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Burden-sharing among Official and Private Creditors

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Official creditors — especially multilaterals — have absorbed more of the burden of the debt crisis than private creditors have. Official creditors are not necessarily weaker or less senior, but for the sake of nonfinancial objectives, they may be unwilling (rather than unable) to exercise their substantial enforcement power.

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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 regarding 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 (August 1992, 31 pages).

Demirgüç-Kunt and Fernández-Arias analyze how the burden of the debt crisis has been shared by various classes of creditors. Given the rising share of official debt in the total debt of developing countries, official creditors have a growing need to develop a burden-sharing indicator.

This paper represents the very first step in this direction. So, its analysis narrowly focuses only on financial profits. No inference should be made regarding the overall performance of official creditors, whose evaluation requires the assessment of their nonfinancial objectives. Similarly, no inference should be drawn regarding the solvency of multilaterals, which is essentially determined by external guarantees. Extensive further research is required to shed light on these areas and to eventually derive the relevant policy conclusions.

The authors briefly review the relative performance of external creditors during the debt crisis in terms of exposure, net transfers, and arrears. They argue, however, that a meaningful measure of burden-sharing needs to go beyond those observations and consider the capital losses that creditors have made on outstanding debt stocks. So, they develop a financially sound measure of rate of return — incorporating repayment flows and capital losses — and derive a financially sound definition of burden-sharing. This definition is then applied to a group of severely indebted countries for which secondary market prices are available. The finding: private creditors made a loss of about 30 percent during the debt crisis, and official creditors avoided absorbing a comparable burden only if, on average, the implied prices of their debt stocks were significantly higher than market prices.

To assess burden-sharing, the unobservable implied prices of official debt need to be estimated. The authors first analyze how, in a seniority-based corporate debt model, information on these implied prices can be recovered by looking at the differential impact of various stocks of debt on the market price. They analyze the validity and drawbacks of this model for the sovereign debt case and conclude that seniority sharing rules are probably not appropriate. They then show that implied prices are still identified under more general sharing rules, which allows us to relax that assumption and still be able to derive relevant inferences. A suitable multicreditor debt valuation model, dependent on the stock of private debt and the debt shares of various creditors, is then derived and estimated.

The empirical estimations show weak effects of the official debt stocks on the market price and suggest that the implied prices of official creditors are lower than the market price, especially for multilateral creditors. This finding implies that official creditors have, relative to private creditors, absorbed a larger burden, especially multilaterals. But it does not imply that official creditors are weaker or less senior: official creditors may be unwilling, rather than unable, to exercise their substantial enforcement power for the sake of nonfinancial objectives. Two qualifications to the findings on implied prices: First, the "single collateral" assumption of corporate debt may not be applicable to sovereign debt. The evidence may also be consistent with undiscounted official implied prices if official creditors have independent enforcement mechanisms not available to private creditors. Second, the class of admissible sharing rules used for identification generalizes the seniority rules but may still exclude the relevant sharing rule.

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I. INTRODUCTION

This paper seeks to determine how the burden of the debt crisis is being shared among different creditors, particularly private creditors, multilateral creditors, and bilateral creditors. Burden sharing among creditors is not a well defined concept. One popular measure of how the burden is being shared is given by the observed trends in the changing composition of the external debt portfolio of debtor countries, which is a reflection of the financial flows connected to debt service and new lending as well as debt conversions. Significant as these trends may be for the evolution of the debt crisis, burden sharing cannot be measured by simply looking at net transfers received or new money provided by each creditor class. Determining burden sharing among creditors requires determining capital losses and gains in their stock of debt.

This paper addresses the issue of how capital losses and gains are shared by creditors. However, this issue is still narrow since, while private creditors only care about their financial position, official creditors have other concerns as well, such as the development impact in the case of development institutions such as IBRD. Nevertheless, a purely financial analysis is useful because financial losses in a given country reduce lending capacity elsewhere and therefore result in an additional constraint on the optimal allocation of funds for development or other relevant purposes. It should be emphasized at the outset that precisely because international financial institutions have non-financial goals to which financial returns are subsidiary, their performance should not be evaluated narrowly from a financial viewpoint. To the extent that the best policy suited for their purpose is followed, which may imply financial losses, they would remain useful institutions and, therefore, the support of their shareholders can be expected. The credit rating of these institutions is determined by this backing, both through explicit and implicit guarantees. Therefore credit ratings of IFIs depend on good performance with respect to their specific objectives and not on financial performance alone. In the case of official creditors, financial returns are one component of the analysis rather than the bottom line. This paper only focuses on this component.

Capital losses arise because the financial value of debt claims, as measured by the present value of the resources that the debtor can be expected to make available for their service, can fall below its face value[1]. While the secondary market price of debt reflects the capital losses on debt held by commercial banks, the absence of a market makes the corresponding price of official debt claims unobservable. How the implicit price of official debt and the price of private debt relate is controversial: while some opine that official creditors are implicitly more senior, others think that they have a weaker bargaining position and are consequently less senior.

The literature on burden sharing is very scanty. Dooley (1990) was the first author to emphasize that a financially sound measure of burden sharing among creditors needs to look at the capital losses made on outstanding debt. He constructs a measure of burden in terms of the rates of return on total claims. However, a fundamental limitation of the Dooley analysis is that it is basically an accounting framework. Simulation results depend entirely on the assumed relative seniority between official and private creditors. The issue of seniority of official creditors, and of multilaterals in particular, is not addressed, which makes the simulations less useful.

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[1]This disregards other factors affecting the financial value of debt, such as the implicit deposit insurance subsidy that commercial banks receive by holding impaired debt claims. Note that in this case the financial value of debt would overestimate the country's expected payments.

Although there are many who believe that official creditors are more senior than private creditors, Sjaastad (1990) and more recently Bulow and Rogoff (1991) have questioned the World Bank's senior creditor status.[2] Finally, Berthelemy and Vourc'h (1991) empirically estimate burden sharing among creditors. However, their estimated value of official claims is based on the assumption that official creditor claims are impaired. Thus they estimate the ability of capturing net transfers in the future based on the analysis of the net transfers creditors have been able to extract in the past, and show that the burden is being shared in inverse relation to the proportion of net transfers received from debtor countries. However, there is no real basis for this assumption.

This paper addresses both the relative seniority and burden sharing of different creditor classes. The implied prices for equal burden sharing during the debt crisis are derived. A ranking of implied prices for different creditor groups is estimated within a multi-creditor valuation model of private debt that does not assume the existence of a seniority structure. Burden sharing among creditors is determined based on these implied prices. Our valuation is forward looking, i.e., it is based on future expected net transfers rather than past net transfers.

The paper consists of seven sections. The next section discusses the relative performance of external creditors during the debt crisis, analyzing historical trends. Section III defines the concept and measure of burden sharing and Section IV derives implications of equal burden sharing during the debt crisis. Section V constructs an analytical multi-creditor debt valuation model, which is empirically estimated in Section VI. Finally, section VII concludes the analysis.

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[2]After the first draft of this paper was written, two more pieces make the case of equal seniority between private and official creditors following similar methods: Bulow, Rogoff, and Bevilaqua (1992) and Cohen (1992). This paper discusses the restrictive assumptions that are needed to justify those methods, which are implicit in both papers.

II. RELATIVE PERFORMANCE OF EXTERNAL CREDITORS DURING THE DEBT CRISIS

Performance of different creditors during the debt crisis has been sharply differentiated. In what follows, a comparative analysis long-term debt of multilateral, bilateral, and private creditors is presented. This presentation discriminates between Severely Indebted Middle Income Countries (SIMICs) and non-SIMICs (the rest of the developing countries except those not credit constrained), following the definitions in World Debt Tables unless otherwise indicated.

The level of developing country external debt has increased and its composition changed substantially over the course of the debt crisis. It is clear that since the beginning of the debt crisis in 1982, multilateral creditors are the ones increasing their exposure the fastest, private creditors are retrenching and bilateral creditors are in between. This has led to substantial changes in the composition of external debt portfolios as shown Table 1: the share of multilateral creditors persistently increases at the expense of the share of private creditors. Bilateral creditors also increased their share overall, although it slightly decreased in non-SIMICs. These changes are more marked in the SIMICs, where the proportion of multilateral and bilateral credit in private credit grew,in the period 1982-1989, from less than 10% and 20% to more than 20% and 40% respectively.

A substantial part of the growth in debt stocks expressed in dollars is due to the fact that on average the dollar depreciated in relation to other currencies in which external debt is denominated. If debt stocks are corrected by valuation changes[3], lower stocks are obtained. In particular, private creditors in SIMICs would have had a reduction in exposure. As shown in Table 1, in this case the share of multilateral creditors would have been even higher in both SIMICs and non-SIMICs. In particular, the proportion of multilateral debt in private debt is even higher considering these adjusted debt stocks (the opposite is true for bilateral creditors). The fact that in share terms private creditors decreased their exposure measured in dollars at the expense of official creditors, particularly multilateral creditors, cannot be attributed to lower exchange rate capital gains but to their performance in relation to the amount of net transfers they have extracted from debtor countries.

Figure 1 shows net amounts transferred in relation to outstanding debt, which is the key factor explaining the evolution of adjusted debt stocks. While private creditors have been extracting net resources since the beginning of the crisis at sizable rates, by and large official creditors, and in particular multilateral creditors, have been providing net resources which have partially compensated the private creditors extraction.

Another interesting dimension of the process relates to arrears. Arrears have been accumulating at a rapid rate, as shown in Figure 2. It is very clear, however, that they have been falling mostly on bilateral and private creditors, while multilateral creditors have managed to avoid arrears to a large extent[4]. Arrears are for the most part a problem of SIMICs. In this group of countries, as of the end of 1989, accumulated arrears represent around 20% of bilateral and private debt and around 5% of

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[3]Valuation changes were estimated as the difference between the change in the stock of debt augmented by debt reduction on the one hand, and net flows and interest rescheduled on the other. Therefore what is reported under valuation changes includes errors and omissions.

[4]It should be noted that the previous definition of arrears includes not only accumulated interest arrears, as reported in WDT, but also their capitalization (at rates similar to the ones on current service due).

multilateral debt. The record about reschedulings is similar to the one discussed for arrears: multilateral creditors have not rescheduled debt, while private and bilateral creditors have done it repeatedly.

This picture is consistent with multilateral creditors providing positive net transfers in retribution to full debt service and private creditors extracting net transfers through receiving partial payment of debt service due, which is renegotiated in the form of a rescheduling agreement or arrears. The case of bilateral creditors falls somewhere in between.

III. BACKGROUND AND DEFINITIONS

In this section we start the analysis of the evidence by looking at claims held by private creditors and measuring their losses. We then generalize the concepts to official creditors and define burden-sharing among all of them.

Let D[t] be the face value of private debt claims at the end of period t and V[t] its financial value. Let p[t]=V[t]/D[t] be the implied price of face value debt. If a secondary market for debt exists, p[t] would be the market price[5] and V[t] would be the market value of debt, that is the opportunity cost of holding the claims. Let T[t] be the net transfer received from the debtor at the end of period t. Then the realized rate of (economic) profit x is such that:

(1) $$1+x = (V[t]+T[t])/((1+i)V[t-1]))$$
$$(p[t]D[t]+T[t])/((1+i)p[t-1]D[t-1]))$$

where i is the market discount rate in period t (the opportunity cost of holding a unit value during period t). In market equilibrium, the expected rate of profit x is zero.

In order to analyze how losses may come about, consider first the simplest case where debt service obligations are always honored. In this case the financial value of claims, that is their market value, is the expected present discounted value of contractual debt service. Assuming that there is competition among creditors, this value coincides with the face value of debt. In other words, the competitive market rate i is charged and expected p[t]=1 for all t. Then expected x=0 because (D[t]+T[t])/((1+i)D[t-1]))=1. In this case with no sovereign risk, these equalities also hold ex-post if it is assumed that future market discount rates are certain, which we assume in what follows in order to focus on sovereign risk. It is easy to check that in this case the expected profit rate x is unaffected by the transfer T[t] made under the particular debt service schedule of the contract, because the associated compensatory changes in face value debt D[t] would be valued at par. In particular, new lending at time t would lead to zero profit. Therefore, lending would be voluntary and there should not be any difficulty in rescheduling debt service.

Suppose, by contrast, that with some positive probability contractual debt service may not be met. If this possibility arises for liquidity reasons but solvency is not an issue (in the sense that debt obligations would be expected to be met in the future if rescheduled), then the no sovereign risk case would still apply and previously contracted obligations would be met by additional borrowing at risk-free rates. However, if solvency is uncertain sovereign risk becomes relevant. In this case, if solvency conditions

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[5]Like in stock prices, there is a possibility of price bubbles not reflecting fundamentals which will be disregarded for simplicity. It should be noted however that in no case can prices be below fundamentals (i.e the country's expected present value service), because in that case it would be more profitable to hold to the asset and there would be no seller. In other words, bubbles can only be explosive, as opposed to implosive. This implies that bubbles cannot be an explanation for low secondary market prices of debt.

deteriorate to the point that the market value of debt V[t] falls below face value debt D[t], ex-post p[t] would consequently fall below unity. To the extent that p[t-1]=1, lending at time t-1 is voluntary and therefore, as before, x is expected to be zero by virtue of lenders' competition. In this case, however, a risk premium r needs to be charged in order to compensate for the possibility that x be negative ex-post. The feasibility of this risk-offsetting premium, in turn, would justify the voluntary nature of the lending under these circumstances.

Suppose for simplification that loans are made for one period in the amount D[t-1] and that, as perceived at t-1, an adverse shock imposing a ceiling S on present value debt service from period t onwards will occur with probability s. Then the contractual debt service at period t is $(1+i)(1+r)D[t-1]$. If the shock does not occur, the rate of profit r is realized. If it occurs, a negative rate of profit $h=S/(1+i)D[t-1]-1$ is realized (under the assumption that $S<(1+i)D[t-1]$). Here the rate of profit x may take the values r or h depending on the state of nature. In equilibrium zero expected profits obtain, and therefore $E[x]=(1-s)r+sh=0$, which determines the risk-premium r. Therefore p[t-1]=1[6].

The most extreme case of sovereign risk is when no feasible interest rate premium compensates sovereign risk. In this case, prices fall below unity. Since an additional dollar lent would lead to a capital loss, no voluntary lending takes place, the country is credit rationed, and creditors attempt to withdraw. How this may happen can be illustrated by the situation that would emerge after the previously described shock occurs: since S is not enough to recover contractual debt obligations even if rescheduled, once the transfer T[t] is made the remaining resources B=S-T[t] are not enough to cover remaining debt D[t]. Then V[t]=B and $p[t]<1$. More generally, the present value of net transfers is a random variable which is truncated when all debt obligations are paid. Let B be the expected value of such distribution after the transfer T[t] is made. To the extent that $B<D[t]$, credit rationing and $p[t]<1$ obtain.[7] Note that since B is derived from a distribution truncated when contractual debt is fully paid, in general B, and therefore V[t], can be assumed to depend on face value D[t].

While how T[t] and B are determined is in the realm of bargaining theory and exceeds the scope of this paper, it can be generally expected that under these circumstances creditors will attempt to extract the largest possible T[t] period after period (see Fernandez-Arias (1991) for a discussion). Even though competition in lending breaks down, it should be noted that competition in secondary debt markets still ensure that ex-ante profit rates are zero, since market prices already incorporate expected losses. Like in the competitive case where initial market prices are unity, lower-than-expected future prices would lead to ex-post negative profits and a higher-than-expected future prices would lead to ex-post positive profits.

The above reasoning can be generalized to official creditors. There are two difficulties however, one practical and one conceptual. The practical problem is that there is no market valuation of official debt, which would be needed to compute (1). The conceptual problem is that since official creditors are not subject to competition, there is a weaker case for some of the observations made for private creditors.

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[6]In a constant probability model where the probability of the adverse shock is always s until it occurs, the previous reasoning can be extended for all periods before the shock occurs.

[7]This implies that too high risk premia are not feasible or that the probability of all debt obligations being ever repaid decreases sufficiently fast.

For example, lending by official creditors may not be profit-maximizing. This may occur by design, because official creditors may look at dimensions beyond narrowly defined financial results. It may also occur because of the lack of market controls on poor performance, such as stock quotations or buyouts. This may reflect in appropriate risk-premia not being charged when non-negative profits are feasible. It may also reflect in willingness to lend when the optimal strategy, from a purely financial point of view, would be to attempt to withdraw as private creditors do. A strategy which is suboptimal from a narrow financial point of view may be globally optimal for a creditor government or a development institution. The case can be made that performance of official creditors should be measured in a more comprehensive way. An attempt to do so may hide poor performance, however. Here we prefer to stick to our financial measure of burden and rate of profit keeping in mind its limitations. This purely financial measure has the additional advantage of leading to an unambiguous definition of burden-sharing, which would be subjective if idiosyncratic factors were introduced.

With these considerations in mind, formula (1) can be also applied to official creditors. Its content is mostly conceptual, however, because the imputed price of debt p[.] and its value V[.] are not observed. More generally, let j index creditor classes. Let $D_j[t]$ be the face value of creditor j debt claims at the end of period t and $V_j[t]$ the expected present discounted value of its associated debt service (given the lending strategy followed by creditor j). Let $p_j[t]=V_j[t]/D_j[t]$ be the implied price of face value debt. Let $T_j[t]$ be the net transfer received from the debtor at the end of period t. Then the realized rate of (economic) profit in period t, $x_j[t-1,t]$ is such that:

(2) $$1+x_j[t-1,t] = (V_j[t]+T_j[t])/((1+i)V_j[t-1]))$$
$$= (p_j[t]D_j[t]+T_j[t])/((1+i)p_j[t-1]D_j[t-1]))$$

where i is the market discount rate in period t.

The rates x_j can be interpreted as the gain per unit of original value. In the context of losses they would be negative. Let x be the average profit rate computed lumping together all creditors. It is easy to check that it is a weighted average of the profit rates x_j weighted by weights w_j, where w_j is the share of $V_j[t-1]$ in total value at the beginning of period t. In the case that profit rates x_j are the same for all creditors, and therefore equal to x, we say that profits are equally shared. Assuming that $x<0$, this is the case of equal burden sharing. More generally, we say that the lower (the more negative) x_j, the larger the creditor j's share of the burden.

Expression (2) and the definition of burden-sharing can be extended to cover a longer period where a stream of transfers is made or received. Consider the case where transfers are received over $t-t_0$ years. Let $T_j[t_0,t]$ be the present value of the stream of net transfers to creditor j in the period (t_0,t) discounted forward to period t.

Then

(3) $1+x_j[t_0,t] = (V_j[t]+T_j[t_0,t])/((1+I)V_j[t_0])$
$T_j[t_0,t]/((1+I)p_j[t_0]D_j[t_0]) + p_j[t]D_j[t]/((1+I)p_j[t_0]D_j[t_0])$

where I is the discount rate for the entire period (t_0,t).

Expression (2) is a particular case of expression (3) when $t_0 = t-1$. Expression (2) can be seen as a definition of marginal burden and leading to a definition of marginal burden-sharing in relation to period t. Expression (3) can be interpreted as a similar concept but related to total burdens and burdensharing over the entire period. Both concepts relate to gains or losses in relation to the value of claims in the base year. Therefore the marginal concept focuses on how the new burden is shared, irrespective of how the past burden was shared. The total concept, in contrast, if applied to a past period, summarizes how the total burden generated in the period was shared. It is easy to check that $x_j[t_0,t] = x_j[t_0,t-1] + a[t_0,t-1].x_j[t-1,t]$, where $a>0$ is the ratio of the market value of debt at t-1 and at t_0. As discussed above, the marginal profit rate $x_j[t-1,t]$ has zero expected value at time (t-1). Since then $a[t_0,t-1]$ is fixed, total profit rate is a martingale and follows a random walk. This implies that losses are accumulated over a period only through unexpected adverse realizations.

IV. EQUAL BURDEN SHARING IMPLICATIONS

In what follows we will use three creditor classes: private, official multilateral, and official bilateral. The subindex j will be correspondingly substituted by p,m and b. When a distinction is made only between private and official creditors, the letters p and o are used.

The debt crisis can be characterized within the above framework. In the lending phase, say between 1973 and 1982, risk premia were charged by private lenders to cover the risk of adverse shocks putting a binding constraint on the value of debt outstanding. In this period the implicit price of private debt was unity, lending was voluntary and expected profits were zero. Until 1982 such a shock did not occur, which led to positive ex-post profits. In 1982 a sufficiently big adverse shock in terms of terms of trade and interest rates occurred, which led to ex-post negative profits in a great number of countries. This situation remains very much unchanged until now, since in those countries private lending remains involuntary and secondary market prices quote at a substantial discount. It should be remembered that the ex-ante zero profit condition applies in every period, whether lending is voluntary or not. Therefore ex-post capital gains or losses during the entire period have been realized to the extent that unexpected events occurred.

The ex-post gains of private creditors before 1982 may have compensated the ex-post losses after that date. Even if this is not so, since ex-ante profits are zero and lending was voluntary before 1982, ex-post losses should not be seen as meriting any particular compensation. In an ex-ante sense there is no burden. In an ex-post sense there is a burden which depends on when we want to start accumulating. The burden would be smaller, perhaps negative, if ex-post profits are accumulated since the beginning of the lending boom in 1973. We leave that exercise for further research and concentrate on the ex-post return obtained after the breakdown in 1982 until 1989. This is done by using formula (3) to obtain:

(4) $1+x= T/(1+I)V[1982] + V[1989]/(1+I)V[1982]$
$T/(1+I)D[1982] + p[1989]D[1989]/(1+I)D[1982]$

where I is the discount rate for the entire period 1982-1989 (the compounded Libor rate in the period) and T is the present value of the net transfers received during the period discounted forward to 1989. The initial stock of debt is valued at par.

Applying (4) to private creditors, the first term can be interpreted as the fraction of initial investment that private creditors have been able to recover by extracting net transfers in the period. It amounts to almost 50% for the SIMICs (0.4941). The return is higher than this, however, because the capital loss has not been complete and the remaining debt has a positive value, which equals the expected additional fraction that can be recovered in the future. The above calculation requires an estimate of p[1989]. For SIMICs this can be calculated as a weighted average of secondary market prices in those countries quoted at the end of 1989, where the weights reflect the importance of each country in private creditors SIMIC portfolio[8]. We obtain p[1989]=0.294, which leads to a residual value of almost 20% (0.1947). Then 1+x = 0.4941 + 0.1947 = 0.6888. This implies that the rate of profit x=-31.12%. We now pose the question of how the other creditors are doing and how the burden is shared.

To answer that question is not easy. It should be noted at the outset that burden-sharing among creditors cannot be addressed by simply looking at the trends described in section II. While net transfers is relevant for the determination of the burden absorbed by a particular creditor, it is necessary to know the remaining value of outstanding claims in order to assess it. Since there is no market for multilateral and bilateral debt, there is no direct market information about it. The evolution of exposure, both in levels and shares, as well as the record of arrears and reschedulings, may provide indications to that effect but are hardly conclusive. Before turning to the discussion of this issue, we apply (4) and compute the implicit price of multilateral and bilateral debt which would lead to equal burden-sharing among them and private creditors for SIMICs. Equal burden-sharing is defined as one in which losses in a given period are proportional to the original value invested, that is to say, one in which the ex-post rates of profit are equal.

Since multilateral and bilateral creditors have been transferring resources in net terms to the SIMICs during the period, the return derived from net transfers extraction is actually negative: -0.3017 for multilateral creditors (of which, -0.2811 for IBRD), and -0.143 for bilateral creditors. For equal burden-sharing the implicit prices as of end-1989 would be 0.6314 for multilateral creditors (0.529 for IBRD), and 0.4653 for bilateral creditors (assuming that the implicit price in 1982 is also unity). This result indicates that for equal burden sharing between IBRD and private creditors, IBRD claims must be worth much more than those of private claims (23.5 cents more on the dollar). Only if IBRD claims are worth more than 52.9 cents on the dollar, private creditors would be sharing more of the burden associated with the debt crisis. Similar qualitative results apply to other official creditors. This of course includes the case where IBRD and other official claims are not impaired in any way, in which case official creditors would not be suffering any burden at all according to this definition.

V. A MULTI-CREDITOR DEBT VALUATION MODEL

After giving this background information about the range of numbers that equal burden-sharing implies, we return to the conceptual problem of determining the financial value of official creditor claims. One first problem is that part of the burden absorbed by official creditors is the grant element of their concessional loans, which are unprofitable by design. This would not apply to IBRD, however. More generally, since they are not profit-maximizers, they cannot be assumed to follow the strategy that a private creditor would follow. We are conscious that to the extent that part of the financial losses are purposely not avoided if other concerns are more important (such as large development returns), the very notion of financial burden may not be entirely appropriate for many purposes. Nevertheless, here we will

[8]It is assumed that prices of commercial banks apply to all private creditors.

only consider the narrow issue of the financial value of claims and stick to the unambiguous financial definition of burden-sharing.

One way to analyze the problem of the value of official debt is to decompose it into two elements: the value that would be obtained if the entire debt were sold to a new private creditor, which following Sjaastad (1990) we call its intrinsic value, and the rest, which can be attributed to the differential creditor status of official creditors vis-a-vis private creditors. The intrinsic value of official portfolios does not seem to be worse than private portfolios in SIMICs. Reweighing the secondary market index price for SIMICs as of end-1989 by the portfolio weights of official creditors, we obtain that the index is 0.33 and 0.29 for multilateral and bilateral debt respectively, which has to be compared to the private creditor index 0.29. The situation for other countries may be different, but the absence of widespread secondary markets for their debts prevents the application of similar methods.

Regarding differential creditor status the evidence is less conclusive. While the evidence of low incidence of arrears and reschedulings in multilateral debt may confirm that multilaterals are preferred creditors, there are two counterarguments which seriously weaken this conclusion. First of all, it can be argued that the proposition has not been really tested because the multilaterals are willing to lend voluntarily, and actually frequently provide positive net transfers. While receiving, or expecting to receive, positive net transfers, debtor countries would fully service the debt to any creditor, even a non-preferred one. The very willingness of official creditors to lend may indicate that they do not think that their claims are impaired. This argument disregards the distinct possibility that official creditors, not being profit-maximizers like financial institutions, may be willing to lend at some financial loss if other dimensions of their utility function are satisfied. In any event, what official creditors "think" is a much weaker test than the market test to which private creditors are subject to. Second, a more cynical view of the same facts is that official creditors are <u>forced</u> to provide positive net transfers in exchange for a formal compliance with scheduled debt service.

The easiest model to consider is one where there is a fixed <u>given</u> pool of resources to be shared among creditors. If in present value terms this pool amounts to less than the face value of total claims, there is a conflict among creditors over how to share the loss. This model is consistent with an ability to pay model, where the pool represents the availability of resources to service debt. To the extent that there is uncertainty over the availability of resources, it may occur that in some circumstances the resources exceed total debt claims. Since this excess will not be used to service debt, the relevant probability distribution of available resources is truncated when all debt claims are fully serviced. The relevant measure of ability to pay becomes the expected present value of this distribution, which is therefore a function of total face value. The model is generalized to the case of uncertainty by considering a given pool of resources equal to this expected present value. To the extent that the pool is smaller than the face value of debt, there are financial losses to all the creditors combined and conflict among them as to how to share the loss.

The scanty literature on multi-creditor valuation models has relied on ability-to-pay models and has modelled the conflict among creditors in terms of a seniority structure. In a seniority arrangement, there is a pre-established order in which each creditor class can claim and receive payment. This framework of ability-to-pay and seniority structure is taken from the corporate debt literature, where there is essentially one unspecific collateral (the value of the firm) to be shared by creditors in the order specified by the law. We will argue that this framework may not be entirely appropriate to the sovereign debt case and needs to be generalized. We start building our model by applying this corporate debt

framework to sovereign debt, where for simplicity creditors are classified in only two classes: private and official. There are three cases considered in the literature: official creditors are senior to private creditors, official creditors are junior to private creditors, and both classes of creditors have the same seniority and share the loss equally (can claim in proportion to exposure). We now explain the implications of such a model and later turn to the restrictive nature of its assumptions.

If the corporate seniority model is applied to sovereign debt, the total value of debt of private and official creditors, $V=V_p+V_o$, depends only on total face value $D=D_p+D_o$ (the time index is dropped for clarity), as can be easily checked by looking at the problem from the debtor's point of view, where the order in which creditors claim is irrelevant. The value V increases with face value D, because there is some probability that the entire debt can be serviced as explained before (this assumes that the possibly adverse effect of debt on the country's ability to pay as a result of the so-called "debt overhang" is not severe enough as to give rise to a debt Laffer curve). This probability can be expected to decrease with face value of debt. Under these conditions, the value V is an increasing concave function of face value D (starting at a 45-degree line for low values of D). In Figure 3 this value function V[.] is depicted under the assumption that official creditors are senior. In this case, the first portion of D is D_o with a corresponding value $V_o=V[D_o]$ which can be read directly from the graph, as if no other creditor had any claim. The second and last portion of total face value corresponds to private debt D_p. Its value is the residual value after the senior official creditors are satisfied: $V_p=V[D_o+D_p]-V[D_o]=V-V_o$.

The imputed price of debt can be represented by the slope of lines OA, in the case of official creditors, and AB in the case of private creditors. We note that due to concavity, the price of senior debt is larger than the price of junior debt, and may be one at low levels of debt where the value function is a 45-degree line. Note that if the face value of a particular class of debt increases by one unit, the price of that class of debt always falls, be it senior or junior (it can of course remain at one at low levels of senior debt). The effect on the price of the other class depends on seniority, however. If the class increasing debt is senior, the price of junior debt will decline even more than with an own-class debt increase, as can be seen by comparing the slope of A'B' and AB'. If the class increasing debt is junior, however, no effect would be felt on the price of senior debt. If private debt is senior to official debt, the graph and conclusion would be obviously reversed. Finally, if both classes share the burden equally, the price of their debts would be the same and would be equally affected by changes in either class of debt. This case amounts to assuming that there is only one class of debt with face value D.

The above model and results can be generalized as follows. In the spirit of an ability-to-pay model, we keep the assumption that there is a given pool of resources to be shared. This only assumption implies that total value $V=V_o+V_p$ depends on <u>total face value</u> $D=D_o+D_p$, as opposed to both face values separately. However, we dispense with the seniority structure assumption and allow more general sharing rules. In the context of sovereign debt, by contrast to the corporate debt case, this generalization appears relevant because there is no applicable law determining seniority. Since by definition $V_j=p_jD_j$, in an ability-to-pay model it holds true that

(5) $p_pD_p+p_oD_o=V[D_o+D_p]$,

where the prices p_j are functions of both face values D_o and D_p.

Partially differentiating (5) with respect to D_p and D_o, and noticing that both derivatives of V[.] are equal, we obtain:

(6) $p_p-p_o = D_p(dp_p/dD_o - dp_p/dD_p) - D_o(dp_o/dD_p - dp_o/dD_o)$

Notice that the comparison of own-derivatives and cross-derivatives contain information on the implied price for official debt, relative to private debt, irrespective of the sharing rules. The intuition behind these relations is similar to the analysis of the three seniority cases conducted above. The implications, however, are not restricted to these three cases. Suppose more generally that the sharing arrangements between creditors are such that the resulting prices move together according to a function $p_o=s_o[p_p]$.[9] The three seniority cases can be accommodated under this assumption: $p_o=0$, $p_o=p_p$, and $p_o=1$. Other functions would reflect different sharing rules, not necessarily reflecting a seniority structure. In particular, it may correspond to an implicit agreement as to how the burden is going to be shared. The fact that identity (5) always holds severely restricts the set of admissible functional relationships between prices if those functions need to apply over the entire range of feasible prices, to the point that it is not clear whether any meaningful generalization beyond the three previous cases would be achieved. However, since only marginal changes are considered, it only needs to be assumed that this stable relationship holds in the relevant range of indebtedness, around the levels that have been actually observed during the crisis. Therefore, although still restricted, this provides a meaningful generalization.

Then $dp_o/dD_j=s_o'dp_p/dD_j$, where s_o' is the derivative of p_o with respect to p_p. Then:

(7) $p_p-p_o = c(dp_p/dD_o - dp_p/dD_p)$,

where $c=D_p+s_o'D_o>0$. Equations (5)-(7) can be generalized to an arbitrary number of official creditors, for example multilateral and bilateral. Let $s_m[.]$ and $s_b[.]$ be the corresponding price-sharing functions. In that case, two equations (7) would result, referring to the price gap of multilateral and bilateral debt respectively: $p_p-p_m = c(dp_p/dD_m - dp_p/dD_p)$ and $p_p-p_b = c(dp_p/dD_b - dp_p/dD_p)$, where $c=D_p+s_m'D_m+s_b'D_b$. The important thing to notice is that c is the same in both equations. This implies that the difference in prices is proportional to the difference in the derivatives of the price of private debt with respect to the corresponding debt stocks. Since the constant of proportionality c is the same for all classes of creditors, the estimated marginal change in the private price when the face value of debt of various creditors change can be used to rank their implied prices. Positive correlation of the price movements, as in the simple seniority cases analyzed, is a sufficient condition for c to be positive. Assuming more generally that the functions s[.] are arbitrary distribution functions, that is non-decreasing functions mapping into [0,1], $c>0$ and price gaps can be signed and ranked by looking at the derivative differential.

In order to arrive at an empirically estimable specification, assumptions on the sharing arrangements need to be made. Assume (without loss of generality in the context of ability-to-pay models as described above) that the value of private debt V_p is:

(8) $p_pD_p = wV[D_p] + (1-w)(V[D_o+D_p]-V[D_o])$,

where w is a weight which might depend on the face value of both debts. The value of official debt V_o is obtained by combining (5) and (8): $p_oD_o = (1-w)V[D_o] + w(V[D_o+D_p]-V[D_p])$. Arbitrary sharing rules can be generated by considering arbitrary weight functions w. Note that the three seniority cases described above are special cases of this formulation. Private seniority is obtained with $w=1$, official seniority is obtained with $w=0$, and equal seniority and sharing is obtained for an intermediate value $w=w^*$ which makes $p_p=p_o$.

The weight w^* is in general a function of both face values. Assuming that the increasing and concave value function $V[D]=AD^a$, $0<a<1$, it can be checked that w^* is a function of the share of

[9]All results go through if total debt D is also an argument of the function $s_o[.]$.

relative exposures $f=D_p/D_o$ only. An interesting family of multi-creditor value functions is one where the total value function $V[D]=AD^a$, $0<a<1$, and the weight w depends on relative exposure (w[f]), of which the seniority cases are special cases. Dividing (8) by D_p and manipulating we obtain:

(9) $p_p = Ah[f](D_p)^{a-1}$,

where h[f] is a function of relative exposure f (in the case of equal seniority, $h[f]=(1+1/f)^{a-1}$). In this specification, the secondary market price depends not only on the face value of private debt (a decreasing convex function, as implied by the concavity of the value function) but also on the share of private to official debt. To the extent that, ceteris paribus, additional official claims diminish the value of private claims and therefore their price, an increasing function h[f] can be expected.

All of the above can be generalized to the case of several creditors. In particular, if official creditors are classified into multilateral and bilateral, then equation (9) is generalized by considering $f_m=D_p/D_m$, $f_b=D_p/D_b$, and $h[f_m,f_b]$ (where the function h is expected to be increasing in both arguments). In section IV, a version of (9) is empirically estimated, where the constant A is modelled in terms of time and country-specific characteristics and h[.] is specified in a parametric way which provides a flexible approximation to arbitrary sharing rules, of which the cases studied under the seniority model are particular cases.

Generality and limitations of the model

To the extent that the assumption leading to equation (9), which holds for seniority sharing rules, is a reasonable approximation for the true sharing rule, the analysis in equation (9) applies. In this specification, while total value is a function of total face value, the recovery shares depend on relative exposure in some arbitrary way. By specifying the estimating equation under these assumptions, we are able to exploit the power of the single pool assumption, in the spirit of an ability-to-pay model, while retaining the flexibility of arbitrary sharing rules.

A particular difficulty in this problem which this approach solves is that if official creditors are not attempting to fully withdraw like private creditors, perhaps, but not necessarily, because their claims are not impaired, there is no strong connection between the financial value of official claims $V_o[t]$ and current financial flows with the countries. If it is assumed that official creditors are attempting to withdraw as much as they can given their institutional constraints, then the problem would be similar to the one for private creditors and relatively straightforward: the future recovery could be estimated based on the actual net transfers that official creditors have been willing and able to capture in the past. This is in essence what Berthelemy and Vourc'h (1990) do, where not surprisingly they show that the burden is being shared according to their net transfers-debt outstanding ratio and that, therefore, private creditors benefit at the expense of official creditors, particularly multilaterals. The premise that official debt is impaired and that official creditors are exerting maximum pressure to extract net transfers has no basis and needs to be substantiated, however. The above model attempts to examine this issue without making such unwarranted assumptions.

It should be kept in mind that official creditors may be willing to lend even if in so doing they incur financial losses. This model addresses these financial losses without making assumptions about the motivations behind the official debt strategy. Financial losses may simply indicate that there are overriding non-financial concerns, rather than junior status. <u>The value of official debt need not have any influence on the value of private debt</u> as long as official creditors are expected to be willing to lend, <u>for good or bad financial reasons</u>. This holds true even if official creditors are absolutely preferred, as long as they are not expected to be willing to exercise their power. A strong negative relation between the

values of different creditors' debt has been typically implied in the context of theoretical models assuming that there is a seniority structure. The need for the assumption that official creditors are expected to attempt to withdraw to maximize the recovery value of their claims in order to make valid inferences about their status of preferred creditor seems to have gone unnoticed. Evidence of a weak effect of official debt on the price of private debt may indicate that official creditors are not expected to withdraw when they should according to purely financial criteria, rather than that they are not preferred creditors. Nevertheless, the implications derived for the financial value of official claims remain valid irrespective of the motivations of their strategy as long as the market correctly anticipates such strategy.

Regarding limitations, this model makes assumptions that are justified in the case of corporate debt but may be restrictive in the case of sovereign debt. In the corporate case, the total value of the resources that the debtor has available for creditors (V) is equal to the value of the value of the firm and all creditors claim against this single collateral. Furthermore, the laws governing corporate bankruptcy determine that creditors share this single collateral according to a seniority structure: junior creditors receive payments only after senior creditors are fully paid, and creditors belonging to the same class share in proportion to exposure. In the sovereign debt case, however, there is no enforceable international law making the country's assets available to external creditors and determining a seniority structure among creditors. Why a country would pay and how much it can be extracted, both in total and in connection to each creditor, is not entirely clear but is certainly in the realm of bargaining theory. Whether the corporate debt model can be still justified is open to questions.

The model above assumes that creditors share a given present value of resources that the country can be expected to have available for them, in the sense that total value does not depend on the share composition of debt among creditors ($V=V[D]$). This assumption is akin to the single collateral of corporate debt. Even though in the sovereign debt case there is no sizeable collateral as such, this assumption may still be applicable. To the extent that sovereign debt service is fundamentally determined by the country's ability to pay somehow defined, which by definition is not dependent on who the creditors are, the assumption appears reasonable. If, alternatively, debt service is determined by the threat of sanctions that creditors have at their disposal, then the composition of debt among creditors may matter. However, when there is a pool of sanctions which are available to all creditors whose punitive effect does not depend on which creditor class applies them, which implies that once a creditor class applies a sanction the other classes cannot do additional harm by applying it, then, formally, the ability-to-pay model is still applicable. In this case the single collateral assumption is also justified: the level of resources for total debt service is determined through a bargaining process between creditors and the debtor country based on the penalties resulting from the application of the set of available sanctions, which act as an implicit collateral determining the total value of debt claims.

If, by contrast, specific sanctions are available only to a particular class of creditor, or, alternatively, sanctions available to all of them retain some effectiveness even if they are being exercised by other classes of creditors, then to some extent the value of debt of each creditor class is determined by its power to apply additional penalties which need not be shared with other creditors. In the extreme case where each creditor has available specific sanctions, not available to other creditors, then the value of debt of each creditor would depend only on its own face value of debt, rather than total face value. This would correspond to a corporate case where creditors have specific collaterals. In this extreme case, debt of official creditors would not have any impact on the price of private debt. While in an ability-to-pay model that would be an indication that the price of official debt is lower than the price of private debt (official debt would be junior in a seniority model), in this model of creditor-specific collaterals it would

provide no information to make any inference. Evidence of a weak effect of official debt on the price of private debt may indicate that the true model is one where creditor-specific collaterals are important, rather than that the implied price of official debt is low (that official debt is not senior, so to speak). The existence of creditor-specific collaterals would bias downwards the implied prices of official debt derived from "ability-to-pay" models.

While the single collateral assumption can be justified under a variety of circumstances in the sovereign debt case, the assumption of a seniority structure among creditors appears more difficult to justify. Since no enforceable international law applies, even in the context of an ability-to-pay model, and certainly in a model based on the threat of penalties that each creditor may apply, bargaining among creditors (perhaps over their shared power to exercise sanctions) would determine the applicable sharing rules. The assumption of seniority sharing rules would be very convenient for the purpose at hand because it leads to testable implications relating market price derivatives with respect to stocks of debt and implicit prices, but there is no reason to believe that actual sharing rules would mimic the outcome of seniority rules. In the model above, flexible sharing rules, which include seniority rules as particular cases, are allowed in order to approximate the actual sharing arrangements within a family of admissible sharing rules. We have been able to relax the assumption of seniority sharing rules while retaining our ability to make useful inferences by showing that its basic implications still hold if it is simply assumed that prices are directly functionally related in the relevant range. This more general assumption, however, is still restrictive and may rule out plausible sharing rules.

An additional issue is whether official creditors cooperate rather than being rivals. To the extent that in the last analysis the industrialized countries are the important decision agents in both cases, either directly or through their role as shareholders, the cooperation argument appears plausible. Still, it is not clear what the outcome of such cooperation would be. Bulow and Rogoff (1991) argue that bilateral creditors tend to bail out multilateral creditors from bad borrowers. If this were true, the depressing impact of multilateral debt on the price of private debt could be small because additional money from bilateral sources would be expected in the future to cover obligations with multilaterals. Therefore weak effects of multilateral debt would occur even though multilateral credit may not be impaired in any way. The existence of cooperative linkages between official creditors may lead to the derivation of wrong inferences from the above model in relation to the financial position of each individual official creditor class. In the context of models like the one above where total value only depends on total face value, and in particular, if the ability-to-pay assumption applies to official creditors, this particular interaction does not seem to add much to the determination of the total value of official claims. While it would affect the value of each individual official creditor, like IBRD, it can be argued that this is not the most interesting question. To the extent that industrialized countries view the problem in a comprehensive way, this problem would amount to an irrelevant accounting convention.

VI. EMPIRICAL EVIDENCE

In this section we seek to determine empirically, how the burden of the debt crisis was shared among different creditors. Contrary to the popular approach, we do not determine burden sharing by looking at net transfers provided by each class of creditors. Instead, we analyze how the price of private debt relates to the face value of official and private debt, and derive a ranking of implicit prices for different classes of debt. Finally, we discuss the implication of these results for creditor seniority and burden sharing.

We estimate the price of private debt within a valuation model that does not make any assumption about the seniority structure or sharing rules, as discussed in section III. Equation (10) is a parsimonious empirical counterpart of equation (9):

(10) $\log p_p = \log a - \alpha_0 \log libor + \alpha_1 \log D_p + \alpha_2 \log D_p/D_m + \alpha_3 \log D_p/D_b + e$

As specified in the valuation model, the equation includes face value of private debt and relative exposure of private creditors to multilateral and bilateral creditors. We also include a time trend and country dummy variables to capture other country and time specific factors not included in our theoretical model.[10] The last term e is the statistical error.

The model is estimated using annual data on 40 countries for the 1986-1989 time period. Table 2 reports the estimation results. It is interesting to note that only the private debt stock has a significant effect on the secondary market debt price. As expected, the private debt price significantly decreases with increases in private debt stocks. The estimated coefficients of multilateral or bilateral debt stock are of opposite sign: increases in bilateral debt stocks appear to decrease private debt price, whereas increases in multilateral debt stocks lead to its increase. Neither of them is significantly different from zero, however. As the F tests reported at the foot of Table 2 indicate, it is appropriate to enter debt stocks of different creditors separately into the regression. Their impacts are significantly different, especially for private and multilateral debt stocks. Finally, the discount rate libor develops a significant coefficient that is not significantly different from unity, as expected.

As explained in section III, the difference between the marginal impact of the face value of debt of different creditors on the price of private debt reveals the difference between the imputed prices of those claims. Because of the logarithmic specification of the estimated equation, to get the relevant derivatives, the log-derivatives reported in Table 2 are elasticities that need to be multiplied by their corresponding price to debt ratios for each country.

Table 3 reports the calculated derivative differences for each country in the sample. Dervative differences are reported for 1989 as well as average for the period 1986-89. The difference of the first two derivatives (dp_p/dD_p-dp_p/dD_b) is equal to the difference between bilateral debt price and private debt price (p_b-p_p) times a positive constant c. The difference of the second pair of derivatives (dp_p/dD_p-dp_p/dD_m) is equal to the difference between multilateral and private debt prices times c. Table 3 shows that there are only two cases observed in our sample. The most common one, which holds for 26 out of 40 countries is the case where both differences are negative, with the second one being greater in absolute value. This implies a price ranking with private price being the highest and multilateral price the lowest ($p_m < p_b < p_p$). The other case, which holds for 14 out of 40 countries is the one where the first difference is positive but the second is negative which implies that multilateral price is the lowest but bilateral price is the highest ($p_m < p_p < p_b$).

[10] In an earlier version of the paper we also experimented with other empirical specifications including standard variables in price equations, such as exports, gnp, net transfers, growth etc. However, since our central results do not change significantly, we prefer the parsimonious specification which remains within our theoretical model.

The breakdown of countries with respect to their different price rankings is given in Table 4. These rankings hold for the entire sample period, except for Turkey and Philippines which shift ranking in 1989. Our results indicate that although the ranking of private and bilateral debt prices is not the same across countries, multilateral debt price appears to be consistently the lowest for each country in the sample.

In the context of seniority sharing rules, these results imply the relative seniority ranking of creditors, with multilateral creditor being least senior, and private or bilateral creditors the more senior depending on the country. This result coupled with our burden sharing calculations of section IV indicates that burden of the debt crisis is shared disproportionately by official creditors, especially multilaterals.

VII. CONCLUSIONS

Burden sharing is essentially determined by the capital losses in the stock of debt of different creditors, which arise because the payments that creditors would be able to extract from debtors fall short of the face value of debt. While there is a market for private debt, official debt cannot be valued that way. Unless an implicit ranking of the prices of different debt classes is estimated, how the burden of the debt crisis was shared remains very much a simulation exercise and the results obtained are based on assumptions made about unobservable official debt prices.

This paper seeks to overcome this problem. First an appropriate concept and measure of burden sharing is defined, the analytical framework is laid down, and the historical evidence is examined. Second, a valuation model of private debt is estimated, without making any assumptions about the existence of a seniority structure. A ranking of implied prices is obtained from this estimation. Based on the definition of burden and estimated ranking of debt prices, it is possible to derive conclusions as to how the burden of the debt crisis was shared.

In what follows we highlight our main results and limitations of this analysis. Our calculations of the ex-post burden for the period 1982-1989 suggest two main results:

(i) The burden of the debt crisis was higher for official creditors than for private creditors (defined as equal ex-post loss rates) unless the implicit price of official debt is, on average, sufficiently higher than the price of private debt.

(ii) Among official creditors, the burden was higher for multilateral creditors than for bilateral creditors unless the implicit price of multilateral debt is, on average, sufficienctly higher than the implicit price of bilateral debt.

In addition, our empirical results indicate that:

(i) Multilateral or bilateral debt does not have a statistically significant effect on the price of private debt whereas private debt significantly decreases the private price.

(ii) Depending on the country, implied prices of private, bilateral, and multilateral debt can be ranked as $p_m < p_b < p_p$ or $p_m < p_p < p_b$.

These results, coupled with our calculations on the ex-post burden after 1982 referred above, would indicate that the burden of the debt crisis was not equally shared, with official creditors, and especially multilaterals carrying a disproportionate share of the burden.[11]

It may be tempting to conclude that the enforcement mechanisms available to multilateral creditors are less effective and that, in terms of seniority, they are junior to other creditors. This view is unwarranted, however. First, as emphasized throughout the paper, we need to remember that the burden sharing concept these results relate to is a purely financial one. Thus, a weak effect of official debt on the price of private debt may indicate that official creditors are not expected to withdraw because of non-financial objectives, rather than lack of powerful enforcement mechanisms at their disposal and weak creditor status. While we chose to apply the concept of financial burden because it is the only unambiguous method which allows comparisons, the performance of official creditors may have to be measured in a more comprehensive way. Second, if there is cooperation among official creditors such that bilateral creditors bail out the multilateral creditors (as argued by Bulow and Rogoff (1991), implied prices for bilateral and multilateral creditors may not reflect their creditor status. In this case the status of multilateral creditors may be lower and the status of bilateral creditors higher than what our estimates suggest. (Given the low implied status of multilateral creditors that was found, our results do not appear to support this official cooperation hypothesis on the surface.)

In connection with our burdensharing results, we should also underline the following two qualifications:

(i) Another interpretation of a weak effect of official debt on the price of private debt may be that the relevant model in sovereign debt is one of creditor-specific collaterals, rather than the unspecific, single collateral corporate debt model. If relevant, this qualification would unambiguously indicate that the implied prices of official debt are higher and possibly unity; it may explain why official debt fails to develop a significant coefficient in our estimation.

(ii) The inferences on implied prices are made under the assumption that sharing rules are such that implied prices are functionally related to market prices; if actual sharing rules deviate significantly from such case, effects of official debt on the price of private debt need not be closely related to the underlying implied prices. If relevant, this qualification would have an ambiguous effect dependent on the nature of the relevant sharing rule.

Finally, it should be noted that the previous caveats only apply to the inferences that can be drawn for the creditors' status and implied prices of official creditors. In other words, the caveats relate to the structural burden-sharing implications of the estimated model and the identification of the relevant structural parameters. From a non-structural point of view, the multi-creditor valuation model that was specified appears reasonably flexible and the estimated coefficients relating various determinants of market prices, including official debt stocks, appear robust. Therefore the estimated model appears to be a suitable reduced-form model for the determination of market prices, which improves upon previous work by explicitly considering non-private debt claims.

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[11] Since bilateral price is higher than private price for some countries, bilateral and private creditors may have shared the burden equally, or bilaterals may have carried less of the burden. The case for bilateral creditors is not as clear cut as the multilaterals since we only estimate the ranking, but not the actual prices.

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Table 1 Shares in Long-term Debt Outstanding and Disbursed (LDOD)

	LDOD 1982 (Percent)	LDOD 1989 (Percent)	Change in LDOD 1982-89 (Percent)	Adjusted (1) LDOD 1989 (Percent)	Change in Adjusted (1) LDOD 1982-89 (Percent)
SIMIC					
MULTILATERAL	7.53	12.78	21.87	14.23	54.5
BILATERAL	15.33	25.44	42.92	20.74	53.25
PRIVATE	77.14	61.78	35.21	65.03	-7.75
NON-SIMIC					
MULTILATERAL	17.94	24.45	31.52	25.69	39.19
BILATERAL	32.47	31.39	30.21	29.01	23
PRIVATE	49.59	44.17	38.27	45.29	37.81
ALL					
MULTILATERAL	12.34	18.74	27.44	20.38	43.05
BILATERAL	23.25	28.48	35.58	25.18	30.63
PRIVATE	64.42	52.78	36.98	54.44	26.32

Source: World Debt Tables

(1) LDOD adjusted for valuation changes

Table 2. The Price of Private Debt and Official Creditors

Independent Variables	Coefficient Estimates	Standard Error	T Values
libor	0.879	1.800	0.49
D_p	-0.788*	0.386	-2.04
D_p/D_m	-0.078	0.207	-0.38
D_p/D_b	0.374	0.310	1.21
R^2	0.97		
F	68.25**		
# of obs.	126		
p: $dlog(p_p)/dlog(D_p)$	-0.49*		
b: $dlog(p_p)/dlog(D_b)$	-0.37		
m: $dlog(p_p)/dlog(D_m)$	0.07		
$F_{p=b=m}$	1.88#		
$F_{b=m}$	1.20		
$F_{p=m}$	3.58*		
$F_{p=b}$	0.08		

Dependent variable is the secondary market price of private debt (p_p). Log transformations of all variables are taken. Not reported are the time trend and country dummy variables. **, *, and # indicate significance levels of 1, 5 and 15 percent, respectively. p, b, and m stand for derivatives of log price with respect to log private, bilateral, and multilateral debt. F statistics testing for equality of these derivatives are reported at the foot of the table. The data set covers 1986-89 time period and includes 40 countries. Variable definitions and sources are given in the Appendix.

Table 3. The Difference in the Derivatives of the Price of Private Debt with Respect to Private Multilateral and Bilateral Debt Stocks.

Country	Year	dp_p/dD_p-dp_p/dD_b	dp_p/dD_p-dp_p/dD_m
Algeria	86-89 89	-.0000116 -.0000163	-.000106 -.000097
Argentina	86-89 89	.0000166 .0000058	-.000010 -.0000037
Bolivia	86-89 89	-.0000322 -.0000653	-.000056 -.000095
Brazil	86-89 89	.0000076 .0000033	-.000006 -.000003
Chile	86-89 89	.000150 .000123	-.000039 -.000044
Cote D'ivoire	86-89 89	.0000225 .0000036	-.000043 -.000007
Cameroon	86-89 89	-.0003209 -.0003439	-.000493 -.000481
Congo	86-89 89	-.0000489 -.0000510	-.000107 -.000103
Colombia	86-89 89	.0000238 .0000214	-.000067 -.000063
Costa Rica	86-89 89	.0000262 .0000186	-.000068 -.000061
Dominican Republic	86-89 89	-.0000893 -.0000534	-.000174 -.000097
Ecuador	86-89 89	.0000382 .0000115	-.000043 -.000019
Egypt	86-89 89	-.0001330 -.0001287	-.000143 -.000138
Gabon	86-89 89	-.0013275 -.0009567	-.001794 -.001220
Guatemala	86-89 89	-.0001829 -.0003656	-.000586 -.000741

Honduras	86-89 89	-.0001873 -.0001900	-.000311 -.000277
Hungary	86-89 89	.0002105 .0003923	-.000107 -.000084
Jamaica	86-89 89	-.0004076 -.0004805	-.000511 -.000580
Liberia	86-89 89	-.0001317 -.0001136	-.000192 -.000164
Morocco	86-89 89	-.0000642 -.0000437	-.000093 -.000063
Mexico	86-89 89	.0000275 .0000179	-.000006 -.000005
Mozambique	86-89 89	-.0000723 -.0000697	-.000098 -.000090
Malawi	86-89 89	-.0070890 -.0046302	-.007982 -.005239
Nigeria	86-89 89	-.0000169 -.0000165	-.000032 -.000029
Nicaragua	86-89 89	-.0000104 -.0000046	-.000016 -.000006
Panama	86-89 89	.0002307 .0000914	-.000107 -.000041
Peru	86-89 89	-.0000026 -.0000017	-.000012 -.000007
Philippines	86-89 89	.0000050 -.0000023	-.000032 -.000031
Poland	86-89 89	-.0000121 -.0000070	-.000049 -.000036
Sudan	86-89 89	-.0000071 -.0000028	-.000011 -.000004
Senegal	86-89 89	-.0017147 -.0019513	-.001855 -.002044
Sierra Leone	86-89 89	-.0023494 -.0023479	-.002486 -.002484
Turkey	86-89 89	-.0000032 .0000097	-.000049 -.000038

Tanzania	86-89 89	-.0008376 -.0009948	-.000875 -.001029
Uganda	86-89 89	-.0019542 -.0021220	-.002160 -.002313
Uruguay	86-89 89	.0018891 .0018708	-.000197 -.000162
Venezuela	86-89 89	.0001494 .0000755	-.000139 -.000049
Yugoslavia	86-89 89	.0000353 .0000244	-.000037 -.000036
Zaire	86-89 89	-.0001555 -.0001381	-.000184 -.000160
Zimbabwe	86-89 89	-.0013263 -.0013705	-.001364 -.001411

Variable definitions and sources are given in the Appendix. In calculating average derivative differences, the $dlog(p_p)/dlog(D_x)$ figures reported at the foot of Table 2 are multiplied by p_p/x where p_p is the mean private price and x is the corresponding mean private, multilateral, or bilateral debt figure for the period 86-89. The 1989 derivative differences are obtained in the same way, however instead of multiplying by means, 1989 figures are used.

Table 4. Ranking of Private, Bilateral, and Multilateral Debt Prices

$p_m < p_b < p_p$	$p_m < p_p < p_b$
Algeria	Argentina
Bolivia	Brazil
Cameroon	Chile
Congo	Cote D'ivoire
Dominican Republic	Colombia
Egypt	Costa Rica
Gabon	Ecuador
Guatemala	Hungary
Honduras	Mexico
Jamaica	Panama
Liberia	Philippines*
Morocco	Uruguay
Mozambique	Venezuela
Malawi	Yugoslavia
Nigeria	
Nicaragua	
Peru	
Poland	
Sudan	
Senegal	
Sierra Leon	
Turkey*	
Tanzania	
Uganda	
Zaire	
Zimbabwe	

* Price ranking switches to the other one in 1989. The calculated derivative differences for each country are given in Table 3.

Appendix

Variable Definitions and Sources.

P_p	Secondary market price for private debt. Average of year-end bid and offer prices. Salomon Brothers and Euroweek.
D_p	Long term private debt including private nonguaranteed debt, bonds, and commercial bank debt. World Debt Tables.
D_b	Long term bilateral debt including suppliers credits. World Debt Tables.
D_m	All multilateral debt, concessional and nonconcessional. World Debt Tables.
libor	Six-month Libor rate. IMF International Financial Statistics.

Figure 1a NET TRANSFERS AS SHARE OF LDOD
SIMICS

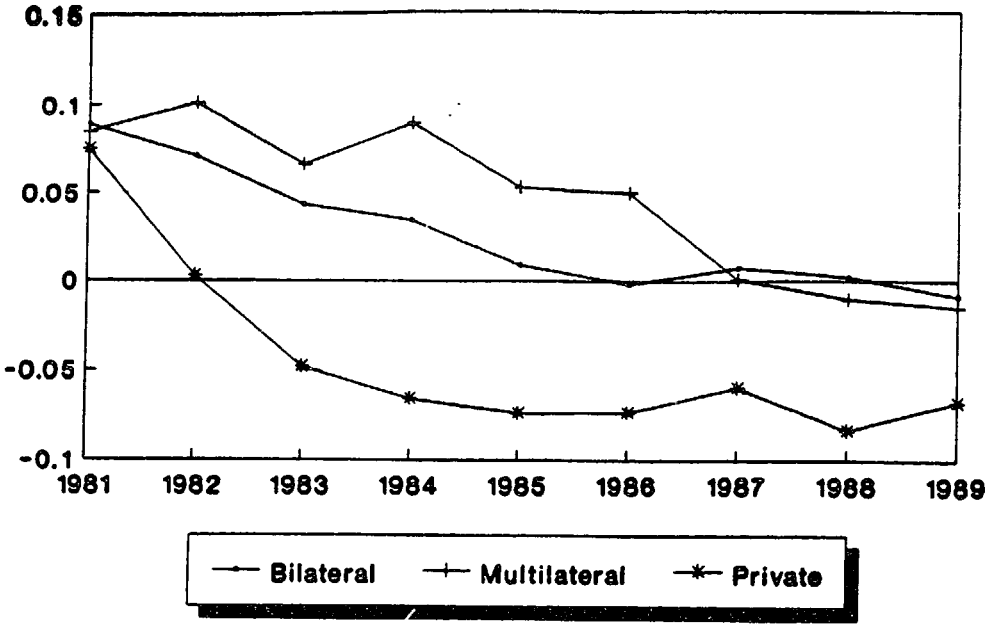


Figure 2a

ACCUMULATED ARREARS FOR SIMICS

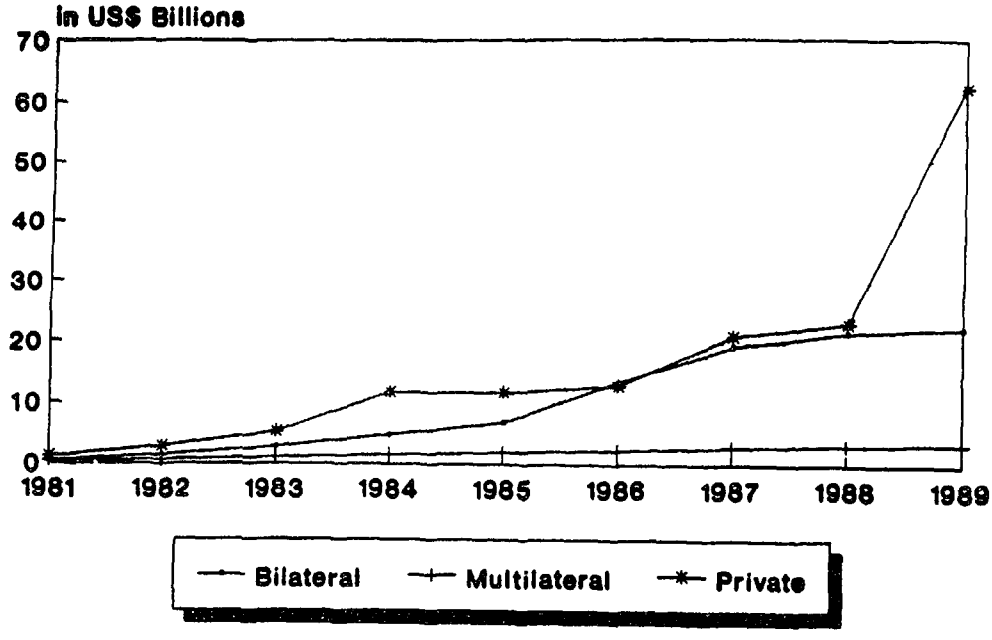


Figure 1b NET TRANSFERS AS SHARE OF LDOD
NON-SIMICS

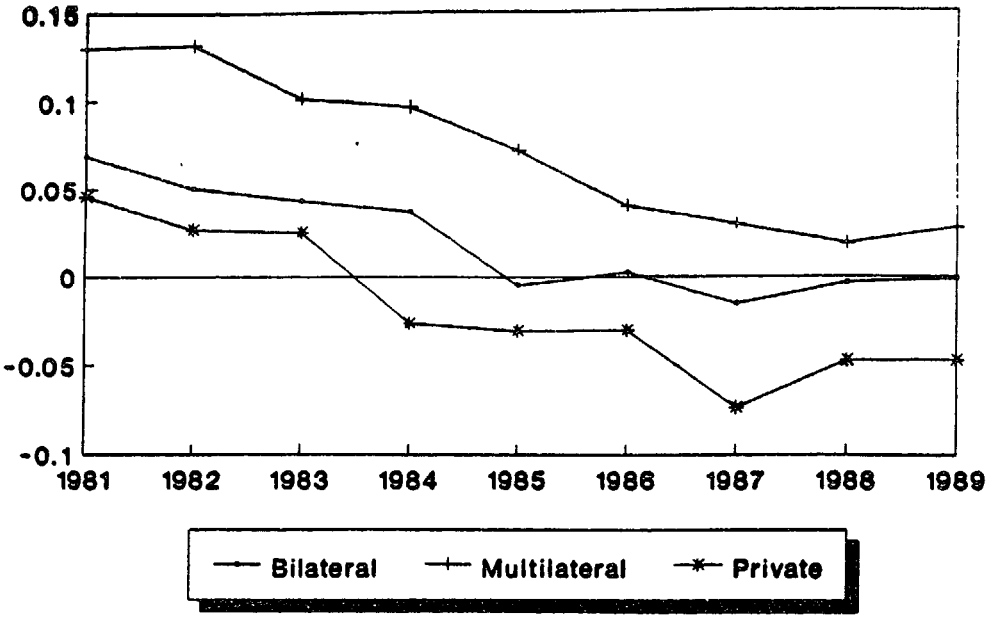


Figure 2b

ACCUMULATED ARREARS FOR NON-SIMICS

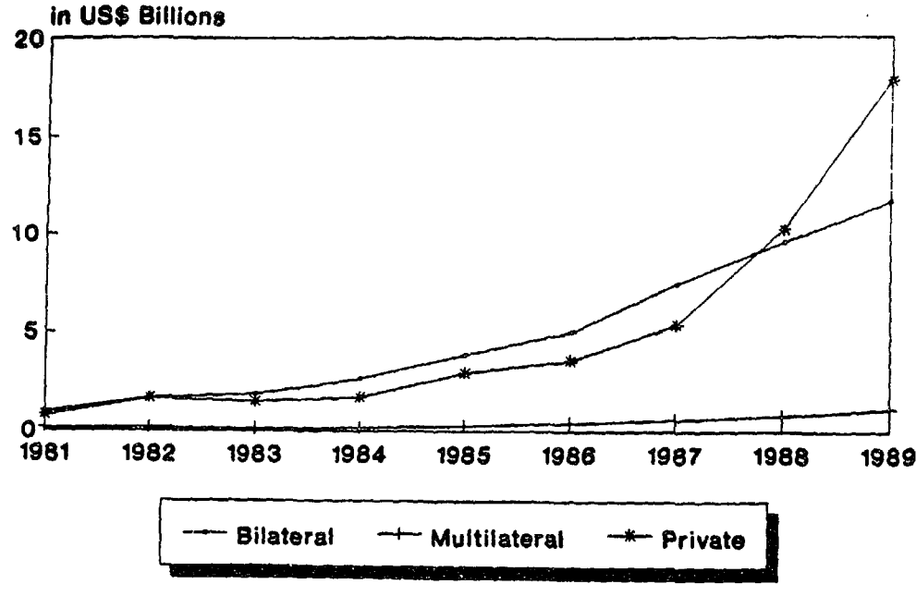
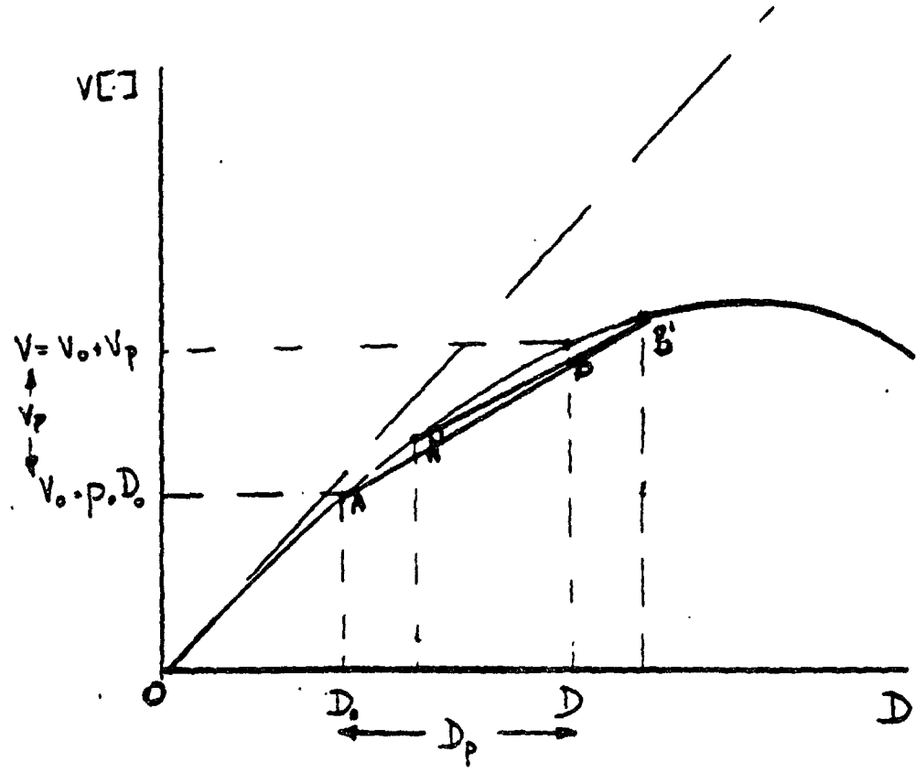


FIGURE 3. DEBT VALUE FUNCTION.



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