ECONOMIC RESEARCH REPORTS

"BURDEN SHARING" IN SOVEREIGN DEBT REDUCTION

BY

Mark M. Spiegel

RR # 92-41 September, 1992

C. V. STARR CENTER FOR APPLIED ECONOMICS

NEW YORK UNIVERSITY
FACULTY OF ARTS AND SCIENCE
DEPARTMENT OF ECONOMICS
WASHINGTON SQUARE
NEW YORK, N.Y. 10003

"BURDEN SHARING" IN SOVEREIGN DEBT REDUCTION

Mark M. Spiegel*

Department of Economics

New York University

September 4, 1992

ABSTRACT

We examine a concerted debt reduction deal between a sovereign debtor, a private creditor, and an official creditor, who insures the deposits of the commercial bank. The results show that a weakening of the financial position of the commercial bank reduces the contribution of the commercial bank to the debt reduction program, while increasing those of the official creditor. However, the net terms faced by the debtor nation are independent of the strength of the commercial bank. This result is robust to changes in the assumed seniority of official and private debt.

Our results also suggest that standard interpretations of the degree of "burden sharing" between official and private creditors may underestimate the contribution of the private creditor and overestimate that of the official creditor. We show that a debt reduction program which leaves both creditor values unchanged will typically have commercial banks retiring debt at "unfairly" high prices, and contain a net contribution by the official creditor.

JEL Classification No.: F34

Send Correspondence to:

Mark M. Spiegel
Department of Economics
New York University
269 Mercer St. #306
New York, NY, 10003

(212)-998-8903

*Technical assistance from the C.V. Starr Center for Applied Economics is gratefully acknowledged.

I. Introduction

The recent debt-reduction literature has allocated much time to the question of debt reduction financed by debtor country governments. However, the debt reduction deals which have taken place under the auspices of the Brady Plan have all included official financing as part of the package. Roughly three-fourths of the enhancements which have been generated in the context of the five major debt reduction deals considered by Claessens et. al. (1992), were accounted for by official financing.

When official participation has been considered, the literature has tended to concentrate on the relative contributions made by commercial creditors and their official counterparts in the context of a debt reduction program and the relative seniority of official and commercial debt,[1] or differences in lending patterns between official and private creditors [Demirguc-Kunt and Detragiache (1991)]. Two exceptions are Bulow and Rogoff (1988) and Diwan and Rodrik (1991). Diwan and Rodrik argue that multilateral agencies possess a comparative advantage in enforcing conditionality and so play a Pareto-improving role by supplanting exposed commercial banks in a debt reduction program. Bulow and Rogoff (1988) develop a model in which creditor country governments can be induced to make side payments in order to avoid invoking mutually costly trade sanctions.

In this paper, I consider an alternative potential incentive for official creditors to contribute to debt reduction. Creditor countries typically maintain insurance of the deposits of their commercial banks, which have outstanding loans to the debtor countries. In the event of bankruptcy by the commercial bank, their deposit insurance liability will be directly

---

[1]For example, see Demirguc-Kunt and Fernandez-Arias (1992), Dooley, et al (1992), and Bulow, Rogoff and Bevilaqua (1992).

affected by the value of these claims.

Below, I introduce a model with three agents, a sovereign debtor, a commercial bank, and an "official creditor" who extends official loans to the debtor nation and provides deposit insurance to the commercial bank.[2] In the context of this framework, I examine the terms resulting from a debt reduction program coordinated by the debtor nation under the assumption that the program must be "voluntary," i.e. that all agents must be left whole at the end of the program. This allows the debtor nation to obtain all the rents generated by the program. While this assumption is highly simplifying, it in no way drives the results below.

The results show that the financial strength of the commercial bank can affect the relative contributions of both creditors to the debt reduction deal, but not the net terms faced by the debtor. Perhaps the most significant development since the beginning of the Brady Plan has been the relative improvement of commercial bank balance sheets, and the provision by many major exposed commercial banks for LDC loan losses. The implications of these changes on the characteristics of debt-reduction deals are therefore issues of policy concern.

The results concerning the relative contributions are driven by the implications of limited liability by commercial banks and the existence of deposit insurance. A commercial bank in a "weak" financial position places relatively less weight on bad states of the world, in which it is likely to be

---

[2] I combine the creditor country government together with the multilateral agency into a single "official creditor" to allow for a simple contrast of official and private incentives. While this is clearly an oversimplification, Bulow, Rogoff and Bevilaqua (1992) have argued that it is a mistake to think of multilateral and bilateral official creditors as totally separate agents.

bankrupt anyway. Consequently, it values retained exposure to the debtor nation at a value which exceeds the "fair price," of the claim or the discounted expected stream of payments from the debtor across all states. Moreover, this disparity increases as the bank's financial position deteriorates.[3] Similarly, the terms of the official creditor are also affected by the strength of the commercial bank. The official creditor receives any gains that accrue from the debt reduction program to the value of commercial bank claims under bankruptcy. Since bankruptcy states are more prevalent the weaker is the commercial bank, official creditor contribution to the program increases when the financial position of the commercial bank deteriorates.

We show below that these two effects exactly cancel each other out. While the strength of the commercial bank affects the relative contributions of commercial and official creditors to the debt reduction program, it has no impact on the net terms faced by the debtor. Essentially, this neutrality result stems from the fact that leaving both commercial and official agents "whole" in a debt reduction program implies considering the value of commercial bank claims in all states, not just those in which the commercial bank is solvent.

This result also suggests that standard interpretations of the degree of "burden sharing" between official and private creditors may underestimate the contribution of the private creditor and overestimate that of the official creditor when bank failure is not unlikely. We show that a debt reduction program which leaves both creditor values unchanged will

---

[3]Note that this mechanism is distinct from those [Diwan and Spiegel (1992)] which stress the loss of valuable leverage rights under deposit insurance as the reason that weak banks are more willing to extend new money. In this paper, I assume that all loans are marked to market, avoiding this effect.

typically have commercial banks retiring debt at "unfairly" high prices, and contain a net contribution by the official creditor. Indeed, we show below that only in deals where the official creditor appears to be a net contributor to the program can debt reduction be achieved at a fair price.

II. Debtor Behavior

Consider a debtor nation with a representative commercial creditor from a developed nation whose government is assumed to have official loan exposure to the debtor as well. All agents are assumed to be risk neutral. I use an extensive form similar to that in Bulow and Rogoff (1991). Define D as the total nominal debt burden of the debtor. Without loss of generality, I assume for simplicity that both sovereign debt and bank deposits earn zero interest. Initially, the debtor is assumed to have an outstanding nominal debt burden composed of official lending, D^O, and commercial obligations, D^C: $D=D^O+D^C$. The share of commercial debt in total exposure to the debtor country is defined as ν, where $\nu=D^C/(D^C+D^O)$. The commercial bank begins with a set of assets A in addition to its exposure to the debtor country, as well as a set of liabilities, L, which are assumed to be insured deposits. The debtor nation is assumed to have an initial endowment of W.

The model has three stages. In the first stage, the debtor chooses the amount of reserves that it wishes to allocate towards debt reduction, R, determining the "new money" contribution of both the official and commercial creditors, N^O and N^C respectively, as shown below, as well as the total amount of commercial debt reduction, X, and the repurchase price, p^b. In the second stage, the country allocates its remaining resources, $W-R$, between consumption, C, and investment, I.[4] In the third stage, a stochastic

---

[4]Note that I am implicitly assuming that all new money contributions are

productivity parameter, θ, determines gross income, $\tilde{Y}$. The country makes its debt service payments, $\tilde{D}=\tilde{D}^C+\tilde{D}^O$, to commercial and official creditors respectively, and consumes the remainder, $\tilde{Y}-\tilde{D}$.

If the debtor defaults, I assume that creditors seize a share π of the output of the nation, as in Bulow and Rogoff (1991). I initially assume equal seniority. The extension to unequal seniority is considered below. The commercial creditor then receives his share of total exposure, ν', where $\nu'=(D^C+N^C-X)/(D^C+D^O+N^C+N^O-X)$, times the total value of seized assets. Similarly, the official creditor receives $(1-\nu')$ times the total value of seized assets. The commercial bank is in failure if its assets fall short of its liabilities. If the commercial bank has failed, the creditor country government pays off insured deposits not covered by the scrap value of commercial bank assets.

Let the debtor nation's production technology satisfy:

(1) $$\tilde{Y} = C + \theta g(I)$$

where θ is a stochastic productivity shock parameter distributed uniform on the unit interval $[0,1]$, and $g_I>0$, $g_{II}<0$. Moreover, I assume that $\partial E(\tilde{Y})/\partial I>0$, so that in the absence of the possibility of seizure, all wealth would be invested. The payment to creditors satisfies:

(2) $$\tilde{D} = min\ (\pi\tilde{Y},D)$$

The expected value of $\tilde{D}$ can be written:

(3) $$E(\tilde{D}) = (1-\bar{\theta})D + \bar{\theta}\pi E(\tilde{Y}|\theta<\bar{\theta})$$

where $\bar{\theta}$ represents both the probability of default and the minimum realization of θ at which the debtor completely services her outstanding debts, i.e. where

---

allocated directly to debt reduction. This appears to be consistent with actual practice, since no real flows from North to South actually take place in this operation [see Dooley (1989)].

$\pi\tilde{Y}=D$, and $E(\tilde{Y}|\theta<\bar{\theta})$ represents the expected value of debtor output in default states. $\bar{\theta}$ satisfies:

(4) $$\bar{\theta} = [(D/\pi) - C]/g(I).$$

Subsequent to the debt reduction program, the debtor allocates her remaining wealth, $W-R$ between C and I to solve:

(5) $$\max_{I} E[\tilde{Y} - \tilde{D}]$$

subject to (1), (3), (4) and:

(6) $$C + I \leq W - R$$

and $C, I \geq 0$.[5]

In the appendix, we derive the investment solution of the debtor and show that I^* is decreasing in the remaining debt burden, D, increasing in the initial endowment, W, and decreasing in the debtor's expenditure on the debt reduction program, R. In addition, the debt reduction program increases investment when $\partial I/\partial D<0$.

III. Commercial Bank Behavior.

To keep the model simple, I assume the commercial bank will agree to any debt reduction agreement which leaves it as well off as it was under the "status quo." In addition, I initially assume that official and commercial debt have equal seniority. Assuming limited liability, the expected value of

---

[5]An additional parameter restriction is implied by the claim that expected debt service is increasing in investment, since creditors are only concerned with the payoffs to investment in the "poor" states of the world where default takes place. The necessary condition is shown in the appendix. Essentially, the condition can be violated if default by the debtor is extremely unlikely, which is not the case of interest for most highly indebted countries.

the bank prior to the debt reduction program is equal to:

$$V^C = (1-\hat{\theta})(A - L) + [(1-\bar{\theta}) + (\bar{\theta}-\hat{\theta})\pi E(\tilde{Y}|\bar{\theta}\geq\theta\geq\hat{\theta})/D]D^C \tag{7}$$

where $\hat{\theta}$ represents the minimum value of θ for which the bank is solvent, which satisfies:

$$\hat{\theta} = (L - A - \nu\pi C)/\nu\pi g(I). \tag{8}$$

Define p^C as the bank's value of the cash equivalent of holding a dollar of sovereign debt to maturity. p^C satisfies:

$$p^C = [(1-\bar{\theta}) + (\bar{\theta}-\hat{\theta})\pi E(\tilde{Y}|\bar{\theta}\geq\theta\geq\hat{\theta})/D] \;/\; (1-\hat{\theta}). \tag{9}$$

Note that p^C is an increasing function of $\hat{\theta}$, the probability of bankruptcy of the bank. This stems from the fact that banks have limited liability. When the bank is weak, it is more likely to be in bankruptcy in states where the debtor defaults, and hence it ignores the payoffs in those states. The value of the bank can then be specified more simply as:

$$V^C = (1-\hat{\theta})[(A - L) + p^C D^C]. \tag{10}$$

I define the debt reduction program as calling for "new money" extensions, N^C and N^O, by both the commercial and the official creditors respectively. In addition, nominal commercial debt of magnitude X is repurchased at price p^b.[6] The program is assumed to be "voluntary" in the sense that both the commercial and the official creditor must be at least as well off as under the status quo, but "concerted" in the sense that the bank

---

[6]One could obviously find a buyback price which would achieve the same level of nominal debt reduction without a placing new money requirement on the commercial bank. I include new money because many actual instruments used in debt reduction packages combine some amount of exit and some amount of retained exposure.

must participate in the agreed magnitude of debt reduction and new money extension at the agreed terms. Let post-debt reduction parameters be designated by primes. Under the assumption that participation in the debt reduction program is voluntary, $V^{C\prime}$ must be greater than or equal to V^{C}.

Subsequent to the debt reduction program, the value of the commercial bank will be equal to:

$$V^{C\prime} = (1-\hat{\theta}')[A - L - N^{C} + p^{b}X + p^{C\prime}(D^{C} + N^{C} - X)]. \tag{11}$$

By equations (10) and (11), the constraint that the commercial creditor voluntarily participates in the debt reduction program, $V^{C} \leq V^{C\prime}$, corresponds to:

$$(1 - \hat{\theta}')(p^{C\prime} - 1)N^{C} + (1 - \hat{\theta}')(p^{b} - p^{C\prime})X + \left[(1 - \hat{\theta}')p^{C\prime} - (1 - \hat{\theta})p^{C}\right]D^{C} + (\hat{\theta} - \hat{\theta}')(A - L) \geq 0. \tag{12}$$

The first term in (12) is negative, corresponding to the capital loss experienced by banks on new money extensions. The second term may be either positive, negative or zero. It refers to the capital gain or loss experienced by the bank from the sale of X dollars of commercial debt relative to holding onto the debt. If the term is negative, then the deal must be concerted, since the bank would not want to sell at the exit price voluntarily.[7] The third term refers to the capital gain experienced by banks on the value of their outstanding debt. Finally, the fourth term is the second-order effect that the impact of the deal on the probability of bankruptcy by the bank affects the bank's valuation of its other assets and liabilities due to limited liability.

---

[7] An example is the Costa Rican deal, where banks were required to sell a minimum of their claims at an agreed-upon price.

Consider the impact of weakening the commercial bank by increasing the liability position of the bank while holding all else equal. Differentiating the first term in (12) with respect to L yields:

$$(13) \qquad \left[- \frac{\partial \hat{\theta}'}{\partial L}(p^{C'} - 1) + (1 - \hat{\theta}')\frac{\partial p^{C'}}{\partial L} \right] N^C > 0.$$

(13) demonstrates that increasing L decreases the expected loss from new money extension. This loss is lower when the commercial bank is weaker because the commercial bank is likely to be bankrupt in many states in which the debtor defaults anyway. As a result, the weaker commercial bank weighs more heavily those states in which default does not occur, and hence expects a smaller loss. It follows that holding all else constant, the weaker is the commercial bank's asset portfolio, the larger is the magnitude of new money extension it can be called upon to provide.

On the other hand, the same logic implies the opposite result for the capital loss on debt reduction. Assuming that $p^b \leq p^{C'}$, differentiating the second term in (12) with respect to L yields:

$$(14) \qquad \left[- \frac{\partial \hat{\theta}'}{\partial L}(p^{C'} - 1) + (1 - \hat{\theta}')\frac{\partial p^{C'}}{\partial L} \right] X < 0.$$

From (14), one can see that as the bank gets weaker, the capital loss it would experience from the sale of debt becomes greater.[8] As a result, the terms under which the bank exits are likely to be more restrictive the weaker is the bank. The logic behind this result is identical to that above: Since the bank discounts poor states when it is weak, it is likely to place higher value on retained exposure. Given the exit price, the loss from exit is increasing in the weakness of the bank.

---

[8] If $p^b > p^{C'}$, the first term in (14) would be positive. However, the net effect would still be negative.

Given that as the bank becomes weaker it is willing to extend larger quantities of new money, but requires a higher buyback price for retiring debt, the net impact of a deterioration in the position of the commercial bank on the terms of debt reduction faced by the debtor are unclear. To resolve this issue, recall that all new money is assumed to be used to repurchase commercial debt. We therefore have the following relationship:

$$N^C = p^b X - N^O - R. \tag{15}$$

Substituting (15) into (12) yields the following comparative static relationship between L and X, holding all else constant:

$$\frac{\partial X}{\partial L} = - \frac{\frac{\partial p^{C\prime}}{\partial L}\left[(N^C - X) + (p^b - 1)\right] - (\hat{\theta} - \hat{\theta}')}{\frac{\partial p^{C\prime}}{\partial X}(N^C - X) + p^{C\prime}(p^b - 1)} \quad . \tag{16}$$

The negative sign of the numerator in (16) is driven by the impact of weakening the commercial bank on its valuation of debt claims. The denominator, which represents $\partial V^{C\prime}/\partial X$, could be positive because the first term is positive. This represents the well-known "debt-relief Laffer curve" possibility [For example, see Froot (1989)]. However, in addition to the fact that the empirical evidence has suggested that the investment disincentive is insufficient to suggest that any of the HIC's are on the wrong side of the Laffer curve, we can rule out the possibility that this term is positive in equilibrium, because it would imply that there was a larger magnitude of debt reduction which would satisfy (12). This larger magnitude would be preferred by the debtor nation and equally desirable to the commercial creditor. Consequently, we conclude that the denominator of (16) is negative, implying that the entire term will be negative.

IV. Official Creditor Behavior

I assume that the creditor country government only participates in

debt reductions which are expected to be revenue neutral. The official creditor faces two forms of exposure relevant to the debtor nation: First, it has outstanding loans in the form of outstanding official debt, D^O. Second, it has an expected liability to insured depositors in the event of bankruptcy by the commercial bank. Subsequent to the realization of θ, the obligation of the creditor country government to insured depositors, Ω, is equal to:

$$\Omega \equiv max\ [0, L-(A+\nu\tilde{D}^C)]. \tag{17}$$

Let the sum of these two forms of exposure equal G. Prior to the debt reduction program, G satisfies:

$$G = E(\tilde{D}^O) - E(\Omega) \tag{18}$$

where:

$$E(\tilde{D}^O) = [(1-\bar{\theta}) + \bar{\theta}\pi[E(\tilde{Y}|\theta\leq\bar{\theta})/D]D^O \tag{19}$$

and:

$$E(\Omega) = \hat{\theta}[L - A - \pi\nu E(\tilde{Y}|\theta\leq\hat{\theta})]. \tag{20}$$

Participation in the debt-reduction program by the official creditor consists of a new-money extension, N^O. Subsequent to the debt-reduction program, G' will satisfy:

$$G' = E'(\tilde{D}^O) - E'(\Omega) - N^O \tag{21}$$

where:

$$E'(\tilde{D}^O) = \left[(1-\bar{\theta}') + \bar{\theta}'[\pi E'(\tilde{Y}|\theta\leq\bar{\theta})/D']\right](D^O+N^O) \tag{22}$$

and:

$$E'(\Omega) = \hat{\theta}'[L - A - p^b X + N^C - \pi\nu' E'(\tilde{Y}|\theta\leq\hat{\theta}')]. \tag{23}$$

The restriction that $G\leq G'$, implies that:

$$\Lambda = [E'(\tilde{D}^O) - E(\tilde{D}^O)] - [E'(\Omega) - E(\Omega)] - N^O \geq 0. \tag{24}$$

Equation (24) states that the new money contribution of the official creditor must be less than the difference between the increase in the expected amount of revenue from outstanding official exposure, and the increase in the expected deposit insurance liability.

Differentiating (24) with respect to N^O yields:

$$(25) \qquad \partial\Lambda/\partial N^O = [(1-\bar{\theta}') + \bar{\theta}'\pi[E'(\tilde{Y}|\theta\leq\bar{\theta})/D' - 1]$$

$$+ (\partial[E'(\tilde{Y}|\theta\leq\bar{\theta})/\partial N^O)\bar{\theta}'\pi(D^O+N^O)/D'$$

$$+ \hat{\theta}'\pi\nu'(\partial[E'(\tilde{Y}|\theta\leq\hat{\theta})/\partial N^O).$$

The first term of (25) is negative, representing the capital loss on new money extension by the official creditor. However, the second and third terms are positive, representing the positive impact that new money extension has on the returns to outstanding official and private debt respectively. For positive levels of official new money extension to be rational, the entire expression must be positive in some range. However, since we will assume that the debtor calls for as much new money extension as she can obtain, the term must be negative in equilibrium.

Assuming that the condition in equation (24) is binding, we obtain the following comparative static result:

$$(26) \qquad \frac{\partial N^O}{\partial L} = -\frac{(\hat{\theta}-\hat{\theta}') + (\partial\hat{\theta}/\partial L)\pi\nu'[\partial E'(\tilde{Y}|\theta\leq\hat{\theta})]}{\partial\Lambda/\partial N^O} > 0.$$

(26) shows that the official creditor incorporates its deposit insurance liability when determining the magnitude of new money it is willing to extend. When the commercial bank is relatively weak, new money extensions by the official creditor have a larger impact on its expected deposit insurance liability. Consequently, its contribution is larger.

V. Equilibrium Debt Reduction Deals.

We define the "terms of debt reduction" as the magnitude of debt reduction, $X-N^C-N^O$, which can be obtained for a given debtor contribution, R. Given the constraint that $V^{C\prime}\geq V^C$ and that $G'\geq G$, it follows that an equilibrium deal must satisfy $V^{C\prime}+G'\geq V^C+G$. By equations (12), (15) and (24), this implies:

$$R + (1-\tilde{\theta}')(D^O+D^C+ N^O + N^C - X) + \tilde{\theta}'[\pi E'(\tilde{Y}|\theta\leq\tilde{\theta}')] \tag{27}$$

$$\geq (1-\tilde{\theta})(D^O+D^C) + \tilde{\theta}[\pi E(\tilde{Y}|\theta\leq\tilde{\theta})].$$

Assuming that (27) is binding, and solving for $(X-N^C-N^O)$, yields:

$$X-N^O-N^C = \frac{R + (\bar{\theta}-\bar{\theta}')(D^O+D^C) + [\bar{\theta}'\pi E'(\tilde{Y}|\theta\leq\bar{\theta}') - \bar{\theta}\pi E(\tilde{Y}|\theta\leq\bar{\theta})]}{(1-\bar{\theta}')} \tag{28}$$

Two important results are apparent from (28): First, the financial position of the commercial bank plays no role in determining the cost of debt reduction faced by the debtor nation. The reason for this is that a change in the financial position of the debtor nation only affects the distribution of assets and liabilities between the commercial bank and the official creditor, rather than their total values. In particular, the value of the balance sheet of the commercial bank is incorporated into the value of the commercial bank in states where it is solvent, and into the value of the official creditor in states where the commercial bank is in bankruptcy. Changing the distribution of these states moves assets from one agent to another, but the total value of the claims on the debtor is unchanged.

Second, it can be seen that the terms of debt reduction are "fair," in the sense that both commercial and official creditors are left as well off as they were prior to the debt reduction program, only when official creditors are included in the transaction. Dealing solely with the commercial creditors, even in a concerted deal, would preclude recovering the decrease in the deposit insurance liability associated with improving the financial position

of the commercial bank. This may explain why official creditors are commonly participants in the debt reduction programs, and in particular appear to be net contributors to the program.

Finally, it is trivial to show that these results above are robust to removing the assumption of equal seniority between official and private debt. Consider the case where commercial debt has full seniority, and define $\bar{\theta}^C$ as the value of θ at which commercial debt is fully serviced. The value of the commercial bank would then equal:[9]

$$V^C = (1-\hat{\theta})(A - L) + [(1-\bar{\theta}^C)D^C + (\bar{\theta}^C-\hat{\theta})\pi E(\tilde{Y}|\bar{\theta}\geq\theta\geq\hat{\theta})] \tag{29}$$

prior to the debt repurchase program and:

$$V^{C\prime} = (1-\hat{\theta}')[A - L - N^C + p^bX] + [(1-\bar{\theta}^{C\prime})(D^C+N^C-X) + (\bar{\theta}^{C\prime}-\hat{\theta}')\pi E(\tilde{Y}|\bar{\theta}^{C\prime}\geq\theta\geq\hat{\theta}')] \tag{30}$$

subsequent to the debt repurchase.

Since official debt is assumed to be completely junior, it is only serviced for realizations greater than $\bar{\theta}^C$. However, the probability of bankruptcy by the commercial creditor is also now lower. G therefore becomes:

$$G = (1-\bar{\theta})D^O + (\bar{\theta}-\overline{\theta}^C)[\pi E(\tilde{Y}|\overline{\theta}^C\leq\theta\leq\bar{\theta})-D^C] - \hat{\theta}[L-A-\pi E(\tilde{Y}|\theta\leq\hat{\theta})] \tag{31}$$

prior to the debt reduction program and:

$$G' = (1-\bar{\theta}')(D^O+N^O) + (\bar{\theta}'-\overline{\theta}^C)[\pi E'(\tilde{Y}|\overline{\theta}^C\leq\theta\leq\bar{\theta}')-(D^C+N^C-X)] - \hat{\theta}'[L-A-p^bX+N^C-\pi E'(\tilde{Y}|\theta\leq\hat{\theta}')] \tag{32}$$

subsequent to the debt reduction program. One can see by inspection that by equations (29) through (32), the condition that $V^{C\prime}+G'\geq V^C+G$ is identical to (27), and the seniority of claims has no impact on the results above.

---

[9]Note that the value of $\hat{\theta}$ would be smaller when commercial debt was senior.

VI. Conclusion

Many contend that the emergence of the Brady Plan in the late 1980's, which called for creditor-country government assistance in commercial debt reduction, represented a response to the poor performance of the previous concerted lending program under the Baker plan. This paper suggests another force which may have contributed to the willingness of official creditors and multilateral agencies to contribute to debt and debt service reduction programs under the auspices of the Brady Plan: The precarious financial position of developed country commercial banks implied that creditor country governments shared the commercial banks' claims on the highly indebted countries through their deposit insurance liabilities.

Our results indicate that a deterioration in the financial position of a commercial creditor results in additional contributions made by its official counterpart towards a debt reduction program. However, these contributions are exactly offset, from the debtor's point of view, by increases in the price at which commercial creditors are willing to accept the debt reduction program. The financial position of the commercial bank therefore affects the relative contributions of the official and private creditor to debt reduction, but not terms of the program as a whole as faced by the debtor nation. This result is robust to changes in the assumed relative seniority of official and private debt.

The results also suggest that a reconsideration of the terms of debt reduction programs is warranted. We find that leaving the values of both the official and commercial creditor unchanged requires that commercial creditors retire debt at an "unfair price," ie. above the discounted stream of expected payments from the debt claim, and that official creditors are net contributors to the program through extensions of new money financing. It is easy to see

that neglecting the implicit claim that official agents have on the assets of commercial banks under bankruptcy would lead to overestimating the share of the burden borne by official creditors and underestimating that borne by private creditors.

APPENDIX

1. Condition for $\partial E(\tilde{D})/\partial I>0$.

By (3) $E(\tilde{D})$ can be written as:

(A.1) $$E(\tilde{D}) = D - \bar{\theta}\pi E(\tilde{Y}|\theta<\bar{\theta}).$$

Differentiating with respect to I yields:

(A.2) $$\partial E(\tilde{D})/\partial I = - \partial\bar{\theta}/\partial I[D-\pi E(\tilde{Y}|\theta<\bar{\theta})] + \bar{\theta}[\partial E(\tilde{Y}|\theta<\bar{\theta})/\partial I] > 0.$$

Since $\partial\bar{\theta}/\partial I>0$ by assumption, a sufficient condition is $\partial E(\tilde{Y}|\theta<\bar{\theta})/\partial I>0$, as indicated in the text. However, the weaker necessary condition in (A.2) allows for small negative values of $\partial E(\tilde{Y}|\theta<\bar{\theta})/\partial I$.

2. Comparative statics for debtor solution.

The debtor chooses I to maximize:

(A.3) $$E(\tilde{Y}-\tilde{D}) = (1-\pi)\bar{\theta}E(\tilde{Y}|\theta<\bar{\theta}) + (1-\bar{\theta})[E(\tilde{Y}|\theta\geq\bar{\theta})]$$

which yields the first-order condition:

(A.4) $$\partial\bar{\theta}/\partial I[(1-\pi)E(\tilde{Y}|\theta<\bar{\theta})-E(\tilde{Y}|\theta\geq\bar{\theta})+D] + \bar{\theta}(1-\pi)E(\tilde{Y}|\theta<\bar{\theta}) + (1-\bar{\theta})E(\tilde{Y}|\theta\geq\bar{\theta}) = 0.$$

The second order condition for this to be a maximum is $\partial^2 E(\tilde{Y}-\tilde{D})/\partial I^2<0$. It follows that the sign of $\partial I^*/\partial D$ is equal to the sign of:

(A.4) $$\frac{\partial^2 E(\tilde{Y}-\tilde{D})}{\partial I\partial D} = \frac{\partial\bar{\theta}}{\partial I} + \frac{\partial\bar{\theta}}{\partial D}\left[(1-\pi)\frac{\partial E(\tilde{Y}|\theta<\bar{\theta})}{\partial I} - \frac{\partial E(\tilde{Y}|\theta\geq\bar{\theta})}{\partial I}\right] + \frac{\partial^2\bar{\theta}}{\partial I\partial D}\left[(1-\pi)E(\tilde{Y}|\theta<\bar{\theta}) - E(\tilde{Y}|\theta\geq\bar{\theta}) + D\right].$$

Though the first two terms are of the correct sign, the second order effect captured by the third term is positive, reflecting that increases in D increase the impact of I on $\bar{\theta}$. However, an envelope condition suggests that in the neighborhood of optimal I, this second order effect will be overcome by the primary effects of increasing D, i.e. lowering the net expected rate of return on I. Similarly,

(A.5) $$\frac{\partial^2 E(\tilde{Y}-\tilde{D})}{\partial I\partial R} = \frac{\partial\bar{\theta}}{\partial R}\left((1-\pi)\frac{\partial E(\tilde{Y}|\theta\leq\bar{\theta})}{\partial I} - \frac{\partial E(\tilde{Y}|\theta\geq\bar{\theta})}{\partial I}\right)$$

$$+ \frac{\partial^2 \tilde{\theta}}{\partial I \partial R}\left((1-\pi)E(\tilde{Y}|\theta \leq \tilde{\theta}) - E(\tilde{Y}|\theta \geq \tilde{\theta}) + D \right)$$

The argument concerning the dominance of the primary effect is similar. Finally, note that the absolute value of $\partial I/\partial D$ is greater than that of $\partial I/\partial R$.

REFERENCES

Bulow, Jeremy and Ken Rogoff.(1988) "Multilateral Developing-Country Debt Rescheduling Negotiations: A Bargaining-Theoretic Framework, International Monetary Fund Staff Papers, Vol. 35, No. 4, December, pp. 644-657.

———————. (1991) "Sovereign Debt Repurchases: No Cure for Overhang," Quarterly Journal of Economics, Vol. 106, No. 4, (November), 1219-1236.

Bulow, Jeremy, Kenneth Rogoff, and Alfonso S. Bevilaqua. (1992) "Official Creditor Country Seniority and Burden-Sharing in the Former Soviet Bloc," Brookings Papers on Economic Activity, 1, 195-222.

Claessens, Stijn, Ishac Diwan and Eduardo Fernandez-Arias. (1992) "Recent Experience with Commercial Bank Debt Reduction, mimeo, World Bank, (January).

Demirguc-Kunt, Asli and Enrica Detragiache. (1992) "Interest Rates, Official Lending, and the Debt Crisis: A Reassessment, mimeo, (January).

Demirguc-Kunt, Asli and Ishac Diwan (1990) "The Market-Based Menu Approach: An Analysis of Commercial Banks' Choice Behavior," mimeo, World Bank, IECDI.

Demirguc-Kunt, Asli and Eduardo Fernandez-Arias (1992) "Burden Sharing Among Official and Private Creditors," mimeo, World Bank, (February).

Diwan, Ishac and Ken Kletzer. (1990) "Voluntary Choices in Concerted Debt Deals: Mechanics and Attributes of the Menu Approach to LDC Debt," World Bank Economic Review,

Diwan, Ishac and Dani Rodrik. (1991) "Debt Reduction, Adjustment Lending, and Burden Sharing," mimeo, (September).

Diwan, Ishac and Mark M. Spiegel. (1992) "Are Buybacks Back?: Menu-Driven Debt Reduction Schemes with Heterogeneous Creditors," mimeo (January).

Dooley, Michael. (1989) "Buybacks, Debt-Equity Swaps, Asset Exchanges and Market Prices of External Debt," in J. Frenkel et al. (eds.) Analytical Issues in Debt, International Monetary Fund, Washington D.C.

Dooley, Michael, Richard D. Haas, and Stephen Symansky. (1992) "A Note on Burden Sharing Among Creditors," International Monetary Fund Working Paper #92/21.

Froot, Ken A. (1989) "Buybacks, Exit Bonds, and the Optimality of Debt and Liquidity Relief," International Economic Review, Vol. 30, pp. 49-70.