80	7.0
Nepal	114	1.4	11.4	n.a.	6	0.7	344	0.09	0.011	5.50	5.6
Nigeria*	639	0.2	27.2	26.3	1 335	166.8	166	0.66	0.082	0.08	0.8
Pakistan*	218	2.0	11.7	17.1	325	15.1	3 053	0.49	0.023	4.58	5.1
Paraguay	872	6.8	17.6	24.7	122	4.7	160	1.25	0.048	1.64	2.9
Peru*	811	-1.6	12.7	14.8	937	596.3	513	1.85	1.174	1.01	4.0
Philippines*	513	3.7	24.2	24.6	2 386	738.1	886	2.58	0.799	0.96	4.3
Portugal	1 820	3.9	9.8	19.6	2 253	201.0	208	3.22	0.288	0.30	3.8
Sudan*	394	0.8	8.8	13.7	696	12.1	1 479	2.55	0.044	5.41	8.0
Syria, Arab.Rep.	968	0.8	14.8	29.9	186	0.2	3 515	0.59	0.001	11.07	11.7
Tanzania	221	2.1	12.3	19.1	375	23.6	1 620	2.48	0.156	10.71	13.3
Thailand	486	5.4	20.8	24.4	989	119.1	955	1.15	0.138	1.11	2.4
Uruguay*	1 784	4.3	11.7	15.7	80	11.2	46	0.39	0.055	0.22	0.7
Zaire*	197	-5.4	9.3	22.2	749	499.3	1 188	3.53	2.355	5.60	11.5

n.a. = not available

<sup>a</sup>Columns (2) - (4): unweighted averages for the years 1976-79; columns (5) - (7): aggregated net financial inflows in the period 1976-79; columns (8) - (11): aggregated financial inflows in per cent of aggregated nominal gross domestic product in 1976-79; for a detailed definition of variables and calculation procedures, see the text. - <sup>b</sup>Nominal GDP in domestic currency converted to US-\$ by applying the period average exchange rate. -\*Indicates countries that entered into debt renegotiation between 1976-1984.

Sources: World Bank, World Development Report 1983; World Bank, World Tables, Third Edition; IMF, International Financial Statistics, var. iss.; OECD, Geographical Distribution of Financial Flows to Developing Countries, var. iss.

Appendix B: A Mathematical Outline of the Underlying Theoretical Model (from Lächler, 1985)

A two-period Fisherian consumption model is considered, where future output is a stochastic function of current investment.

$$(B.1) \quad Q_{t+1} = x_{t+1} F(I_t)$$

$Q$  = aggregate output,  $I$  = investment,  $\bar{x}$  = a stochastic variable with mean 1, distributed according to the probability density function,  $g(x)$ , over the non-negative interval  $(0, \bar{x})$ .

The expected social utility function to be maximized by the agent is:

$$(B.2) \quad S = U(C_t) + \beta \int_0^{\bar{x}} U(C_{t+1}) g(x) dx,$$

where  $U' > 0$ ,  $U'' \leq 0$  and  $U(0) = 0$ . We also have that,

$$C_t = \bar{y} + T - I_t, \quad C_{t+1} = \text{Max} (\gamma [x_{t+1} F(I_t) - B], 0)$$

$\bar{y}$  = initial endowment of the agent

$\beta$  = discount term

$T$  = capital transfer from abroad

$B$  = the amount owed to the foreign principal in period 2, in return for a debt transfer in period 1.

$\gamma$  = domestic equity share = 1 minus the equity share of net output accruing to the foreign principal in return for an equity transfer in period 1.

The present expected value of a combined claim (held by the foreign principal), involving an amount,  $B$ , of debt and  $(1-\gamma)$  in foreign equity participation, can be expressed, for any given level of investment by the agent, as

$$(B.3) \quad T = F(I) \left[ 1 - \gamma \int_b^{\bar{x}} (x-b)g(x)dx \right],$$

where  $b \equiv B/F(I)$ . In this simplified version of the model, the absence of "sovereign risk" is assumed.

For a given transfer of size  $\bar{T}$ , the cooperative equilibrium solution is derived by maximizing  $S$  w.r.t.  $(I, \gamma)$  or  $(I, B)$  subject to equation (B.3). The non-cooperative equilibrium solution is derived by maximizing  $S$  only w.r.t.  $I$ , given  $\gamma$  and  $B$ . The resulting first-order condition, together with equation (B.3) are then used to solve for the equilibrium values of  $(I, \gamma)$  or  $(I, B)$ .

A transfer in the form of foreign aid (gifts) can be simply treated as an increase in  $\bar{y}$ .



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Footnotes

1. The basic equations of the model that correspond to these assumptions are provided in Appendix B.
2. It also turns out that, for any given level of foreign debt or equity financed transfers, the equilibrium level of investment undertaken by the agent is always greater in a cooperative environment than in a non-cooperative one.
3. Additional regressions were also performed with the annual growth rate of GDP (unadjusted for population growth) instead of GR as the dependent variable. Since no significant difference in the estimation and hypothesis-test results emerged, we do not report those additional results.
4. Notice that the regressions with DSR and IR in Table 2 exhibit a higher  $R^2$  than the one with GR as dependent variable. That observation can also be given an interpretation that is consistent with our theoretical model: Recall that the basic theory concerns the determination of investment, while changes in output are necessarily a stochastic function of investment. Hence, even if our empirical model could perfectly explain all variations of IR (i.e., with an  $R^2$  of 1), we should still expect a less than perfect fit in the case of GR.

On the other hand, there could be measurement errors that may offset the statement just made. That is, the observed

values of IR and DSR may not correspond to true investment, in the sense of foregone present consumption to raise future expected output. The empirical distinction between investment and consumption is largely a matter of convention. Thus, the label of investment is attached to various consumption activities (perquisites) by management and to white elephant projects mainly designed to enhance the glory of some transient politicians, while other more productive expenditures (on cars, for example) are mislabeled consumption. This problem should not arise in the case of growth figures, since output changes presumably reflect true investment activities, independent of how they are labeled.