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Interest Rates, Official Lending, and the Debt Crisis

A Reassessment

Aslı Demirgüç-Kunt
and
Enrica Detragiache

Studies of economic performance among the highly indebted countries during the debt crisis should control for cross-country differences in the burden of interest payments. Some countries had better access to highly subsidized interest rates.

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This paper — a product of the Debt and International Finance Division, International Economics Department — is part of a larger effort in the department to understand the economic relationships between developing countries and external creditors in regard to credit rationing and debt negotiations. Copies of the paper are available free from the World Bank, 1818 H Street NW, Washington DC 20433. Please contact Karin Waelti, room N9-043, extension 37664 (July 1992, 33 pages).

Demirgüç-Kunt and Detragiache document and try to explain the sizable cross-country differences in interest rates on external debt paid by a group of highly indebted developing countries in 1973-89.

They find that Indonesia and Turkey, which are often praised for not rescheduling in the 1980s, paid interest rates substantially below LIBOR — and avoided the interest rate shock of the early 1980s.

Differences in the default-risk premium explain some of the variation among countries, but different degrees of access to official loans carrying highly subsidized interest rates played the major role.

In the sample they studied, they found no evidence that debt at floating interest rates was more expensive than debt at fixed rates.

For the period 1981-89, it is possible to control for differences in the currency composiiton of debt, and the results are essentially unchanged.

These results suggest that studies of economic performance among the highly indebted countries during the debt crisis should control for cross-country differences in the burden of interest payments.

Interest Rates, Official Lending, and the Debt Crisis: A Reassessment

by
Aslı Demirgüç-Kunt
Financial Policy and Systems Division, World Bank

and
Enrica Detragiache
Department of Economics, Johns Hopkins University*

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1. Introduction.

Most analyses of the debt crisis of the 1980s maintain that debtor countries were paying interest rates approximately equal to the world risk–free interest rate plus a small spread, as most loans were at floating interest rates (see for instance M. Feldstein et al., 1987, or J. Sachs, 1989). This view emphasizes how the rise in real interest rates in the early '80s increased the burden of debt service for all highly indebted countries (HICs). The data on interest payments by HICs, however, show that this description fits some countries quite well and others not at all. Figure 1 shows the average interest rate on long–term debt paid by nine of the largest debtor countries in 1973–89 and LIBOR, the usual measure of the international risk–free interest rate. The data are obtained dividing interest payments by the stock of debt outstanding, and correcting for interest arrears, hence they reflect all contractual obligations towards external long–term creditors, as opposed to actual payments[1]. Turkey, Indonesia, and the Philippines were charged rates systematically below LIBOR for most of the period under consideration, while other countries, such as Mexico and Chile, had to pay a positive spread[2].

Differences in the interest rate, of course, imply that countries with similar inflows of foreign capital end up with quite different debt service obligations, and that high–interest rate countries must make larger transfers of resources to their creditors before their debt statistics start to improve. Hence, a large cross–country variation in interest rates casts some doubts on the distinction between 'good' and 'bad' borrowers,

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[1]The Turkish interest rate in 1979–80 is not corrected for arrears, as the size of the arrears could not be determined.

[2]It should be noted that large cross–country differences would remain even if we looked at actual interest rates, as interest arrears were neither widespread nor large in the sample (see section 2 below).

based on whether a country needs ex–post debt relief or not: If 'good' debtors are paying below–market interest rates to start with, the fact that they do not default does not make them a profitable investment for their creditors, nor does it necessarily imply that they have followed wiser macroeconomic policies. Some studies (see J. Sachs et al., 1989) have sought to explain differences in rescheduling behavior across HICs in terms of different policy responses to external and internal shocks. Figure 1 suggests that these countries faced interest rate shocks of a very different magnitude, and that these differences should be taken into account in evaluating responses to the crisis. Also, the issue arises of why some creditor countries were able to pay rates systematically below the cost of funds for their lenders.

The purpose of this paper is both to document and to try to explain this large cross–country variation in interest rates. So far, a number of studies (G. Feder and R. Just, 1977, S. Edwards, 1984, S. Özler, forthcoming, H. Huizinga, 1991) have investigated the determinants of spreads on individual loans to HICs. The purpose of these studies was not to assess the burden of debt service for different HICs, but rather to test whether market interest rates reflected the creditworthiness of the borrower. Hence, the spread on floating–rate loans from private creditors is used as the dependent variable, and a number of variables related to a country's ability and willingness to repay foreign creditors are the regressors[3]. Less creditworthy countries had to pay larger spreads on their external debt.

Differences in the default–risk spread, however, are not the only element that can generate differences in the contractual burden of debt service. Variation in the share of fixed–interest rate debt, in the share of official debt, and in the currency composition of debt may also matter (Tables 1 and 2). If official loans include an implicit grant element,

[3]Özler (forthcoming) also shows that previous credit–market experience plays a role in the formation of the spread.

more access to this type of credit obviously means a smaller burden of debt service. Different shares of floating–rate debt in the total can also potentially provide an explanation of cross–country variation in interest rates. For instance, if the interest rate shock of the early '80s was largely unexpected, countries with more debt at fixed–rates would have benefited at the expense of their creditors. Finally, differences in the currency composition of debt may also play a role. Countries more indebted in high–inflation currencies would tend to pay higher nominal interest rates. Such rates, however, simply compensate creditors for the depreciation of the principal, and do not constitute a higher burden of debt service.

To investigate the determinants of average interest rates we use a sample of pooled cross–section and time–series data for nine large HICs. We estimate a model of the average spread over LIBOR that allows us not only to assess the impact of various creditworthiness indicators, but also to test whether official debt involved a significant grant element, and whether fixed–rate debt has been cheaper than floating–rate debt in the period under consideration. Since data on currency composition are available only for the period 1981–89, we present results for the whole sample without correcting for differences in currency composition, and then we study the effects of taking such differences into account for the shorter subperiod 1981–89.

We find that official debt involved a substantial subsidy, and the observed cross–country differences in the share of official debt can account for differences in interest rates of the order of 3–4 percentage points. So differential treatment by official creditors has played an important role in determining the burden of debt service. These results have implications for judging the fairness of recent debt relief initiatives: Official creditors provided considerable implicit subsidies in the form of loans at below–market interest rates to the Asian countries in our sample, while Latin American countries did not benefit as

much from this type of aid. The resources recently provided by multilateral and bilateral lenders to reward and support economic stabilization in countries like Mexico are having the indirect effect of correcting the initial imbalance.

The estimation also indicates that debt at fixed–rates and debt at floating–rates have been equally expensive on average. Hence, countries with a lot of debt at fixed rates, although they were able to avoid the surge in LIBOR in the early '80s, were penalized in other periods. It may still be the case that floating–rate loans hurt borrowers if they forced them to make higher interest payments in periods in which it was especially costly do so (E. Detragiache, 1992). Further research is needed to address this issue.

Finally, controlling for differences in the currency composition of debt does not substantially alter the results discussed above. There is some evidence that the grant element associated with official debt is sensitive to the currency of denomination, and that fixed–rate debt denominated in strong currencies (yen, D–mark and Swiss franc) was more expensive than floating–rate debt.

To sum up, this study shows that attempts to evaluate the economic performance of HICs during the period of the debt crisis, and, in particular, to assess the effectiveness of different policy responses to the external shocks of the early '80s, should take into account that countries had a different burden of interest payments, due to the different structure of their foreign debt. Failure to do so may lead to overemphasize policy differences.

The paper is organized as follows: In the first section, the data is described in some detail. Then a simple model of the interest rate is presented, and an empirical specification is derived. A brief discussion of estimation techniques, and the results of the estimation are in Section 4. Then model is extended to allow for a different currency composition, and empirical results are presented for the subperiod 1981–89. The conclusions summarize the results.

2. A First Look at the Data.

The sample consists of nine large and middle–size countries, all of which experienced high levels of indebtedness sometimes during 1973–88. All countries, with the notable exception of South Korea and Indonesia, had to reschedule their debt. Turkey rescheduled in the late seventies, while all the remaining countries (Argentina, Brazil, Chile, Mexico, the Philippines, and Venezuela) experienced debt restructuring in the mid–eighties. Finally, all countries in the sample except South Korea had not significantly reduced their indebtedness by 1989.

Figure 1 contains plots of the world risk–free interest rate (LIBOR) and of the average interest rate paid by each country, obtained as the ratio between interest payments in a given year and the stock of debt outstanding at the end of the previous period. To arrive at a measure of the contractual interest rate, it is necessary to correct for arrears in interest payments. Argentina had interest arrears in 1983–89, the Philippines in 1982–89, and Brazil in 1987–88. Also, Turkey had arrears in 1979–81, but due to data availability, we could not correct interest payments in 1979–80 (see footnote 1). The correction is done by summing the change in the stock of interest arrears to actual interest payments. Figure 1 reveals sizable cross–country differences. Three countries, Indonesia, Turkey, and the Philippines, were charged an interest rate much lower and much less variable than LIBOR for most of the sample period. The spread tends to become smaller after 1986. At the opposite end of the spectrum, the graphs for Chile and especially Mexico show that after 1975 the time–path of the average interest rate is very close to that of LIBOR, with the consequence that both countries were severely hit by the sudden increase in world interest

rates after the second oil shock[4]. Furthermore, positive spreads over LIBOR were paid after '82. Brazil and Venezuela were also substantially affected by the interest rates shock of the turn of the decade. Unlike the other Latin American countries, Argentina seems to have partially avoided the increase in LIBOR between '78 and '81. Finally, South Korea is an intermediate case. Her implicit average interest rate shows considerable covariance with LIBOR, but stayed well below the peak rates reached after the second oil shock and the worldwide recession that followed. In the second half of the '80s, South Korea took advantage of favorable external circumstances to make large transfers to her creditors, thereby substantially reducing her external debt. Mexico or Chile also made substantial positive net transfers after 1983, but because of the high interest rates and of the slower rate of growth of their economy, their debt statistics have hardly improved.

This cursory inspection suggests that interest rate shocks played a relevant role in triggering reschedulings in Chile, Mexico, Brazil, and Venezuela after 1982, as stressed by most accounts of the debt crisis. What is usually not underscored is that the impact of the interest shocks was considerably lower for the three countries that were successful in avoiding reschedulings in the mid–eighties, namely South Korea, and especially Turkey and Indonesia. Two countries, Argentina and the Philippines, had to reschedule even in the absence of a sizable interest rate shock, suggesting that policy mistakes alone should be blamed for the crisis. It should be noted that both countries (especially the Philippines) had a large amount of high–interest rate short–term debt at the beginning of the '80s, so that the interest rate shock for these two countries was much larger than what appears from the data on long–term debt. Also Venezuela had a lot of short–term debt.

The next step is to explore possible reasons for the sharp cross–country differences

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[4]It is important to point out that the increase in the large nominal interest rates of '78–83 were also large <u>real</u> interest rates (see for instance R. Dornbusch. 1989).

in interest rates. In Figure 2 the average interest rate is broken down into two components, the interest rate charged by official creditors (both bilateral and multilateral), and the rate charged by private creditors, which includes public, publicly guaranteed, and private non–guaranteed debt[5]. The first observation is that for all countries official debt has been considerably cheaper, although this state of affairs seems to be changing at the end of the '80s. The interest rate on official debt varies between 5% and 8% for all countries, and Turkey and Indonesia seem to have benefited from a more favorable treatment by official creditors.

For the Latin American countries, the behavior of the private interest rate follows the average interest rate quite closely, consistent with the fact that the share of official debt is small (Table 2). The same cannot be said for the Asian countries: S.Korea, for instance, was treated by her private creditors quite similarly to Brazil and Venezuela, suggesting that it was the considerable size of official debt in the total (Table 2) that allowed this country to keep her average interest rate low. Similarly for Indonesia: Without official debt, the interest rate paid by this country would have been quite close to LIBOR, at least on average. Indonesia had also a smaller share of variable–rate debt (Table 2), so that the time–path of the interest rate on private debt is flatter than LIBOR. Fixed–rate debt has allowed Indonesia to limit the interest rate shock of the early '80s, but has meant paying a positive spread (at least on private debt) when LIBOR fell in the second half of the '80s. As for Turkey, it is evident the reaction of private creditors to the debt difficulties of '76 and '77, and the arrears that followed. The spread between LIBOR and the interest rate on official debt has narrowed in recent years, suggesting that the recent increase in official lending to the Latin American countries may not result in

[5]Since data on arrears to official creditors is confidential, the interest rates in Figure 2 are not corrected for arrears, hence they reflect actual as opposed to contractual payments.

substantial interest rate relief. The increase in the rate of interest applied by official creditors can probably be explained at least in part by the decline in the share of bilateral lending for all countries in the sample.

Table 1 contains the shares of official debt in the total. In general, the share tends to decline until the mid–eighties, as private lending boomed, and then it gradually increases, as international institution and bilateral donors became increasingly involved in helping HICs. However, the level of the exposure to official creditors varies considerably across countries: Latin American countries have generally a small exposure, except for Chile in the early '70s, while all four of the Asian countries have benefited from a substantial involvement of official lenders. The dichotomy between Latin American and Asian borrowers also appears in the propensity to borrow at variable interest rates, as shown by Table 2. By the early '80s, most of Latin American debt is at variable rates, while the four Asian countries keep most of their debt at fixed rates.

Finally, a few remarks on the currency composition of debt obligations in the period 1981–89. For all countries, external debt was mostly denominated in US dollars. The Japanese yen has become increasingly important in the last few years, but its share stays below 10%–15% for Latin American countries and for Turkey. S. Korea, Indonesia, and the Philippines had between 25% and 35% of yen–denominated debt by 1989. Also, Turkey had a sizable fraction of debt in D–marks (11–17%). Other currencies played a minor role.

3. A Simple Model of the Interest Rate, and the Empirical Specification.

In this section we present a model of the determinants of the interest rate in the sovereign debt market which allows us to test two hypotheses: Whether official lenders

have involved an implicit grant element, and whether fixed–rate debt has been systematically cheaper than variable–rate debt.

Let i_{it} be the average interest rate paid in year t by country i (for the moment we are not making any distinction between official debt and debt owed to private creditors). i_{it} is a weighted average of the rate paid on loans at fixed interest rates (i_{it}^{fx}) and the rate paid on loans at floating rates (i_{it}^{fl})

$$i_{it} = h_{it}\, i_{it}^{fx} + (1 - h_{it})\, i_{it}^{fl}$$

where h_{it} is the share of debt at fixed rates. Let r_t be the reference rate (LIBOR), s_t be the average spread over LIBOR, and s_{it}^{fl} be the spread on floating rate debt. Then

$$s_{it} = i_{it} - r_t = s_{it}^{fl} + h_{it}\,(i_{it}^{fx} - i_{it}^{fl}) \tag{1}$$

The spread on floating–rate debt should cover the risk that the loan will not be repaid in full. Hence, it should be related to variables affecting the country's ability or willingness to pay, and her bargaining power. A large literature has debated what induces sovereign debtors to repay their foreign debt (J. Eaton and M.Gersovitz, 1981, J. Bulow and K. Rogoff, 1989). Rather than developing a full–fledged model of sovereign default, and derive a functional form of the spread from first principles, we follow existing empirical studies of the sovereign debt market (G. Feder and R. Just, 1977, S. Edwards, 1984, S. Özler, forthcoming), and model the spread as a linear function of a vector of creditworthiness variables

$$s_{it}^{fl} = \gamma + \beta\, y_{it} + w_{it} \tag{2}$$

where w_{it} is an error term with zero mean, β is a row vector of constants, and y_{it} is a column vector of creditworthiness variables. To arrive at an empirical specification of equation (1), we need to model the unobservable difference between interest rates on the two types of debt contract. Let $x_{it} = i_{it}^{F} - i_{it}^{V}$. If the default risk–premium is the same for the two types of contract, x_{it} should be

$$x_{it} = x_t = r_t^e - r_t \tag{3}$$

where r_t^e is the expected risk–free interest rate at the time the fixed–rate contract was negotiated. Since r_t^e is not observable, we postulate that expectations are formed based on past realizations of r_t

$$(1 + r_t^e) = a_0 + \Sigma_{k=1}^{n} \delta_k (1 + r_{t-k}) + \epsilon_t \tag{4}$$

were ϵ_t is an error term with zero mean. Then (3) becomes

$$x_{it} = x_t = \alpha_0 + \alpha_1 (1 + r_t) + \Sigma_{k=1}^{n} \delta_k (1 + r_{t-k}) + \epsilon_t \tag{5}$$

The average spread s_t can be written as follows

$$s_{it} = \alpha_0 h_{it} + \alpha_1 [h_{it} (1 + r_t)] + \Sigma_{k=1}^{n} \delta_k [h_{it} (1 + r_{t-k})] + \gamma + \beta y_{it} + w_{it} + h_{it} \epsilon_t \tag{6}$$

To introduce official debt, suppose that official lenders charge the same interest rate on floating–rate and fixed–rate debt as the private creditors, except for a constant grant

element g, which is the same for both types of loan, and it is the same for all countries . The interest on fixed–rate debt owed to official creditors is then

$$i_{it}^{ofx} = i_{it}^{fx} - g$$

and similarly for floating–rate debt. The average spread paid by the country on her total debt is

$$s_t^a = \gamma + \beta\, y_{it} + \alpha_0\, h_{it} + \alpha_1\, [h_{it}\,(1 + r_t)] + \Sigma_{k=1}^{p}\, \delta_k\, [h_{it}(1 + r_{t-k})] + g\, o_{it} + \eta_{it}$$

where o_{it} is the share of official debt in the total, and $\eta_{it} = w_{it} + h_{it}\, \epsilon_t$ is the error term. Since lags of LIBOR turned out not to be significant, they have been omitted from the preferred specification, and the equation estimated is

$$s_t^a = \gamma + \beta\, y_{it} + \alpha_0\, h_{it} + \alpha_1\, [h_{it}\,(1 + r_t)] + g\, o_{it} + \eta_{it} \qquad (7)$$

If official debt does not contain any grant element, g should not significantly differ from zero. To test whether fixed–rate debt has been significantly cheaper than debt at floating rates over the sample, we compute

$$\bar{x} = \hat{\alpha}_0 + \hat{\alpha}_1\,(1 + \bar{r})$$

where $\bar{r}$ is the mean of LIBOR in the period under consideration, while $\hat{\alpha}_0$ and $\hat{\alpha}_1$ are the estimated values of the coefficients. If $\bar{x}$ does not significantly differ from zero, we cannot reject the hypothesis that the two types of debt contract have resulted in the same burden

of interest payments on average.

The vector y_{it} includes a list of variables that have shown to be significantly related to HICs repayment prospects in previous studies: Real GNP per–capita, the growth rate of real GNP, debt–to–export ratio, the share of imports in GNP, the rate of inflation (which is a proxy for the ability of the HIC government to keep the budget deficit under control). LIBOR is also included. Variables related to foreign exchange reserves, which are often used in these studies, have been omitted because it is likely that HICs do not truthfully report their reserve holdings, especially during periods of repayment difficulties.

4. Estimation Technique and Results.

Equation (6) is estimated using pooled cross–section and time–series data for the period 1973–1988. The covariance model (J. Kmenta, 1971) is used to account for country and time–specific effects. In this model, each country and each time period are characterized by a different intercept, incorporated in the regression through dummy variables. Also, the time–series for each country are tested for possible autocorrelation in the residuals through a Durbin–Watson test, and no autocorrelation is detected[6].

Notice that the error term in equation (7) is heteroskedastic by construction. To deal with heteroskedasticity two methods are used. First, the model is estimated using OLS, and then White's consistent estimates of the variance–covariance matrix (H. White, 1980) are computed. White shows that the degree to which these asymptotic standard errors differ from the usual ones indicates the severity of the heteroskedasticity. The results in Table 4 indicate that these differences are generally small, and do not change the

[6]The D–W statistic falls either in the no–autocorrelation or in the ambiguous region for all time–series.

significance levels of the coefficients. White (1980) also mentions that if the correct structure of the error variance is known, taking it into account by making the appropriate transformations in the equation to be estimated would improve the efficiency of the estimators in small samples. Consequently, a weighted OLS specification is also estimated. This is obtained as follows. First, we assume that the two components of the error term ϵ_t and w_t are both normally distributed with mean zero and variance σ^2_ϵ and σ^2_w respectively. Furthermore, we assume that cov $(\epsilon_t, w_t) = 0$ for all t. Then a proper transformation is to divide all observations by $(s^2_w + h^2_t\, s^2_\epsilon)^{0.5}$, where the s^2 are the estimated variances of the two components of the error term. These are obtained by regressing the squared residuals from the unweighted regression on h^2_t. The transformed model is then estimated using OLS. As shown in Table 4, the results of the estimation remain basically unchanged if the weighted model is used, confirming that heteroskedasticity is not severe.

The model has also been tested for the possibility of a structural shift around 1982, when several countries started rescheduling their debt, and spreads began to be negotiated in the rescheduling agreements. A Chow test shows that the hypothesis of no structural shifts cannot be rejected at 5% confidence level. In any case, equation (6) has also been estimated for the two subperiods 1973–81 and 1982–88 separately. The creditworthiness variables become less significant in the second subperiod, but all the other results hold[7].

Table 4 presents the estimation results. First of all, among the creditworthiness variables, the share of imports in GNP has a significant and positive effect on the average spread: Countries that are more dependent on imports are more vulnerable to terms of trade or exchange rate shocks, and therefore they are more likely to default. Also, larger levels and growth rates of GNP per–capita make countries more creditworthy. The rate of

[7]Also, introducing a dummy variable for Turkey in 1979–80, to control for interest arrears of unknown size, does not change the results.

inflation, the level of GNP per–capita, and LIBOR are not significant. Also, perhaps surprisingly, the coefficient of the debt–to–export ratio is not significant, although it is of the expected sign.

At the bottom of the Table, the estimated difference between the interest rate on fixed–rate debt and on floating–rate debt is presented. $\bar{x}$ is not significantly different from zero, indicating that creditors have obtained on average the same return on the two types of loan. However, this does not mean that borrowing countries should be indifferent between the two types of contract: Floating and fixed–rate debt give rise to a different profile of debt service over time and over states of nature, and a risk–averse country would prefer the contract that provides better "insurance" against fluctuations in the marginal utility of consumption (see E. Detragiache, 1992).

The coefficient of the share of official debt is negative and significant, hence countries that were relatively more exposed towards official creditors benefited from lower interest rates. The coefficient is around – 0.7%, indicating that a difference in the share of official debt of 10 percentage points leads to a reduction in the average interest rate of about 70 basis points. Table 1 shows that cross–country differences in the share of official debt can be as large as 50%–60% of total indebtedness, suggesting that this source accounts for a sizable portion of the cross–country variability in interest rates. Countries with a large exposure to official creditors – such as Turkey, Indonesia, the Philippines, and South Korea – obtained a significant subsidy in the form of below–market interest rates. This element also accounts for some of the time–series variation in the spread: For instance, Chile's negative spread in the early '70s quickly changes sign as the share of official debt drops from almost 50% to around 10% in the '80s.

It is important to point out that the grant element implicit in official loans cannot simply be evaluated by looking at the difference between the interest rate on private debt

and on official debt, documented in Figure 2. Official loans may be cheaper because of an implicit grant element but also because official creditors expect debtor countries to default on debt owed to private creditors before they default on official debt. In other wants, official creditors consider themselves de facto senior[8]. However, in an equilibrium, for any given level of debt, the average interest rate does not depend on the break–down into senior and junior claims: a country with more (low–interest rate) senior debt must pay a larger rate on junior debt. Hence, the negative and significant coefficient of the share of official debt in the regression explaining the average interest rate must capture exclusively the subsidy element implicit in official loans[9].

5. Differences in the Currency Composition of Debt.

The results presented so far do not take into account that debt was denominated in different currencies. If currency composition shows considerable variation both across countries and over time, it may explain some of the variation in average interest rates. Moreover, it may be that differences in interest rates do not reflect differences in the real burden of debt service: Consider two countries, one of which is indebted mostly in US dollars, while the other is indebted mostly in yen. Suppose that in the period under consideration inflation in Japan is on average lower than in the U.S., and the dollar tends to depreciate relative to the yen. Then nominal interest rates on dollar–denominated assets will be higher on average than interest rates on yen–denominated assets, although

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[8]The alleged seniority of official creditors is often mentioned in the policy debate, and it has recently been questioned by M. Dooley (1990).

[9]It can be argued that official loans, since they sometimes contain an element of conditionality, improve the chances that the receipient country will follow wise policies, and therefore increase creditworthiness. However, the creditworthiness variables included in the regression should control for the effects of conditionality.

real interest rates are the same. Consequently, the country indebted in dollars pays higher interest rates on her debt, but this is compensated by a lower real cost of repaying the principal. It should be noted that high nominal interest rates, although they may not increase the real burden of debt service, may still create payment difficulties, as observed by R. Dornbusch (1989): The maturity of the debt is effectively shortened, causing potential liquidity problems. Also, since banks are generally more reluctant to reschedule interest than principal, countries more exposed in high–inflation currencies are likely to find it harder to renegotiate their debt.

In this section, we reformulate the model of section 3 to take into account the different currency composition of external debt, and we arrive to an empirical specification that allows essentially the same hypothesis testing performed in section 4. Since data about currency composition is available only from 1981, these second set of result is based on a much smaller sample. The regression analysis also allows us to construct estimates of the average interest rate that each country paid on debt denominated in a particular currency. Using these estimates, we can evaluate whether the observed variation in interest rates was actually due to differences in currency composition or not.

The country's debt is denominated in n currencies. Currency 1 is US$. $e_{t,k}$ is the exchange rate between US$ and currency k at t. Dropping the subscript that identifies the country, the average interest rate on currency k–denominated debt is

$$i_{t,k} = \frac{I_{t,k}}{D_{t-1,k}}$$

where $I_{t,k}$ are total interest payments at t on debt denominated in currency k, and $D_{t-1,k}$ is the stock of currency–k debt outstanding at the end of period t–1. The average interest rate on total debt converted in dollars is

$$i_t = \frac{\Sigma_{k=1}^{n} e_{t,k} I_{t,k}}{D_{t-1}} = \Sigma_{k=1}^{n} \left[\frac{e_{t,k} D_{t-1,k}}{D_{t-1}} \right] i_{t,k} = \Sigma_{k=1}^{n} f_{t,k} i_{t,k}$$

where $f_{t,k} = \frac{e_{t,k} D_{t-1,k}}{D_{t-1}}$. $f_{t,k}$ is observable. Notice, however, that in our data set the share of currency–k debt in the total is not $f_{t,k}$, but $\frac{e_{t-1,k} D_{t-1,k}}{D_{t-1}}$, because end–of–the–year debt is converted at the exchange rate of t–1. So to compute f_t from the data we must multiply the shares by $\frac{e_{t,k}}{e_{t-1,k}}$. Define also

$$f_t = \Sigma_{k=1}^{n} f_{t,k}$$

Let $r_{t,k}$ denote the risk–free rate on currency k. The average spread on currency k debt is then

$$s_{t,k} = i_{t,k} - r_{t,k}$$

The average spread over LIBOR is then

$$(8) \qquad s_t = i_t - r_{t,1} = \Sigma_{k=1}^{n} f_{t,k} s_{t,k} - [\Sigma_{k=1}^{n} f_{t,k} r_{t,k} - r_{t,1}]$$

($r_{t,1}$ is LIBOR). The term in parenthesis is observable. Define the following modified spread

$$\tilde{s}_t = \Sigma_{k=1}^{n} f_{t,k} s_{t,k} = s_t + \Sigma_{k=1}^{n} f_{t,k} (r_{t,k} - r_{t,1})$$

From previous analysis (section 3), the average spread on debt denominated in currency k can be modeled as

$$s_{t,k} = RP_{t,k} + h_{t,k}\,(i^{fx}_{t,k} - i^{fl}_{t,k}) + g_k\,o_{t,k} \tag{9}$$

where $RP_{t,k}$ is the default–risk premium, and g_k is the grant element associated with official loans, which is potentially currency–specific. To arrive to a testable equation, we assume that the default risk–premium is equal for all currencies

$$RP_{t,k} = RP_t = \gamma + \boldsymbol{\beta}\,\mathbf{y}_t + w_t$$

Also, we need to assume that the parameters in the expression that captures the difference between the interest rate on fixed–rate loans an on floating–rate loans are not currency specific

$$i^{fx}_{t,k} - i^{fl}_{t,k} = x_{t,k} = \alpha_0 + \alpha_1\,r_{t,k} + \epsilon_{t,k} \tag{10}$$

Substituting (9) and (10) into (8)

$$\tilde{s}_t = \gamma\,f_t + (\boldsymbol{\beta}\,\mathbf{y}_t)\,f_t + \alpha_0\,\Sigma^n_{k=1}\,(f_{t,k}\,h_{t,k}) + \alpha_1\,\Sigma^n_{k=1}\,(f_{t,k}\,h_{t,k}\,r_{t,k}) + \Sigma^n_{k=1}\,g_k\,(f_{t,k}\,o_{t,k}) + \omega_{t,k} \tag{11}$$

where the error term $\omega_{t,k}$ is

$$\omega_{t,k} = f_t\,w_t + \Sigma^n_{k=1}\,f_{t,k}\,h_{t,k}\,\epsilon_{t,k}$$

The parameters to be estimated are γ, the vector β, α_0, α_1, and $g_1, g_2, .., g_n$. Hypothesis testing is similar to that of section 4, namely

$$H_0 : \beta = 0, g_k = 0 \text{ for all k}, \bar{x}_k = \hat{\alpha}_0 + \hat{\alpha}_1 \bar{r}_k = 0 \text{ for all k}.$$

with the same interpretation as before. We can also test whether the size of the grant element and the difference between floating and fixed–rate debt vary according to the currency of denomination.

Table 5 presents the results. The coefficient estimates of the creditworthiness variables are not significant at the five percent level. Since the value of the F statistic and of the adjusted R^2 improve without these variables, they are excluded from the preferred specification. Since the sample period covers only 1981–89 this result is not surprising. The summary statistics at the bottom of Table 5 indicate the fit of the model. The statistical fit is better for the weighted specification[10].

The grant element associated with official debt continues to be significant when differences in currency composition are taken into account. The g coefficients are collectively different from zero at one percent significance level. However, the hypothesis that they are all equal is rejected. The differences are apparent from the individual coefficients in Table 5. Sterling–denominated official loans seem to have the largest grant element, while D–mark have the smallest (it is not significantly different from zero). A

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[10]The estimation of the weighted model differs from that of equation (7) only in the estimation of the weights. Squared residduals from the unweighted model are regressed on f_t^2 and $\Sigma_{k=1}^{n}(f_{t,k}\ h_{t,k})^2$ to obtain the variance estimates. Then, all observations are divided by $[f_t^2\ s_w^2 + \Sigma_{k=1}^{n}(f_{t,k}\ h_{t,k})^2\ s_{\epsilon k}^2]^{0.5}$, where the s^2 are the estimated variances. The transformed model, which now has a constant error term, is estimated using OLS.

large share of official debt in French francs appears to have had an adverse effect on the average spread However, the coefficients of sterling, French and Swiss franc should be evaluated with caution, since the share of official debt denominated in these currencies is generally negligible, and the results we observe may be due to rare individual occurrences. To sum up, there is a significant grant element associated with official debt, and its magnitude is different according to the currency of denomination.

The estimated difference between the interest rate on fixed–rate debt and floating–rate debt for the different currencies is reported at the bottom of Table 5. Again, the results vary significantly according to the currency of denomination. For US dollar, French franc and sterling, $\bar{x}_k$ is not significantly different from zero, indicating that creditors obtained the same return on floating and fixed–rate debt on average. However, this is not true for D–mark, Swiss franc and yen. For these currencies, fixed–rate debt appeared to have been significantly more expensive than floating–rate debt, suggesting that perhaps the market has consistently overestimated actual interest rates on these three currencies. It may not be a coincidence that these currencies are all from low–inflation countries, but we have no interpretation to offer for why this may be the case.

To sum up, controlling for the currency composition of debt does not substantially alter the results in section 4. Also, using the parameters estimated above it is possible to construct the average interest rate that countries would have paid in a given year, if they had chosen the same currency composition. If sizable cross–country differences also appear in this measure, we must conclude that factors other than a different currency composition have mattered, and that observed differences in nominal interest rates have resulted in a different real burden of debt service. Let $\bar{f}_{t,k}$ be the average share of currency k in the sample at time t. $\hat{i}_{t,k}$ is the estimated average interest rate on currency k debt for country i in year t. Then

$$z_t^i = \Sigma_{k=1}^{n} \bar{f}_{t,k} \hat{i}_{t,k}^i$$

is the estimated average interest rate paid by country i in year t, if the currency composition of debt had been the sample average for that year. Figure 3 shows this standardized interest rates, plotted against LIBOR. Clearly, the large differences documented in Figure 1 persist. In particular, Indonesia, Turkey, and the Philippines would have benefited of significantly lower rates than the Latin American countries, even when the effects of a different currency composition of debt are eliminated.

5. Conclusions.

A correct understanding of the causes and circumstances that led to the international debt crisis of the '80s is important both because it may help prevent other such crises, and because of the major role that multilateral institutions have recently acquired in promoting and financing debt relief initiatives: This role raises the question of whether debt relief rewards countries that do not deserve international aid, and whether it will just encourage future default behavior.

The evidence presented in this paper suggests that HICs have received different treatment from their creditors in terms of the interest rate that they paid. Differential treatment has resulted in average interest rates well below market rates in several cases. In particular, the three large debtor countries which did not reschedule in the '80s (Indonesia, Turkey, and South Korea) were able to pay average interest rates markedly below those paid by Mexico, Chile, and Brazil. Lower interest rates were in part the result of a favorable assessment of default risk, which could be attributed to prudent policies in

the borrowing country. Large growth rates of GNP per–capita and low ratios of imports to GNP are associated with lower spreads. However, a large share of official debt has also meant significantly lower spreads for the countries in the sample. This component can explain differences in the average interest rate of 3–4 percentage points, arising from the substantial grant element implicit in official loans. Greater access to official loans has allowed countries like Indonesia, Turkey, the Philippines, and South Korea to limit the burden of debt servicing. Recently, international institutions and bilateral donors have subsidized debt restructuring in Latin American countries, such as Mexico. This flow of aid, motivated by the desire of donors to reward and support policy reform, is reducing differences in access to official creditors among the countries in the sample.

During the '70s and '80s HICs have also significantly differed as to the share of debt at floating interest rates in the total. It has often been suggested that floating–rate debt has hurt indebted countries, and recent debt reduction agreements show a tendency to reverting to fixed–rate instruments. Our results show that the interest rates on the two types of loan have not significantly differed on average, so that in spite of the extremely high nominal interest rates in the early '80s it does not seem that fixed–rate debt allowed countries to reduce their average interest burden over the sample. It may be true, however, that indexation to LIBOR forced countries to make especially large transfers in periods it which it was particularly burdensome to do so.

Finally, for the years 1980–1989 it was possible to control for the effects of differences in currency composition on the average interest rate. The results are essentially unchanged, although it appears that for 'strong' currencies (yen, Swiss franc, and D–mark) fixed–rate debt has been more expensive than floating–rate debt on average. Also, the size of the grant element associated with official debt appears to be significantly affected by the currency of denomination. Finally, we find that if countries had all chosen the same

currency composition of debt, large cross–country differences in average interest rates would have persisted.

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TABLE 1. Share of Official Debt in Total Debt, 1973–89

	Argentina	Brazil	Chile	Indonesia	S.Korea
1973	14.3	20.9	48.7	61.6	45.2
1974	16.2	17.8	46.4	56.2	43.6
1975	17.1	17.1	48.7	48.3	42.3
1976	15.4	15.6	46.7	46.8	43.8
1977	15.3	14.3	41.9	48.7	42.8
1978	16.8	12.5	31.0	51.8	39.4
1979	13.3	12.0	20.9	51.8	35.6
1980	11.3	12.2	14.6	52.6	34.7
1981	8.4	11.8	10.1	51.8	33.6
1982	7.2	11.6	8.5	51.1	34.5
1983	7.8	12.4	8.7	47.8	34.0
1984	7.1	13.9	8.7	46.9	31.3
1985	11.5	17.0	11.9	49.5	29.0
1986	13.2	20.8	16.1	51.0	30.6
1987	17.1	23.8	21.7	55.0	38.1
1988	17.7	24.3	26.9	58.3	38.1
1989	18.6	26.9	32.9	60.9	37.2

	Mexico	Philippines	Turkey	Venezuela
1973	29.4	32.2	90.4	21.9
1974	25.7	31.7	89.1	23.3
1975	22.5	31.9	89.8	37.0
1976	20.9	28.3	84.8	16.1
1977	17.7	28.6	73.9	9.4
1978	17.8	30.5	75.6	5.8
1979	16.8	32.0	58.6	3.8
1980	10.9	29.8	61.8	4.1
1981	10.1	32.7	64.0	3.6
1982	11.7	31.4	63.9	3.1
1983	8.2	35.1	62.7	2.4
1984	8.1	38.2	60.1	1.7
1985	10.0	41.1	61.4	1.5
1986	13.3	37.8	60.0	0.1
1987	15.9	41.2	57.6	1.3
1988	18.1	44.8	54.8	1.5
1989	20.9	52.9	46.3	3.2

Source: World Debt Tables, World Bank, various years.

Table 2. Share of Variable–Rate Debt on Public and Publicly Guaranteed Debt, 1973–89.

	Argentina	Brazil	Chile	Indonesia	S.Korea
1973	6.8	35.9	6.8	2.3	8.6
1974	17.5	44.6	11.0	1.6	14.0
1975	17.5	52.1	11.0	15.0	16.7
1976	36.7	55.6	14.0	17.5	17.7
1977	39.4	54.7	17.5	16.4	17.9
1978	38.2	56.7	32.7	13.5	26.1
1979	48.0	59.5	47.1	13.4	27.2
1980	57.2	61.3	51.2	16.2	35.2
1981	59.5	67.3	55.8	17.8	39.0
1982	42.9	69.7	66.1	20.1	42.3
1983	77.1	72.2	71.3	22.8	47.1
1984	78.4	75.9	80.5	24.2	49.2
1985	82.9	72.1	82.3	22.1	43.6
1986	83.2	70.1	80.7	24.3	30.6
1987	84.1	67.5	79.1	26.2	30.5
1988	83.0	73.4	80.1	35.5	45.8
1989	85.6	72.9	76.4	38.0	45.7

	Mexico	Philippines	Turkey	Venezuela
1973	40.1	7.4	0.5	22.9
1974	49.0	17.1	1.0	20.7
1975	51.1	20.0	0.8	18.3
1976	50.3	19.7	3.0	39.0
1977	53.3	21.2	9.3	60.2
1978	59.6	21.8	8.8	63.4
1979	69.8	25.1	31.5	76.7
1980	71.2	29.4	24.0	78.5
1981	75.0	30.6	23.4	79.9
1982	76.3	36.1	24.0	83.6
1983	82.5	35.5	24.3	81.2
1984	83.8	37.1	27.5	88.1
1985	81.4	36.4	27.3	86.0
1986	79.4	51.0	29.4	89.7
1987	79.1	48.2	31.8	89.1
1988	80.4	45.5	35.2	88.9
1989	80.3	44.4	32.1	89.0

Source: *World Debt Tables, World Bank, various years.*

TABLE 3. Sample Means for Each Country, 1973-1989.

	GNPPC	GGNPPC	IMPGNP	EDTEXP	INFL
ARGENTINA	1936.52 (341.9)	.049 (.11)	.101 (.04)	358.81 (179.1)	4.16 (7.7)
BRAZIL	1693.11 (478.2)	.096 (.11)	.089 (.02)	323.38 (75.1)	2.03 (3.1)
CHILE	1528.05 (487.3)	.042 (.17)	.270 (.07)	227.91 (87.1)	1.32 (1.9)
INDONESIA	423.29 (159.1)	.112 (.14)	.227 (.03)	165.92 (57.3)	.16 (.12)
S. KOREA	1845.82 (1119.2)	.167 (.08)	.359 (.03)	104.28 (28.4)	.13 (.09)
MEXICO	1881.00 (549.7)	.063 (.14)	.120 (.03)	294.63 (61.7)	.49 (.38)
PHILIPPINES	561.41 (161.2)	.077 (.11)	.237 (.04)	222.99 (86.5)	.14 (.11)
TURKEY	1121.50 (266.5)	.079 (.13)	.172 (.06)	225.34 (86.3)	.42 (.22)
VENEZUELA	3407.40 (985.4)	.044 (.14)	.225 (.06)	153.40 (92.6)	.20 (.23)

Standard errors are reported in parantheses. Variable definitions and sources are provided in the appendix.

TABLE 4. OLS Regressions Explaining Average Spread.

OLS	Unweighted			Weighted	
RHS variables	coeff. est.	std. error	White's std. er.	coeff. est.	std. error
(1+LIB)	-.027	.014	.014	-.023	.014
(1+LIB)h	-.963**	.166	.144	-.974**	.166
GGNPPC	.026*	.012	.010	.026*	.011
GNPPC	$-2x10^{-6}$	$2x10^{-6}$	$2x10^{-6}$	$-3x10^{-6}$**	$2x10^{-6}$
IMPGNP	.098**	.035	.034	.096**	.035
EDTEXP	$9x10^{-6}$	$1x10^{-5}$	$1x10^{-5}$	$3x10^{-6}$	$1x10^{-5}$
INFL	$-9x10^{-5}$	$4x10^{-4}$	$3x10^{-4}$	$-1.7x10^{-4}$	$4x10^{-4}$
h	1.071**	.182	.157	1.081**	.182
o	-.075**	.017	.015	-.071**	.016
calc. $\bar{x}$	.0136	.014	.015	.012	.015
Summary Statistics					
# of obs.	151			151	
R^2	.89			.91	
F	32.12**			36.46**	

Dependent variable is average spread (rd-lib). Variable sources and definitions are given in the appendix. Not reported above are coefficients of country and year dummy variables. Weighted specification weights observations by $(s_w^2+s_e^2h^2)^{.5}$. **, * indicate coefficient estimates that differ significantly from zero at 1 and 5 percents respectively.

TABLE 5. OLS Regressions Explaining Average Spread, Controlling For Currency Composition of Debt

OLS	Unweighted			Weighted	
coeff. from eq. (10)	coeff. est.	std. error	White's std. er.	coeff. est.	std. error
α_0	.165**	.046	.038	.152**	.040
α_1	-1.530**	.309	.290	-1.530**	.225
g_{US}	-.104**	.054	.042	-.066	.047
g_{DM}	-.137	.249	.159	.047	.207
g_{FF}	1.690**	.588	.598	1.500**	.601
g_{STLG}	-2.830**	1.210	1.030	-3.290**	1.160
g_{SWF}	-.639#	.523	.392	-.908*	.438
g_{YEN}	-.122*	.078	.057	-.114	.078
calc. $\bar{x}_{US}$	.009	.033	.031	-.004	.035
calc. $\bar{x}_{DM}$	.066*	.036	.032	.053#	.032
calc. $\bar{x}_{FF}$	-.030	.035	.034	-.043	.030
calc. $\bar{x}_{STLG}$	-.011	.032	.030	-.025	.031
calc. $\bar{x}_{SWF}$	.083**	.037	.032	.070*	.033
calc. $\bar{x}_{YEN}$	.073*	.036	.032	.060#	.032
Summary Statistics					
# of obs.	80			75	
R^2	.89			.94	
F	20.60**			35.30**	

Dependent variable is the average spread correcting for currency composition. Not reported above are coefficients of country and year dummy variables. Weighted specification weights observations by $(f_t^2 s_w^2 + \Sigma^n_{k=1}(f_{t,k}h_{t,k})^2 s_{e,k}^2)^{.5}$. **, *, # indicate coefficient estimates that differ significantly from zero at 1, 5, and 10 percents respectively.

Figure 1. Average Interest Rate for Selected HICs and LIBOR, 1973–89.

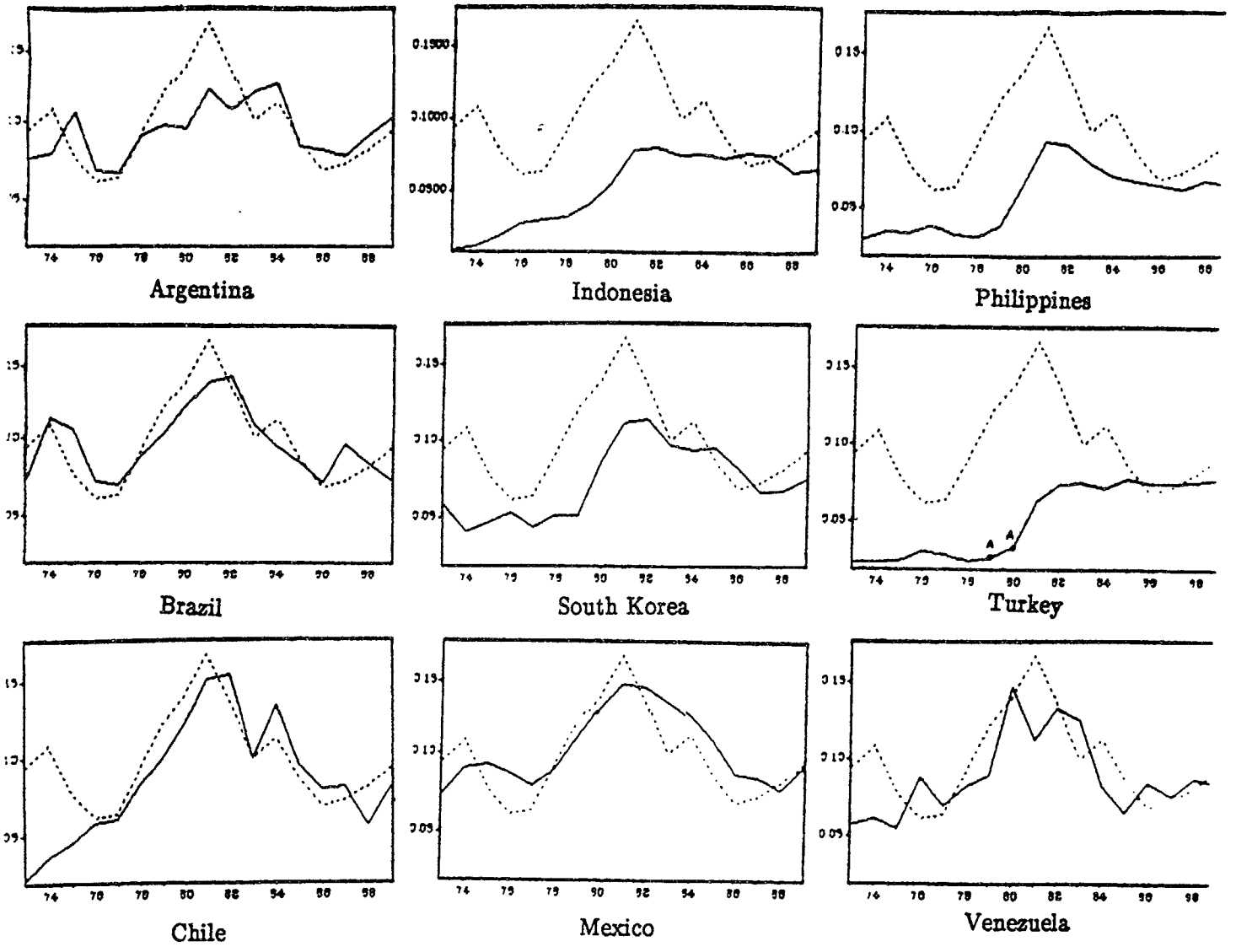


Figure 2. Interest Rate on Official Debt and on Private Debt for Selected HICs, and LIBOR, 1973–89.

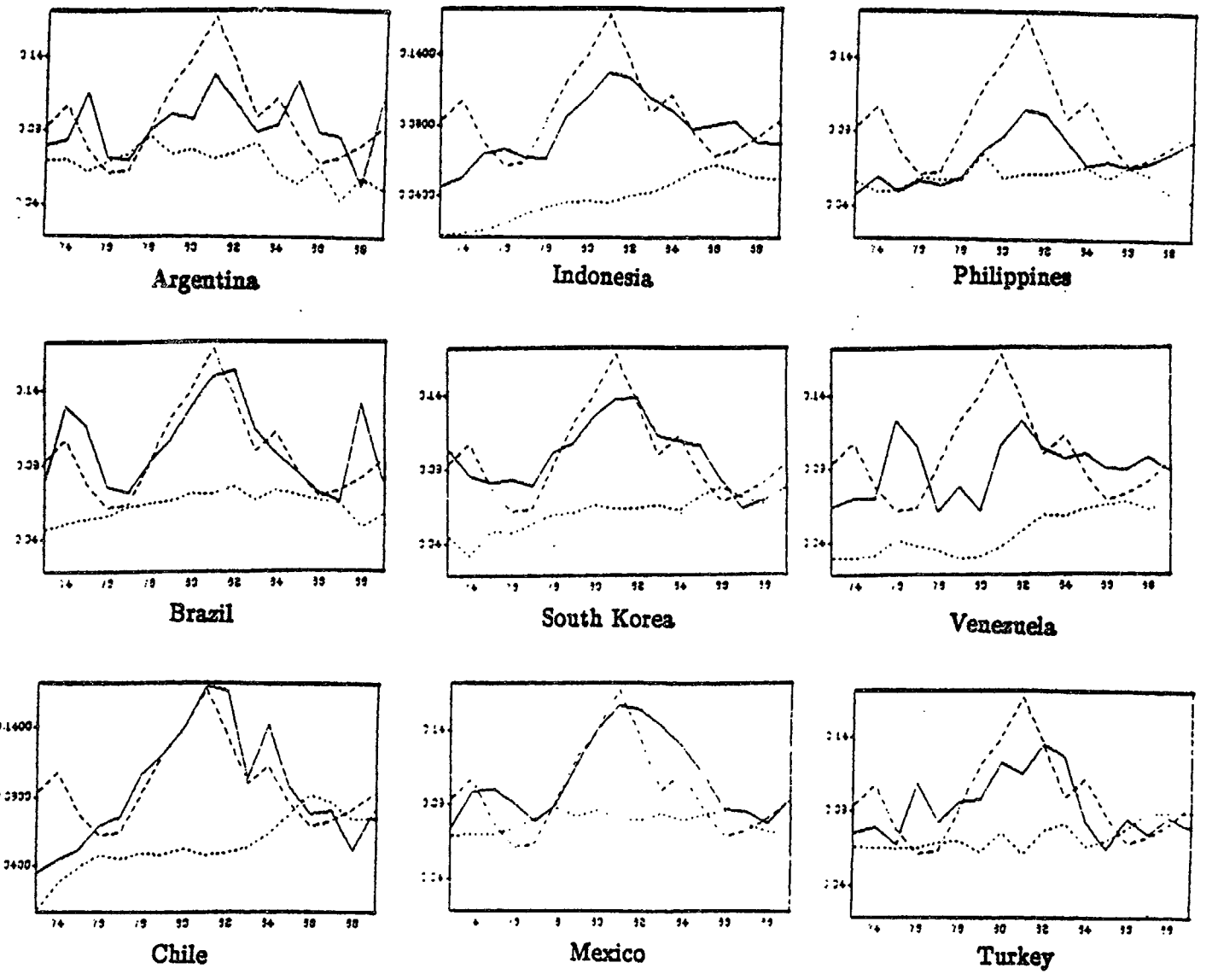
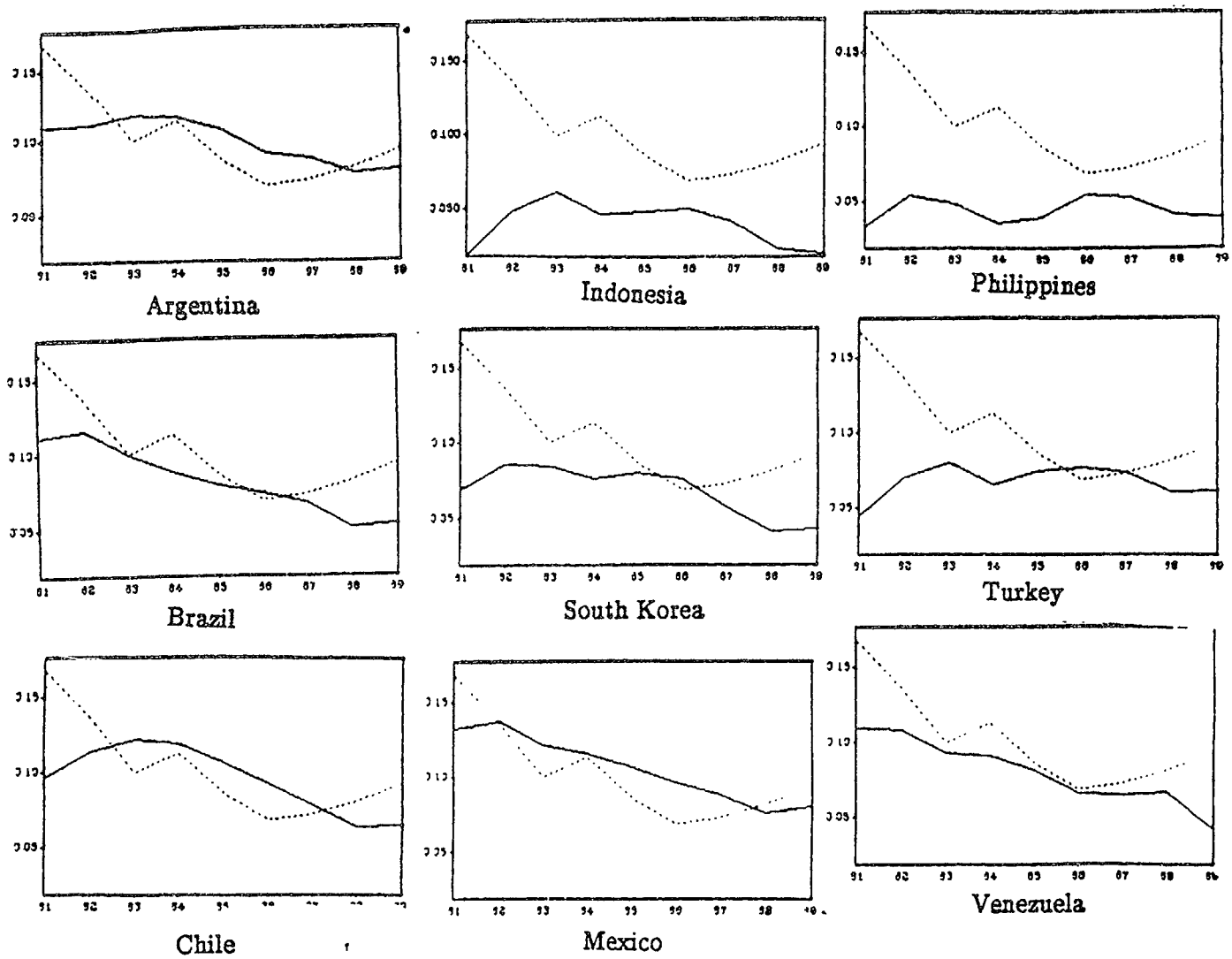


Figure 3. Average Interest Rate Standardized for Currency Composition for Selected HICs and LIBOR, 1981–89.



APPENDIX

Variable Definitions and Sources.

GNPPC:	GNP per-capita in constant US$.
GGNPPC:	Percentage change in GNPPC.
IMPGNP:	ratio of imports to GNP.
EDTEXP:	ratio of total external debt to exports.
INFL:	rate of inflation as given by percentage change in GDP deflator.
LIB:	6-month LIBOR rate.
R:	interest rate charged on public debt by private creditors.
RP:	interest rate charged on private non-guaraneed debt by private creditors.
OFR:	interest rate charged on official debt by official creditors.
RD:	weighted-average of the above three interest rates.
h:	ratio of fixed rate loans to total loans.
o:	ratio of official debt to total debt.
SPRRD:	average spread, rd-lib.

All variables are available annually for Argentina, Brazil, Chile, Indonesia, South Korea, Mexico, Philippines, Turkey, and Venezuella. LIBOR and euromarket rates on other currencies (DM, FF, STLG, SWF, YEN), as well as exchange rates (period averages) are obtained from the International Financial Statistics of the International Monetary Fund. Currency composition of debt and all other data are from the World Bank's Debt Reporting System.

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