Policy, Research, and External Affairs

WORKING PAPERS

Debt and International Finance

International Economics Department
The World Bank
May 1991
WPS 675

Are Buybacks Back?

Menu-Driven Debt-Reduction Schemes with Heterogenous Creditors

Ishac Diwan
and
Mark M. Spiegel

Two debt-reduction mechanisms — market buybacks and concerted debt-reduction agreements — run into coordination problems. The menu approach captures some of the advantages of both but not their inconveniences.

Policy, Research, and External Affairs

WORKING PAPERS

Debt and International Finance

WPS 675

This paper — a product of the Debt and International Finance Division, International Economics Department — is part of a larger effort in PRE to analyze the role of debt and debt service reduction for highly indebted countries. Copies are available free from the World Bank, 1818 H Street NW, Washington, DC 20433. Please contact Sheilah King-Watson, room S8-040, extension 33730 (38 pages).

There is always some price that is low enough so that a debtor country gains by buying back some of its debts. Similarly there is always some price that is high enou‿a so that creditors gain by selling their debt claims. What is needed is a mechanism that allows trades to take place at some price within this range.

One mechanism, the market buyback, has been called a boondoggle. Market buybacks are too expensive from the debtor's point of view. Faced with a buyback bid, each creditor has incentives to hold onto its claim unless the bid is larger than the value of debt after the deal.

Concerted debt-reduction agreements can overcome this type of coordination failure, but they may be difficult to reach in practice because of the heterogeneity of creditors.

Diwan and Spiegel argue that the menu approach to debt reduction retains the advantages but not the inconvenience of buybacks and concerted agreements.

The authors introduce a model of bank asset pricing in the presence of tax incentives and deposit insurance. Through it they show that the exit price of any bank depends on the composition of the bank's asset portfolio.

They then derive the equilibrium level of exit and new money for a distribution of creditors facing a given menu program. They show that the optimal menu includes some positive level of debt repurchase in almost all cases — challenging the argument that buybacks are undesirable. The intuition for this result is that by getting the banks with the worse valuation out of the creditors' group, a rescheduling agreement at better terms can be reached with the remaining creditors.

Diwan and Spiegel conclude that the menu program dominates the standard buyback and new-money approaches. That suggests a questioning of the conventional wisdom concerning the role of buybacks and the optimal level of buyback activity.

Are Buybacks Back?
Menu-Driven Debt-Reduction Schemes with Heterogeneous Creditors

by
Ishac Diwan
and Mark M. Spiegel*

Table of Contents

* Technical assistance was provided by the Debt and International Finance Division of the World Bank and the C. V. Starr Center for Applied Economics at New York University.

1. Introduction.

To the extent that default on external debt is costly, there is always some (low enough) price at which a debtor country gains by buying-back some of her debt. Similarly, there is always some (large enough) price at which her creditors gain by selling their debt claims. In order for a Pareto-improving deal to exist, these two values must intersect. Assuming that there is a range of prices for which this is the case, the next important issue is to find a mechanism that allows trades to take place at some price within this range, and to analyze the division of rents that emerges from the use of such mechanism.

Two debt reduction mechanisms have been heavily analyzed in the recent sovereign debt literature: market buybacks and concerted debt reduction agreements. Market buybacks have been characterized as "boondoggles" in the literature [Bulow and Rogoff (1989)], because they are too "expensive" from the debtor point of view. This outcome is a reflection of the uncoordinated nature of market equilibria. Debt reduction improves creditworthiness and thus leads to revaluation of remaining claims. Faced with a buyback bid, each creditor has incentives to hold onto its claim unless the bid is larger than the post-deal value of debt [Dooley (1989), Bulow and Rogoff (1989),(1990)]. Concerted agreements can overcome this type of coordination failure, but they may be difficult to reach in practice, principally because of the heterogeneity of creditors. If concerted agreements are voluntary, exit terms must satisfy the bank with the highest reservation exit price, which is likely to be above the debtor's reservation price.

In sum, both market buybacks and non-discriminating concerted debt reduction agreements run into coordination problems, and there might exist Pareto-improving debt-reduction deals that cannot be obtained with either mechanism. However, such deals can be attained by discriminating between creditors. In particular, the lowest overall buyback price that can be achieved is attained when the banks with the lowest valuations sell their claims at their individual reservation price, and the remaining non-exiting banks transfer their capital gains to the debtor. But coordination of such a transaction would require a large amount of information and create moral hazard.

In this paper, we argue that the so-called "menu approach" to debt reduction captures part of the advantages but not the inconveniences of each one of these mechanisms, by combining concerted and voluntary characteristics In a first round, the options on the menu and their relative pricing are negotiated and the creditors commit themselves to choose one of the options. In a second round, each creditor freely chooses his preferred option. The essential options in any such menu include an exit instrument and a capital-gains-tax instrument. Given the relative prices, the creditors self-select the option they value most, allowing the debtor to save ex-ante on concessions. In recent menus, the gains made by the creditors that do not exit are recaptured by the debtor through a new money "tax" (see Diwan and Kletzer, 1990).

There are a number of reasons for heterogeneity across creditors. Perhaps the most important ones relate to implicit insurance subsidies that banks that hold country debt receive from their regulators, because these also inhibit transactions on the secondary market for debt. It is well known that mispriced deposit insurance (and the safety net in general) subsidizes risk-taking behavior by banks—especially once a bank's financial position deteriorates. Banks can increase their value by taking on more risk (for example, see Merton [1977], Sharpe [1978], Kareken and Wallace (1978), Koehn and Santomero (1980), Mitchell (1986), Penati and Protopapadakis (1988), and Kane [1985]). They can achieve this by increasing their leverage. The extent of leverage they can achieve, however, is limited by capital adequacy requirements.

Our approach concentrates on the impact that transactions in debt claims have on bank leverage. Following Demirguc-Kunt and Diwan (1990), we show that the application of those requirements on the book values of the banks assets subsidize holding those claims whose value has fallen below book. In effect, the ownership of such claims allows banks to over-represent their own capital, thus increasing their (real) leverage. As a result, banks that sell poor quality (inherited) assets that are treated at par by regulators give up valuable "excess leverage rights". These rights, however, cannot be captured by the buyer of the asset since the asset is "marked-to-market," ie. its new book value is now given by the purchase price. In effect, the commercial banks that exit the lending process are taxed. This creates a wedge in valuation between sellers and buyers of debt claims. As a result, differences between banks are not entirely intermediated by the secondary market.

In such an environment, banks can differ for a wide array of reasons, including differences in: expectations about the future prospects of the debtor economy (Williamson, 1989); extent of business interest in the debtor country that can enhance the value of the relending option (Sachs, 1989); existence of alternative business opportunities that encourage exit (Bouchet and Hay, 1990); exposure leading to exit because of diversification motives; banks' nationality due to international differences in the tax and regulatory treatment of country debt; and in size, with small banks exiting to reduce fix costs associated with recontracting and with monitoring the debtor country.

These considerations help explain the evolution of policy initiatives concerning the debt crisis. Under the Baker strategy of the early 1980's, banks were asked to share in the cost of reforming the HIC's by sharing in the supply of new loans. However, banks' interests diverged over the decade. The concerted new money approach began to break down as some banks strongly resisted new money calls. By 988, after the completion of the Brazil deal, new commercial credits literally dried up. The Brady initiative should then be seen as an attempt to reduce the tensions within the creditor group by tailoring financial instruments to the specific needs of banks. In particular, the Brady Plan allows some banks to exit and others to relend. Overall, by negotiating on a menu ex-ante and allowing banks to choose ex-post the options that they value most, the international financial institutions (IFI's) and the commercial banks can negotiate a preferred burden-sharing agreement without unsurmountable coordination problems.

An important welfare implication of this scenario, however, is that the menu outcomes are only unambiguously preferred by three of the four interested parties in the lending process: the debtor, the creditors, and the IFI's. The agreement developed here leads to maximization of tax advantages and deposit-insurance subsidies, both of which are costly to creditor country governments. Moreover, the predicted outcome of the menu approach, relending by weak banks and exit by strong banks may leave the weakest banks in a less secure financial position. Therefore, the welfare implications to the creditor country government depend upon the degree to which the creditor country government values the gains to the three other parties relative to its own direct costs. These include decreased tax revenues, increased deposit insurance subsidies, and a possible decrease in the stability of the financial system.

In this paper, we formalize the welfare claim above. In section 2, we introduce a simple model of a concerted menu program in the presence of tax incentives and deposit insurance. We show that the "exit price" of any bank, the price at which the bank would sell its debt to the debtor nation, is dependent upon the composition of the "non-tradable" equity in the bank's asset portfolio.

Section 3 then derives the equilibrium level of exit and new money for a distribution of creditors facing a given menu program, and it also derives comparative static results. Section 4 confronts the problem faced by the debtor nation: subject to institutional and budgetary constraints, what is the "optimal menu" in terms of achieving both new money extensions and reduction of the old debt burden? We show that the optimal menu includes some positive level of debt repurchase in almost all cases. This result is obviously of importance to the debate that buybacks are undesirable, since the model shows that they are desirable within the context of a concerted menu program. Section 5 provides evidence which backs this claim, through examination of the recent Mexican and Philippines menu deals. Finally section 6 provides some conclusions and explores opportunities for future research.

2. The Model.

2.1 The Decision Problem of a Representative Bank.

The model is two-period. Banks contain a portfolio of loans A^j, in which there are m types of assets, denominated a_1^j through a_k^j where a_i^j represents the book value of the claims of bank j on asset i upon maturity given zero default. Asset a_1 is assumed to represent loans to the debtor nation. All assets mature in period 2. In period 1, some information concerning the value underlying each asset is assumed to have already accrued to the market. The "fair-market" value, ie. the discounted stream of expected payments accruing from a dollar's worth of asset i in period 1, $p_{1,i}$, is equal to:

$$p_{1,i} = \omega_i E(\lambda) \frac{\overline{R_i}}{R} . \tag{1}$$

where λ is a stochastic market risk parameter, $\lambda \epsilon [0,1]$, $\overline{R_i}$ is one plus the nominal interest rate charged on asset i, and ω is the current market information set, $\omega = \{\omega_i\}$ where ω_i is the realization of first-period information concerning the value of asset i,[1] $\omega_i \epsilon [0,1]$. ω is known by all agents in period 1, as are the density and distribution functions of λ, $f(\lambda)$ and $F(\lambda)$ respectively. ω_i can be considered period-zero asset-specific risk while λ represents remaining market risk common to all assets.

In the absence of any buyback program, the value of bank j in period 1 if it holds all of its assets to maturity, $V_1^j(A^j)$, is equal to the value of its assets minus its liabilities, or:

$$V_1^j(A^j) = \left(\frac{1}{R}\right)(1 - t^j)\int_{\lambda_1^j}^{1}\left[\sum_{i=1}^{m}[\omega_i a_i^j \lambda \bar{R}_i] - D^j R\right] f(\lambda)\, d\lambda. \tag{2}$$

where R represents one plus the risk-free rate, D^j represents deposits owed by bank j, λ_1^j represents the maximum realization of λ for which bankruptcy would result for bank j, given ω, and t^j represents the tax rate faced by bank j. λ_1^j can be shown to satisfy $\lambda_1^j = D^j R / \sum_{i=1}^{m} \omega_i a_i^j \bar{R}_i$.

The fact that deposits earn the risk-free rate in equation (2) stems from the assumption that complete deposit insurance exists. For simplicity, we assume fixed premia, which we set to zero without loss of generality. The value function in equation (2) is then a combination of "firm-contributed equity" [Kane (1989)] and the government influence on equity values via taxes and the deposit insurance

[1]Having asset-specific remaining risk would retain the qualitative results here, but would introduce new sources of heterogeneity across banks, due to the diversification properties of asset 1. For simplicity, we do not pursue this potential complication here.

subsidy.

Let $A_1^j = \sum_{i=1}^{m} a_i^j p_{1i}$, the period 1 fair value of the assets of bank j, and

define $k_1^j = 1 - \frac{D^j}{A_1^j}$ as the period 1 capital-asset ratio (CAR) of bank j, and let τ_1^j

represent the tax gains from realizing market asset losses in the first period,

$\tau_1^j = \frac{(R-1)}{R} e_i^j t^j (1-p_{1i})$, where e_i^j represents the dollar sales or "exit" of bank

j from asset i. We can then state the following Lemma:

LEMMA 1: *The value of a bank j in period 1 is equal to the sum of the market value of its assets minus its liabilities plus the "non-tradable" component of its asset value in non-bankruptcy states:*

$$v_1^j(A^j) = (1-t^j)[A_1 - D^j + s_1^j]. \tag{3}$$

where s_1^j, is equal to:

$$s_1^j = \gamma_1^j + \tau_1^j \tag{4}$$

and γ_1^j represents the deposit-insurance subsidy which equals:

$$\gamma_1^j = (1 - t^j)\frac{A_1^j}{R}\int_0^{\lambda_1^j}\left[(1 - k_1^j)R - \frac{\lambda}{E(\lambda)}\right]f(\lambda)\,d\lambda \tag{5}$$

where $\lambda_1^j = \frac{(1 - k_1^j)}{E(\lambda)}$.

The proof is in the appendix. It can be seen in equation (5) that the deposit-insurance subsidy is decreasing in bank CAR's, ie. it is increasing in bank leverage. This fact is well-documented in the literature, as is the conclusion that in the presence of fixed-premium deposit insurance, a capital-adequacy requirement is necessary to limit bank leverage.

Banks do face minimum CAR requirements. With risk-neutral creditors, the CAR requirement will always be binding in equilibrium in period 0 These requirements, however, are placed on the "book-value" of bank assets. Given the realization of ω, the market-value capital-asset ratio will differ from its book value when assets have not been "marked-to-market." With fixed-premium deposit insurance, and given that banks are not required to "mark-to-market," their optimal response is to mark positive, but not negative, assets to market. This strategy allows the banks to increase their true market leverage above that which would be allowed by the CAR requirement. In particular, we assume that the realization of ω_1, the first period shock concerning the debtor nation loan, is below its expected value.

The disparity in realizations of bank portfolio values leaves banks relatively "strong" or "weak." The true market value of the bank capital-asset ratio will equal k_1^j, as defined above, which will lie below k, the required book-value CAR for all banks. Banks with high shares of poorly-performing assets in their portfolios will then be relatively "weak" ie. have lower market CAR's in period 1 than banks with small levels of poorly-performing assets, and stand to lose relatively more from a reduction in the deposit-insurance subsidy.

While failing to mark poorly-performing assets to market increases the magnitude of the deposit-insurance subsidy. the existence of bank tax liabilities gives banks the opposite incentive. Marking a poorly-performing asset to market can hasten the tax write-off associated with the loss experienced on that asset. The present value of the tax liability of bank j can then be reduced by the portion of losing assets which are sold early.[2]

2.2 "Exit Prices" of a Representative Bank.

When choosing the amount of debt to sell back to the debtor nation, an exiting bank will obviously need to consider the impact of the buyback program on the resulting value of remaining debt. The recent literature on sovereign debt has made it clear that due to the absence of legal restrictions on default, sovereign borrowers only service debt when the value of debt service exceeds the value of default. The relationship between the stock of debt and its value is controversial, and has even been argued to be negative, as in the "debt overhang" literature. However, we follow the mainstream arguments by assuming that the present value of expected debt service is an increasing and concave function of the nominal outstanding debt burden δ_t, $f(\delta_t)$, $f'(\delta_t) > 0$ and $f''(\delta_t) < 0$. This implies that the total "fair-market" value of debt is increasing in nominal outstanding debt, but its value per-unit is decreasing.

Let p^b be the price paid in the buyback program and α be total expenditure on the program. The program will raise the fair-market value of remaining debt, $p_{1,1}$, to $p_{2,1}$ where $p_{2,1} = f(\delta_2)/\delta_2$ and $\delta_2 = \delta_1 - (\alpha/p^b)$. As suggested in the literature [Bulow and Rogoff (1990)], it can be seen that a straight buyback would in this case increase the total tradable value of creditor assets, since $p^b \geq p_{2,1}$ is a condition for creditors to sell assets to debtors.

Diwan and Kletzer (1990) show that the transfer given to creditors shown in the repurchase above can be recovered through a par new-money requirement. The

---

[2]Of course, the tax liability is also increased when gains are realized early by selling on the secondary market at higher than purchase prices. Since we assume for simplicity that the banks only consider selling the sovereign debt asset, this complication does not enter here, although it would change no results of the model.

logic is that the capital gain accruing to non-exiting banks can be recovered through a new money requirement based upon the residual exposure of banks subsequent to th buyback. This new money requirement "taxes" the capital gains accruing to banks retaining claims on the debtor nation, since new money is issued at par. We therefore define a "menu" as a combination of an exit price p^b, and new money requirement, n. Banks with remaining claims must extend a new loan of n per dollar of remaining claim. We denote by N the total stock of new money extended.

With the introduction of "non-tradable" components to bank asset portfolios, the impact of asset sales on these components affect the terms at which banks would be willing to sell their debt claims. Since all creditors are below their required CAR, a sale of LDC debt would require a reduction in bank leverage and hence a reduction in the deposit insurance subsidy. However, the tax implications go in the other direction, as banks may prefer to hasten the realization of capital losses.

Consider the decision problem of a bank faced by some menu program (p^b, n). Since banks are forced to mark discounts to market, selling debt results in a loss in the deposit-insurance subsidy due to their leverage decrease, and a decrease in the present value of their tax liability. Demirguc-Kunt and Diwan (1990) have shown in a model with deposit-insurance that banks which choose exit will choose to do so completely. This leads to Lemma 2:

LEMMA 2: *In the presence of deposit-insurance and tax considerations, all banks which choose some positive level of exit will choose to exit completely, i.e. choose* $e_1^j = a_1^j$.

Lemma 2 merely states that the Demirguc-Kunt and Diwan result is robust to the addition of tax considerations. A proof is provided in the appendix. The intuition behind this result is that the benefits of early tax write-downs are linear in e_1^j, as are the gains from the sale of debt. On the other hand, the marginal cost of exit is decreasing in e_1^j, so that if a bank chooses any level of exit, it will choose to exit completely.

Given that exiting banks choose complete exit, the value of exiting banks subsequent to the buyback will be:

$$V_2^{j,e}(A^j,p^b,n) = (1-t^j)\left[A_{2m}^j + p^b a_1^j - D^j\right] + s_2^{j,e}. \qquad (6)$$

where A_{2m}^j is the market value of the bank's portfolio of assets 2 through m and $s_2^{j,e}$ is the "non-tradable" component of bank equity subsequent to the buyback, which satisfies:

$$s_2^{j,e} = \gamma_2^{j,e} + t^j a_1^j (1-p^b). \qquad (7)$$

We assume all individual banks take p_{21} as given, according to the equilibrium outcome described below. This leads to the first proposition:

PROPOSITION 1: *For any bank j with an expected post-menu debt price of $p_{2,1}$, and any new-money claim, n, there is a unique menu, $\{p^{b,j},n\}$, which leaves bank j indifferent between selling its old debt, and retaining its claim and issuing $(1+n)a_1^j$ in new money, ie which solves $V_2^{j,e}(p^b) = V_2^{j,n}$. Moreover, $p^{b,j}$ is increasing in $(1-k_1^j)$, initial bank leverage, and decreasing in t^j, the bank's tax rate.*

PROOF:

The value of a bank j, given that it chooses the new money option, is equal to:

$$v_2^{j,n}(A^j,n,p_{2,1}) = (1-t^j)\Big[A_{2m}^j - D^j + a_1^j[p_2,1 + (p_2,1-1)n)]\Big] + s_2^{j,n}. \tag{8}$$

where $s_2^{j,n}$ is equal to:

$$s_2^{j,n} = \gamma_2^{j,n} + \frac{t^j a_1^j (1+n)(1-p_{2,1})}{R}. \tag{9}$$

From equations (6), (7), (8), and (9), it follows that for any n and $p_{2,1}$, bank j chooses exit at all buyback prices at which $v_2^{j,e} \geq v_2^{j,n}$, which satisfies:

$$p^{b,j} \geq \frac{(1-t^j)}{(1-Rt^j)}(p_{2,1}-1)(1+n) + \frac{[\gamma_2^{j,n} - \gamma_2^{j,e}]}{a_1^j(1-Rt^j)} + 1. \tag{10}$$

Assuming the constraint is binding, and differentiating with respect to t^j:

$$\frac{\partial p^{b,j}}{\partial t^j} = \frac{(R-1)}{(1-Rt^j)^2}(p_{2,1}-1)(1+n) + \frac{[\gamma_2^{j,n} - \gamma_2^{j,e} + \frac{\partial(\gamma_2^{j,n}-\gamma_2^{j,e})}{\partial t^j}]R}{a_1^j(1-Rt^j)} < 0. \tag{11}$$

Since $\frac{\partial^2\gamma_2^j}{\partial e^2} < 0$, as shown in the appendix, it follows that the impact of bank leverage on the minimum buyback price of bank j will be positive if $\frac{\partial^2\gamma_2^j}{\partial e^2} > 0$. This is also shown to be the case in the appendix.

3. Equilibrium

3.1 Equilibrium Exit Decisions.

Although each bank is assumed to be behave as a price taker when making its exit decision, the degree of exit as a group will have an impact on $p_{2,1}$. This leads to the following definition of an equilibrium outcome of a "consistent" menu program:

DEFINITION 1: *An equilibrium outcome from a menu* $\{p^b, n\}$, *consists of a group of* q^* *exiting banks, a post-buyback price,* $p^*_{2,1}$, *and "required-funding" of* α.

We proceed by deriving the exit decisions of individual banks taking the post-buyback price, $p_{2,1}$, as given. We then show that this post-buyback price is consistent with profit maximization by the individual banks, so that the menu yields an equilibrium in which individual bank choices are satisfied. It is convenient to number the banks strategically. Given the post-buyback price that results from the equilibrium, $p^*_{2,1}$, and some new-money call n, we can number the banks according to ascending exit prices by equation (10):

$$\{p^{b,1}\} \le \{p^{b,2}\} \le \ldots \le \{p^{b,Q}\}. \tag{12}$$

By Proposition 1, we know that a banks with greater leverage and lower marginal tax rates will have a higher exit price.

Define a "marginal bank" q, as the bank with the highest exit price which does not exceed the exit price quoted in the menu program, ie. which satisfies $p^{b,j} \le p^b$. This leads to the second proposition:

PROPOSITION 2: *For any buyback program* $\{p^b, n\}$, *there is a unique post-buyback price* ,$p^*_{2,1}$, *a unique "marginal bank," q, such that banks 1 through q choose exit while banks q+1 through Q choose the new-money option, and a unique cost of the buyback program,* α.

PROOF:

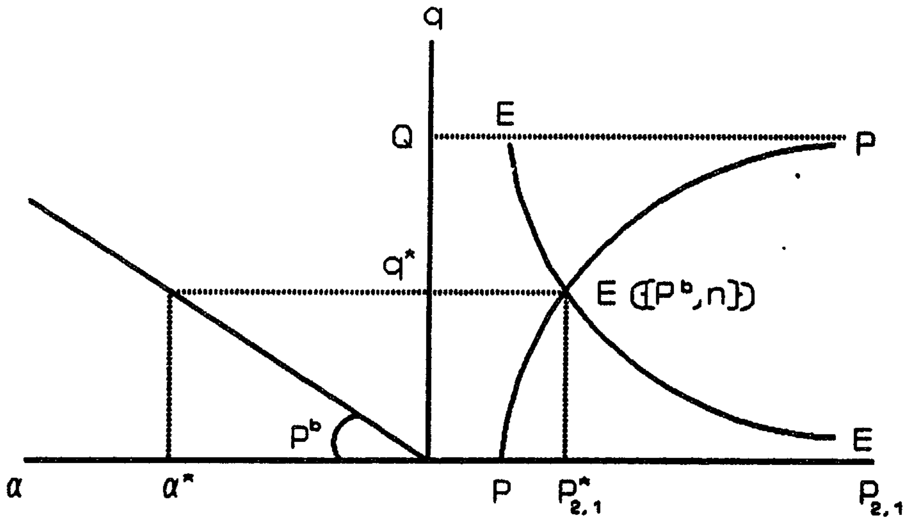
Suppose that the post-buyback price is expected to be $p^*_{2,1}$. By equation

(10), we can number the banks according to equation (12). It then follows that there is a "marginal bank," q, for which all banks 1 through q have exit prices at or below the buyback price, while all banks q+1 through Q have exit prices above the exit price. It follows that banks 1 through q choose exit while banks q+1 through Q choose the new-money option. α, the cost of the buyback program, is then directly attainable (see Figure 1):

$$\alpha = p^b \sum_{j=1}^{q} a_1^j. \tag{13}$$

The existence and uniqueness of an expected $p_{2,1}$ which is consistent ex-

Figure 1



post with desired bank plans is motivated by Figure 1. Given a menu, $\{p^b, n\}$, the EE curve represents the relationship between the expected level of $p_{2,1}$ and the number of banks which choose exit, derived from equation (10). This is clearly a downward-sloping line, as an increase in $p_{2,1}$ makes the new money option more desirable, holding all else constant. Against this consideration, the PP curve demonstrates the positive relationship between the number of banks which exit and the resulting post-buyback price $p_{2,1}$, which is equal to:

$$p_{2,1} = \frac{f\left[(1+n)\sum_{j=q+1}^{Q} a_1^j\right]}{\left[(1+n)\sum_{j=q+1}^{Q} a_1^j\right]}. \tag{14}$$

where Q is the initial number of banks with exposure to the debtor country.

While uniqueness is clear, existence requires that the curves cross. Consider the EE curve. Clearly, when $p_{2,1}$ is equal to zero, all banks choose exit, while when $p_{2,1}$ is infinite, all banks choose relending. On the other hand, the PP curve has p_{21} being infinite when all banks choose exit, and equal to a number smaller than the pre-buyback price when no banks would choose exit. This completes the proof of Proposition 2.

3.2 Comparative Statics.

Comparative static exercises can be conducted relative to the equilibrium above. To simplify the notation, assume that each bank is atomistic, so that q is now a continuous variable, with each "bank" having the equivalent of one dollar of exposure to the debtor nation.[3] It follows that the amount of old debt reduction will be equal to q^*, and that the cost of the buyback program is simply equal to $\alpha = p^b q$. Given Q original exposed "banks," the total amount of new money coming from the buyback program, N, will satisfy $N = n(Q-q)$. The net first-period cost of the menu program to the debtor nation is then $(\alpha - N)$.

We introduce simplified smooth functional forms to capture the results in the analysis above. From individual bank maximization (13), the level of exit is

---

[3] Abstracting from strategic considerations, this assumption can incorporate non-atomistic banks as a group of atomistic banks with identical exit prices.

decreasing in the expected post-buyback price, increasing in the buyback price, and increasing in the "new money" requirement. We can write this relationship as:

$$q = h(p_{2,1}, p^b, n); \quad \frac{\partial h}{\partial p_{2,1}} \le 0, \ \frac{\partial h}{\partial p^b} \ge 0, \ \frac{\partial h}{\partial n} \ge 0. \tag{15}$$

From the market relationship (14), the post-buyback price, is increasing in the amount of banks which choose exit and decreasing in the total level of new money, $p_{2,1} = g(n,q); \ \frac{\partial g}{\partial n} < 0, \frac{\partial g}{\partial q} > 0$.. We obtain the endogenous exit decision as satisfying:

$$q = h[p^b, g(n,q), n]. \tag{16}$$

PROPOSITION 3: *Holding n constant, and assuming that the buyback program is sufficiently funded, an increase in* p^b *results in an increase in q, an increase in* $p_{2,1}$*, an increase in* α*, a decrease in N, a decrease in* δ_2*, and an increase in* $(\alpha - N)$*. Holding* p^b *constant, and assuming that the buyback is sufficiently funded, an increase in n results in an increase in q, and an increase in* α*, but has ambiguous effects upon* $p_{2,1}$*, N,* δ_2*, and* $(\alpha - N)$.

The proof of Proposition 3 follows directly from equation (19), and is demonstrated in the appendix.

Perhaps the most surprising result from the comparative static exercises is that an increase in the new money call may actually decrease the level of new money obtained by the debtor nation. This "new-money Laffer curve" stems from the fact that beyond some level, increases in n can cause sufficiently large levels of exit to decrease N.

In the next section, when we confront the choice problem faced by the debtor nation, we derive the result that the debtor would never choose to be on the wrong side of the new-money Laffer curve. Given this parameter constraint, we can sign some of the ambiguous results of Proposition 3. In particular, since on the correct side of the new-money Laffer curve $\frac{\partial N}{\partial n} > 0$ by definition, it also follows that $\frac{\partial p_{2,1}}{\partial n} > 0$.

4. The Optimal Debtor Solution

Given the equilibrium outcome faced by the debtor above, we are now in a position to determine the "optimal" menu from the debtor's point of view. By Proposition 2, we know that a unique number of exiting banks, q^*, exists for any menu program $\{p^b, n\}$. However, it can easily be established that a number of menu programs exist for any q^*, each of which have a unique net first-period cost, $\alpha - N$. In this section, we find the "optimal menu" from the debtor's perspective in two steps: First, we establish what the optimal menu would be from the debtor's viewpoint for any q^*, deriving a frontier of "best menus" given the value of q desired. Second, we confront the issue of the optimal choice of q, given that the debtor will then choose the menu for q which is on the "best menu" frontier.

4.1 The Optimal Menu for any Level of Exit

We constrain ourselves to the following buyback program: 1. The program must be voluntary ex-ante, ie. each bank must be at least as well off under the program as under the status quo.[4] 2. The program is concerted ex-post, therefore no banks can shirk on the mutually-agreed upon terms. 3. The debtor is precluded

[4] Cases where individual banks had bargaining power might allow them to restrict the set of "acceptable deals" beyond the criteria of leaving the banks whole. This strategic complication is left for future research. However, while this complication would change the shape of the menu "frontier," as defined below, the optimal debtor strategy given this frontier would remain the same.

from discriminating across banks in either buyback prices or relending terms.

We assume that the debtor has a very simple utility function:

$$
\begin{aligned}
U &= u(c_1, c_2) \\
c_1 &= E - \alpha + N \\
c_2 &= \eta(\delta_2)
\end{aligned}
\tag{17}
$$

where E is the first period endowment, $\frac{\partial u}{\partial c_i} > 0, \frac{\partial^2 u}{\partial c_i^2} < 0, (i=1,2)$, and $\frac{\partial \eta_2}{\partial \delta_2} < 0, \frac{\partial^2 \eta_2}{\partial \delta_2} > 0$.

Since the program is voluntary, the lowest price which can be paid to any exiting bank is that which leaves it as well off as prior to the menu program. For any exiting bank j, this satisfies:

$$
p^{b,j} \geq \frac{(1-t^j)}{(1-Rt^j)} p_{1,1} + \frac{[\gamma_2^{j,o} - \gamma_1^j]}{a_1^j (1-Rt^j)}. \tag{18}
$$

The debtor therefore faces two restrictions when designing the menu program. First, he must leave all exiting banks "whole," ie. satisfy (18). Second, he must allow all banks who wish to exit at the buyback price to do so, ie. satisfy (10).[5] This leads to the following Proposition:

PROPOSITION 4: *For all possible exit levels q, there is a unique equilibrium menu program $\{p^b, n\}$, such that bank q is indifferent between exit and relending under the menu program, as well as the status quo.*

PROOF:

Suppose that we rank the banks according to their exit prices in equation

[5] Note that these two conditions combine to require the all non-exiting banks are left "whole" as well, so that they will also consent to the program.

(18). It is easily verified that the ranking will be identical to that in equation (12): $p^{b,j}$ will be increasing in the leverage of bank j and decreasing in the marginal tax rate faced by bank j. $p^{b,q}$ is unique since v_1^j is invariant with respect to p^b while $v_2^{j,e}$ is increasing in p^b.

For any level of exit, q, suppose that the debtor sets the exit price to $p^{b,q}$ according to equation (18). Given that q banks do exit, the cost of the program will be $\alpha = p^{b,q}q$. Moreover, consider a bank j where $j < q$. By definition, $p^{b,j} < p^{b,q}$, so that any other exiting bank will also prefer the buyback program to the status quo for an exit price which satisfies the marginal exiting bank. Given that q banks exit, then, the cost-minimizing buyback price is $p^{b,q}$.

The buyback price $p^{b,q}$ is consistent with an equilibrium menu if banks 1 through q do decide to exit, and banks q+1 through Q choose the new money option, where characteristics of bank q+1 are arbitrarily close to those of bank q. This entails substituting the value of $p^{b,q}$ from equation (18) back into the equilibrium menu condition, equation (10), and choosing the highest value of n which satisfies that equation.

The solution of n to (10) must be unique because:

$$p_{2,1}-1+\left(\frac{1}{a_1^j}\right)\frac{\partial \gamma_2^{j,n}}{\partial n}<0. \qquad (19)$$

If (19) were violated, it would imply that the indirect gain from issuing bad loans, in terms of the increased deposit-insurance subsidy and tax benefits, outweighed the direct losses from the bad loans themselves. Since the value of these subsidies is in lowering the share of the losses borne by the creditor, they can never exceed the entire value of these losses.

Given the unique value of n which satisfies (10), bank q would be indifferent between exit and relending. Second, consider a bank j where $j > q$. Since $\frac{\partial^2 \gamma_2^j}{\partial \theta^2} < 0$, banks with exit prices higher than bank q will also have higher values of $\frac{[\gamma_2^{j,n} - \gamma_2^{j,e}]}{a_1^j (1 - Rt^j)}$ so that any bank higher than will also prefer the new-money option to either exit or the status quo.

Note that this equilibrium menu, $\{p^{b,q}, n^*(q)\}$, is also the "best menu" from the debtor's viewpoint, given that q banks are induced to exit. The exit price, $p^{b,q}$, is the minimum that would be acceptable to the q banks which were going to exit, so that reducing $p^{b,q}$ would violate the condition that the program is voluntary among all banks who eventually choose exit. Similarly, the new money call, $n^*(q)$, is also the maximum new money call which is consistent with the program being voluntary among all remaining banks, since for all banks j, $j \geq q$, $n^{*q}(q) \leq n^{*j}(q)$ where $n^{*i}(q)$ is the maximum level of n acceptable to bank i given exit by q banks. Proposition 4 therefore defines a "frontier" of optimal menus for a given level of exit, q.

The rule of thumb for the debtor is surprisingly simple: Given any level of exit q, the "best menu," $\{p^{b,q}, n|q\}$, is that at which bank q is indifferent between exit, relending, and the status quo situation. To characterize this frontier, consider what happens to p^b and n as q increases. Clearly, p^b must increase as q increases, since we are moving up the supply curve of prices which leaves the banks as well off as under the status quo. In addition, since more banks have exited, additional funds can be called for from remaining banks. We can characterize the effects of movements along this frontier according to the following proposition:

PROPOSITION 5: *For all menus along the "best menu frontier," indexed by their level of exit q,* $\frac{\partial p^{b,q}}{\partial q}$ *and* $\frac{\partial n}{\partial q} > 0$, *but* $\frac{\partial \delta_2}{\partial q}$ *and* $\frac{\partial(\alpha - N)}{\partial q}$ *are of ambiguous sign.*

The proof is in the appendix. While the added restriction that menu programs be voluntary among creditors allows us to sign $\frac{\partial n}{\partial q}$, $\frac{\partial \delta_2}{\partial q}$ is of ambiguous sign: $\frac{\partial \delta_2}{\partial q} = -(1+n) + (Q-q)\frac{\partial n}{\partial q}$, so that when q is very small, or $\frac{\partial n}{\partial q}$ is very large, the outstanding debt of the debtor may actually be locally increasing in the magnitude of debt repurchases. This surprising result is ambiguous because removal of a very strong bank may weaken the constraint on the new money call sufficiently that on the margin, allowing exit by an additional bank may increase total borrowing by the debtor.

It should be stressed, however, that this is only a local possibility. In particular, it cannot be the case that $\delta_2 > \delta_1$ subsequent to the debtor-financed menu program. Using (22), one can see that this condition would violate (13) for any bank choosing the new-money option $j > q$ facing menu $\{p^{b,q}, n|q\}$, since $p_{2,1} < p_{1,1}$ implies that these banks would end up worse off under such a menu program than they were under the status quo.

4.2 Optimal Choice from the Menu Frontier

We examine the case in which the debtor funds her own menu program. Her problem is to choose the utility-maximizing level of q, knowing that for each q, she will choose the "best menu" $\{p^{b,q}, n|q\}$. Since any menu along the frontier has a funding requirement of $\alpha = p^{b,q}q$, the "net" first-period funding requirement of any menu program is equal to: $(\alpha - N) = [(p^{b,q}+n)q] - nQ$. We can therefore characterize the debtor's problem as that of choosing an optimal q^* from the menu frontier which maximizes the debtor's utility. Since we know that $\alpha - N$ is not monotonic in q, both local and global maximization criteria will have to be considered. This leads to the following proposition:

PROPOSITION 6: *For all potential menus along the frontier, $\{p^{b*}, n^*|q_0\}$, $q_0 \leq q^*$, where q^* is the level of exit obtained in the "optimal menu," $\{p^{b*}, n^*|q^*\}$, if there exists a q_1 with a frontier menu of $\{p^{b*}, n^*|q_1\}$ such that $(\alpha - N|q_1) \leq (\alpha - N|q_0)$ and $(\delta_2|q_1) \leq (\delta_2|q_0)$, or if:*

$$\frac{\partial n}{\partial q}(Q-q) + (1+n) + \beta\frac{\partial \eta}{\delta_2}\frac{\partial \delta_2}{\partial q} - p^b - \frac{\partial p^b}{\partial q}q \geq 0$$

where $\beta = \frac{\partial u}{\partial c_2} / \frac{\partial u}{\partial c_1}$.

The proof is in the appendix.

Two characteristics determine the desirability of increasing q: First, the smaller is q, the more likely is the change in transfers to be positive. Second, the more different is bank q than bank q+1, the larger is the gain in new money attainable by letting bank q exit. It is in terms of this second gain that menu programs can be understood to facilitate discrimination by the debtor. The debtor nation can call for greater new-money extensions from banks with higher exit prices by allowing banks with low exit prices to exit.

Some conclusions stem from these observations. First, large buybacks may be less desirable than a small buybacks, since large buybacks, by lowering the bankruptcy risk of the creditor, will decrease the deposit insurance subsidy.

Second, the condition in Proposition 6 is more likely to be positive the larger is $\frac{\partial n}{\partial q}$, since a given level of exit allows for a larger new-money call.

In the appendix, it is shown that $\frac{\partial n}{\partial q}$ is increasing in $|\frac{\partial f(\delta_2)}{\partial q}|$. This is due to the fact the greater is the response in price to the exiting banks, the greater is the amount of new money that can be called for from remaining banks.

It follows that increasing p^b and inducing greater exit will be more desirable the larger is the rise in the resulting exit price. This result is interesting because it does not conform with the "conventional wisdom" concerning the desirability of buybacks adopted from Bulow and Rogoff (1990). In their analysis, buybacks are considered undesirable because they lead to an increase in price, and therefore a transfer from debtors to creditors. In our model, when debtors have the ability to recover the transfer through increased new money calls, the potential gains from repurchasing debt is actually increasing in the impact of debt repurchases on the exit price. The reason for this discrepancy is that debtors use exit in a menu program to facilitate discrimination across creditors, even though they would prefer not to repurchase debt from any individual creditor. Since the ability to discriminate across banks is greater the steeper is the schedule of bank exit prices, the debtor actually will choose a larger level of debt reduction the larger is the expected increase in the post-buyback price.

5. Recent Experiences with Buyback Deals and Menu Programs

Following the onset of the Brady plan, several menu driven "deals" have been negotiated. The first deal with the Philippines had only two options; the following one with Mexico had three; and the following deals had three or more options (Costa-Rica, Venezuela, Chile, Uruguay, Morocco).[6] Below, we review the Philippines and Mexico deals of 1989-90. We show that in both cases, the overall buyback price was well under the average ex-ante price of debt. In the case of Mexico, we contrast the terms of the menu-driven debt-reduction of 1990 with the pure buyback of 1987 (the J. P. Morgan deal). We also discuss evidence different types of banks received different terms under the menu programs, indicating that some level of discrimination by creditor type was achieved.

5.1 The Philippines Deal

The Philippines and its commercial creditors agreed in September 1989 that the Philippines would repurchase $1.3 billion of face value debt at a price of 50 cents (the average past year secondary price), and that the remaining banks would provide $715 million of new money (at Libor+7/8 percent with 7.5 years of grace and 15 years of maturity; disbursed in three tranches) and would reschedule (and reprice) debt outstanding (leading to annual contractual interest savings of $.6 million). The buyback took place on January 3, 1990. Of the new loans, about $600 million has been disbursed so far, and the third tranche awaits an agreement with the IMF on a new program.

It is quite easy to compute the effective buyback price of the program. Besides the direct price, the Philippines received new money traded in the market at below par. The post deal price fluctuated around 54 cents. As a result, at least 46 cents of each dollar of new money is a transfer from the remaining creditors to the Philippines (and probably more, since the price of 53 cents includes the value of "excess leverage rights" to the marginal bank). So overall, the Philippines paid (1.3)(.5)=650 million, and it received a value of at least

---

[6]Of these deals, only the Venezuelan had been consummated at the time of writing. As these deals are progressively becoming more complex, analysis of them would be beyond the scope of the current paper, and is left for future research.

(715)(.47)=336 million. Per dollar of face value of debt reduced, the Philippines paid at most a net amount of [0.650-0.336/1.3]=.24, that is, 24 cents on the dollar. Clearly, the overall deal allowed for a net buyback price that is much closer to the marginal value of debt than to its average value.

Commercial debt eligible for restructuring and debt reduction operations stood at $11 billion at the end of 1989. Thus, the implicit new money call was given by: n=0.715/11-1.3=.07. Banks that exited got 50 cents, and they gave up both their Philippines claim and excess leverage rights. The marginal banks that relent got (1.07)(.53)-.07=.50, since the post-deal price of 53 cents includes the value of its own post-deal excess leverage rights. The evidence supports the conclusion that the marginal bank was left indifferent between the two options.

5.2 The 1987 Mexican Swap

In December 1987 Mexico initiated the first major debt swap scheme since the onset of the debt crisis. The new debt consisted of 20-year zero-coupon bonds, with the principal but not the interest collateralized by U.S. Treasury obligations purchased by Mexico with its own foreign exchange reserves. The Mexican plan essentially packaged together two transactions: a debt buyback and a debt swap. If the Mexicans failed to convince the market of the new bonds' seniority, the transaction would be just equivalent to a debt buyback.

Indeed, this is what happened. At the then current interest rate, the collateral was worth about 20 percent of the face value of the debt. With the existing Mexican debt selling for about 50 percent of its face value, a price above 70 cents would indicate that the market accepted some of Mexico promises for seniority. Of course, if the debt were fully senior, it would have sold for a price of almost a dollar.

For the $3.67 billion in bids that exceeded Mexico's minimum acceptable price, $2.56 billion of the new bonds were issued, backed by $492 million in collateral. When account is taken of the fact that the interest rate on the new bonds exceeded by a small margin that on rescheduled bank debt, the transaction turns out to have reduced the present value of Mexican obligations by almost exactly the same amount as would have been achieved by a straight cash buyback using the same amount of resources.[7]

5.3 The Mexican deal of 1989

Mexico and the steering committee of its creditor banks negotiated for approximately 4 months. On July 23, an agreement was reached on a package that covers about $48.9 billion in medium-term and long-term debt. It offers commercial banks a menu of three options:

1. a discount bond: a 30 year bond with a discounted principal of 65% of the face value of existing debt and an interest rate of LIBOR plus 13/16;
2. a par bond: a bond with no discount but a low interest rate of 6.25% fixed for the lifetime of the bond; and
3. a new money package: 25 percent of exposure (7% of principal balance at the conclusion of the agreement and 6% in 1990, 1991 and 1992), at an interest rate of LIBOR plus 13/16.[8]

The principal of both bonds is guaranteed through collateralization of a 30-year zero-coupon bond (US-Treasury or its equivalent in case of other currencies) and 18 months of interest payment are guaranteed on a rolling basis through an escrow account. In addition, both bonds include a recapture clause which stipulates that, in case the oil-price increased by a certain percentage in the years 1997 and beyond, that the creditors would share in the increased

[7]Lamdany (1988) presents detailed calculations of the Mexican deal.

[8]Note that the present value of the new money call is approximately given by: $.07 + (.06/1.1) + (.06/1.1)^2 + (.06/1.1)^3$.

revenue stream. The agreement also contained a financing facility contingent on oil prices.[9]

In total an amount of $7 billion have been used for debt and debt service reduction (of which $5.757 billion were available from new loans from the World Bank, IMF, and Japan, and $1.243 billion from Mexico's own reserves).

The choices made by banks in early March were the following: 46.7 percent of the debt was swapped into the par bond; 40.2 was swapped into the discount bond; and 13.1 percent contributed new money. Total new money pledges amounted to $1.602 billion (for a period of four years, with a present value (PV) of about $1.35 billion). Relying on precise estimates of the present value of the total debt reduction, we can compute the average price of debt reduction for the deal as a whole. It has been estimated that the PV of debt reduction is given by $11.6 billion [see Van Wijnbergen (1990)]. One must add the $7 in enhancements to get the total value of the reduction in obligations, $18.6 billion. The cost of the operation was $7 billion, implying that the average price of debt reduction of (7/18.6)=0.38. Note that prices in the secondary market were quite volatile in the period leading to the Brady speech and the beginning of the Mexican debt negotiation, fluctuating between 35 cents and 40 cents.

We can now compute the net cost of debt reduction, given that new money was available. However, the price of Mexican debt was not quoted after the deal, because trading became concentrated in the newly created bonds. To extract the price of Mexican risk, therefore, we turn to bond prices. After the completion of the deal, the discount bond price stabilized at 65 cents. To compute the

[9]The agreement further specified a certain number of relending options, in which the banks would be allowed to relend, up to a certain maximum fraction, their claims to Mexican public companies. In addition, banks participating in the debt relief are eligible to participate in a debt-for-equity swap program of at most $1 billion per year. The program would involve public sector companies currently undergoing privatization and qualified infrastructure projects.

implicit price of pure Mexican debt, remember that each discount bond is a mixture of pure Mexican risk and collateral. Starting from a discount bond, we get a unit of Mexican pure risk by stripping the 18 month interest payments and the principal, adding 18 months and a principal of risky debt, and dividing by .65 to adjust for size. Thus, the post-deal price of pure Mexican risk P = [65-24.278(1-P)]/65. Solving, we get P=46. Thus, a new money lender transferred (at least) 54 cents per dollar of new loan (and probably more since the market price includes the value of leverage rights). Thus overall, Mexico paid at most 7-(1.35)(.54)=$6.27 billion, and got $18.6 billion of face value debt reduction, implying a net price of (6.27/18.6)=34 cents. The proximity of the net cost to the average cost is due to the small size of the new-money contribution.

The small number of banks which chose the new-money option in the Mexican program can be easily understood by focusing on the decision faced by the marginal bank. On the one hand, it could exit partially for 38 cents on the dollar and a small regulatory cost (only 35 percent of each interest payment has to be written off each year). And on the other, he could relend for a value of (1.21)(.46)-.21=.35, plus some "excess leverage rights" (remember that the price of .46 is computed on the basis of bond prices that under-represent debt value for non-exiting banks). It is therefore no surprise that given the relatively large new-money call, only the very weak banks chose the relending option. However, since no data exists for other hypothetical programs, there is insufficient evidence to conclude that Mexico was on the wrong side of the "New-money Laffer curve" alluded to earlier.

The results of the calculations in this section are summarized in Table 1. It can be seen that the 1987 Mexico deal, which we argue here can be better understood as a straight buyback program, ended up with a "net buyback price" of $0.50, which is quite close to the average pre or post buyback price. On the other hand, the menu programs conducted by the Philippines and Mexico both succeeded in achieving terms below the average price. The Philippines deal was quite successful, repurchasing debt worth $0.50 at a net price of $0.24. The Mexican deal was relatively less successful, due to the small number of banks

Table 1

Mexico and the Philippines: The deals of 1987 and 1989

Country Year	Mexico 1987	Mexico 1989	Philippines 1989
Program	Buyback	Menu	Menu
Face Value of Debt Reduction	$492 Million	$18.6 Billion	$1.3 Billion
Pre-deal (estimated) price	$0.50	$0.40	$0.50
Buyback price	$0.50	$0.38	$0.50
Gross cost of deal	$246 Million	$7 Billion	$650 Million
Face value of new money (PV)	0	$1.3 Billion	$750 Million
Implicit new money tax	0	$730 Million	$336 Million
Post-deal price	$0.50	$0.46	$0.54
Net cost of deal	$246 Million	$6.3 Billion	$314 Million
Net buyback price	$0.50	$0.24	$0.34

which chose the new-money option. However, the ability of this deal to obtain a debt repurchase below the pre-deal average price also conflicts with the predictions in the literature for straight buyback deals.

6. Concluding Remarks

Two main results emerge from the above paper. First, the dominance of the menu program over the standard buyback and new-money options is quite robust. The market-based approach, which does not require debtors to have knowledge concerning the portfolios of individual banks proves to be adequate in achieving a relatively large degree of discrimination with a relatively small number of instruments. Obviously, an increase in the number of instruments would allow for even greater discrimination. It comes as no surprise, then, that more recent deals have seen a proliferation in the number of different instruments in the package, such as discount and "par bonds,". A thorough analysis of the performance of these more complex financial instruments which have been used in market-based debt reduction deals is left for future research.

Once the buyback is seen as a mechanism for discrimination by debtors, rather than an instrument which addresses a costly "debt overhang," the conventional wisdom concerning the role of buybacks and the optimal level of buyback activity is drastically changed. The debtor uses the menu program to allow for exit by banks which are relatively less willing to participate in a new-money program. The benefits of debt reduction in this context, as opposed to the "overhang" literature, consist of "buying out" banks which are hindering the magnitude of new money attainable to the debtor. Note that more debt may be desirable overall in this context, but the debtor may still choose to repurchase debt from some banks in order to acquire better terms with remaining banks.

Second, the menu approach sheds a new light on some of the accepted empirical prescriptions concerning the desirability of debtor-financed debt reduction. The Bulow and Rogoff literature has highlighted the point that pure debt reduction is in almost all cases undesirable from the debtor's point of view, due to the capital gains which accrue to remaining lenders. However, once these capital gains can be recovered by the debtor, through a concerted program with new money requirements, the parameter space in which one would choose a large level of debt reduction is exactly reversed.

With a menu program, the role played by debt buybacks is not one of purchases at bargain prices. Indeed, as we argued above, the existence of a deposit-insurance subsidy actually suggests that debtors will not face fair prices in the secondary market. The debt buybacks in a menu program are designed to facilitate discrimination across heterogeneous creditors. As a result, when the ability to discriminate across creditors is greater, ie. when the elasticity of bank exit prices with respect to the level of repurchases is higher, the debtor will actually choose a larger level of exit, contrary to the predictions of the simple Bulow-Rogoff framework for straight buybacks.

Finally, our analysis also highlights the inherent limitation of the Brady approach to solve the debt crisis. As argued before, large debt reductions are bound to be expensive to achieve. But in addition, menus can impose a fair burden sharing between exiters and non-exiters only to the extent that the value of debt after the deal is completed remains below par. The menu mechanism to debt reduction must thus be viewed as a method to alleviate a debt overhang at potentially good terms, but it does not seem as a particularly attractive way to bring debtor countries all the way to creditworthiness and voluntary access to the international credit markets.

APPENDIX

I. Proof of Lemma 1:

The value of the deposit-insurance subsidy is the difference between the bank's cost of funds under the insured-deposit regime and its cost of funds in the absence of deposit insurance. In the absence of deposit insurance, the bank would have to compensate depositors for their losses in bankruptcy states. A representative bank j would have to pay R_u^j, which satisfies:

$$DR = \left(DR_u^j [1 - F(\lambda_u^j)]\right) + \left[\int_0^{\lambda_u^j} [\sum_i \omega_i a_i^j \lambda \bar{R}_i] f(\lambda)\, d\lambda\right]. \tag{A.1}$$

Substituting R_u^j into (2), the value of an uninsured bank is:

$$V_u^j(A^j) = (\frac{1}{R})(1 - t^j) \int_0^1 \left(\sum_{i=1}^m (\omega_i a_i^j \lambda \bar{R}_i) f(\lambda) - D^j \frac{R_u^j}{R} \right) d\lambda. \tag{A.2}$$

The value of the deposit-insurance subsidy is equal to the difference between $V_1^j(A^j)$ and $V_u^j(A^j)$. From equations (2), (A.1), and (A.2), γ_1^j is equal to:

$$\gamma_1^j = (\frac{1}{R})(1 - t^j) \int_0^{\lambda_1^j} \left[D^j R^j - \sum_{i=1}^m \omega_i a_i^j \lambda \bar{R}_i \right] f(\lambda)\, d\lambda \tag{A.3}$$

alternatively:

$$\gamma_1^j = (1 - t^j) \frac{A_1^j}{R} \int_0^{\lambda_1^j} \left[(1 - k_1^j) R - \frac{\lambda}{E(\lambda)} \right] f(\lambda)\, d\lambda \tag{A.4}$$

where $\lambda_1^j = \dfrac{(1 - k_1^j)}{E(\lambda)}$.

II. Proof of Lemma 2:

Differentiating γ_2^j with respect to e yields:

$$\frac{\partial \gamma_2^j}{\partial e} = (1 - t^j) \left(\frac{\partial A_2^j}{\partial e} \frac{\gamma_2^j}{A_2} + \frac{A_2}{R} \left[\int_0^{\lambda_2} \frac{\partial (1 - k_2)}{\partial e} f(\lambda)\, d\lambda + \frac{\partial \lambda_2}{\partial e} F(\lambda_2) \right] \right) \tag{A.5}$$

where $F(\lambda_2) = (1 - k_2) - \dfrac{\lambda_2}{E(\lambda)}$, which is equal to zero by definition. Recalling that the alternative to a unit of exit is retaining the unit and lending new money, we can derive:

$$\frac{A_2^j}{\partial e} = p^b - [p_{21} + n(p_{21} - 1)] > 0.$$

$$\frac{\partial(1-k_2)}{\partial e} = - \frac{\partial A_2}{\partial e}\frac{(1-k_2)}{A_2} < 0.$$

Equation (A.5) therefore reduces to:

$$\frac{\partial\gamma_2^j}{\partial e} = - \frac{\partial A_2}{\partial e}\int_0^{\lambda_2} \frac{\lambda}{E(\lambda)} f(\lambda)\, d\lambda < 0. \tag{A.6}$$

Differentiating with respect to e again yields:

$$\frac{\partial^2\gamma_2^j}{\partial e^2} = - \frac{\partial A_2}{\partial e}\frac{\lambda_2 f(\lambda_2)}{E(\lambda)}\frac{\partial\lambda_2}{\partial e} < 0 \tag{A.7}$$

since $\frac{\partial\lambda_2}{\partial e} = - \frac{\partial A_2}{\partial e}\frac{(1-k_2)}{A_2 E(\lambda)} > 0$. Moreover, the cross-partial is equal to:

$$\frac{\partial^2\gamma_2^j}{\partial e\partial(1-k_2)} = - \frac{\partial\lambda_2}{\partial(1-k_2)}\frac{\lambda_2}{E}(\lambda) f(\lambda) < 0 \tag{A.8}$$

since $\frac{\partial\lambda_2^j}{\partial(1-k_2)} = \frac{1}{E(\lambda)} > 0.$

III. Proof of Proposition 3:

Totally differentiating equation (16):

$$\frac{\partial q}{\partial p^b} = \frac{\frac{\partial h}{\partial p^b}}{1 - \frac{\partial h}{\partial g}\frac{\partial g}{\partial q}} > 0 \tag{A.9}$$

$$\frac{\partial p_{2,1}}{\partial p^b} = \frac{\partial g}{\partial q}\frac{\partial q}{\partial p^b} > 0 \tag{A.10}$$

$$\frac{\partial \alpha}{\partial p^b} = q + \frac{\partial q}{\partial p^b} p^b > 0 \tag{A.11}$$

$$\frac{\partial N}{\partial p^b} = -n\frac{\partial q}{\partial p^b} < 0 \tag{A.12}$$

$$\frac{\partial \delta_2}{\partial p^b} = \frac{\partial N}{\partial p^b} - \frac{\partial q}{\partial p^b} < 0 \tag{A.13}$$

$$\frac{\partial q}{\partial n} = \frac{\frac{\partial h}{\partial g}\frac{\partial g}{\partial n} + \frac{\partial h}{\partial n}}{1 - \frac{\partial h}{\partial g}\frac{\partial g}{\partial q}} > 0 \tag{A.14}$$

$$\frac{\partial p_{2,1}}{\partial n} = \frac{\partial g}{\partial q}\frac{\partial q}{\partial n} + \frac{\partial g}{\partial n} \tag{A.15}$$

$$\frac{\partial \alpha}{\partial n} = \frac{\partial q}{\partial n}p^b > 0 \tag{A.16}$$

$$\frac{\partial N}{\partial n} = (Q-q) - n\frac{\partial q}{\partial n} \tag{A.17}$$

$$\frac{\partial \delta_2}{\partial n} = (Q-q) - (1+n)\frac{\partial q}{\partial n} \tag{A.18}$$

IV. Proof of Proposition 5:

To be on the frontier, the debtor will set the exit price for any choice of q such that (13) is binding:

$$p^{b,q} = T^q(p_{2,1}-1)(1+n) + B^q+1. \tag{A.19}$$

where $T^q = \frac{(1-t^q)}{(1-Rt^q)}$ and:

$$B^q = \frac{[\gamma_2^{q,n} - \gamma_2^{q,e}]}{(a_1^q)(1-Rt^q)}. \tag{A.20}$$

However, by definition, $p_{2,1} = \dfrac{f(\delta_2)}{\delta_2}$, which implies:

$$\frac{f[\delta_1 - q(2+n) + Q(1+n)]}{[\delta_1 - q(2+n) + Q(1+n)]} - \left[\frac{p^{b,q} - B^{q} - 1}{T^{q}(n+1)}\right] - 1 = 0 = G(n,q)\,. \qquad \text{(A.22)}$$

Totally differentiating:

$$\frac{\partial G}{\partial q} = \frac{(2+n)\,(p_{2,1} - \frac{\partial f}{\delta_2})}{\delta_2} - \frac{(\frac{\partial p^{b,q}}{\partial q} - \frac{\partial B^{q}}{\partial q})}{T^{q}(1+n)} - \frac{1}{T^{q}}\left[1 - \frac{p_{2,1}}{T^{q}(1+n)^2}\right]\frac{\partial T^{q}}{\partial q} > 0 \qquad \text{(A.23)}$$

when $p_{2,1} > \dfrac{\partial f}{\partial q}$.

$$\frac{\partial G}{\partial n} = -\frac{(Q-q)\,(p_{2,1} - \frac{\partial f}{\partial \delta_2})}{\delta_2} - \frac{(1-p^{b,q}) + \frac{\partial B^{q}}{\partial q}}{T^{q}(1+n)^2} < 0. \qquad \text{(A.24)}$$

So that $\dfrac{\partial n}{\partial q} = -\dfrac{\frac{\partial G}{\partial q}}{\frac{\partial G}{\partial n}} > 0$. Differentiating δ_2 with respect to q:

$$\frac{\partial \delta_2^{*}}{\partial q} = -(2+n)\left[-1 + \frac{(Q-q)\,(2+n)\,(p_{2,1} - \frac{\partial f}{\partial q})}{(Q-q)\,(p_{2,1} - \frac{\partial f}{\partial q}) + \frac{(1-t^{q})\,(1-p^{b,q}+B_q)}{(1-Rt^{q})\,\delta_2\,(1+n)^2}}\right] < 0. \qquad \text{(A.25)}$$

However, $\dfrac{\partial(\alpha - N)}{\partial q}$ is of ambiguous sign:

$$\frac{\partial(\alpha - N)}{\partial q} = \frac{\partial p^{b,q}}{\partial q}q + p_{b,q} + (1+n) - \frac{\partial n}{\partial q}(Q-q) \qquad \text{(A.26)}$$

By equation (A.25):

$$\frac{\partial(\alpha-N)}{\partial q} = -\frac{\partial\delta_2}{\partial q} - (1-p^{b,q}) + \frac{\partial p^{b,q}}{\partial q}\, q \gtrless 0. \tag{A.27}$$

V. **Proof of Proposition 6:**

Consider two equilibrium menu programs on the frontier, $\{p^{b,q}, n|q\}$, and $\{p^{b,\bar{q}}, n|\bar{q}\}$, where $(\delta_2|\bar{q}) \leq (\delta_2|q)$, and $[\alpha^*(q) - N^*(q)] = [\alpha^*(\bar{q}) - N^*(\bar{q})]$. It can be easily shown that while $(c_1|q) = (c_1|\bar{q})$, $(c_2|q) \leq (c_2|\bar{q})$, so menu $\{p^{b,\bar{q}}, n|\bar{q}\}$ is preferred. This proves the global condition. The local condition is derived directly from maximizing (17) with respect to q, given that the debtor chooses the menu on the frontier for each potential choice of q.

References

Bouchet M. and J. Hay, 1989, "The Rise of the Market-Based Menu Approach and its Limitations," in Husain and Diwan eds., Dealing with the Debt Crisis, World Bank.

Bulow, J. and K. Rogoff, 1988, "The Buyback Boondoggle", Brookings Papers on Economic Activity, No. 2: 1988.

——————, 1990, "Sovereign Debt Repurchases: No Cure for Overhang," mimeo, October.

Demirguc-Kunt, A. and I. Diwan, 1990, "The Market-Based Menu Approach: An Analysis of Commercial Banks' Choice Behavior," mimeo, World Bank, Debt and International Finance Division

Diwan, I. and K. Kletzer, 1990, "Voluntary Choices in Concerted Debt Deals: Mechanics and Attributes of the Menu Approach to ... Debt," mimeo, August.

Dooley, M., 1989,

Furlong and Keeley, 1989, "Capital Regulation and Risk-Taking: A Note," Journal of Banking and Finance, vol. 13, 883-891.

Kane, A., 1985, The Gathering Crisis in Deposit Insurance, Cambridge, MA, MIT Press.

——————, 1989, The S&L Insurance Mess: How Did It Happen?, Cambridge, MA, MIT Press.

Kareken and Wallace, 1978, "Deposit Insurance and Bank Regulation: A Partial Equilibrium Exposition," Journal of Business, vol. 51, no. 5, 1978.

Koehn and Santomero, 1980, " Regulation of Bank Capital and Portfolio Risk," Journal of Finance, vol. 35, no. 5,

Lamdany, R., 1989, "Voluntary Debt Reduction Operations," World Bank Discussion Paper no. 42, November.

Merton, Robert C., 1977, "An Analytic Derivation of the Cost of Deposit Insurance and Loan Guarantees: An Application of Modern Option-Pricing Theory," Journal of Banking and Finance, vol. 1, no. 1.

Mitchell, Douglas W., 1986, "Some Regulatory Determinants of Bank Risk Behavior," Journal of Money, Credit, and Banking, vol. 18, no. 3, 374-382.

Penati and Protopapadakis, 1988, "The Effect of Implicit Deposit Insurance on Banks' Portfolio Choices with an Application to International 'Overexposure,'" Journal of Monetary Economics, vol. 21, 107-126.

PRE Working Paper Series

	Title	Author	Date	Contact for paper
WPS650	Administrative Valuation of Soviet Agricultural Land: Results Using Lithuanian Production Data	Karen Brooks	April 1991	C. Spooner 30464
WPS651	Taxation of Financial Assets in Developing Countries	Christophe Chamley	April 1991	A. Bhalla 37699
WPS652	Demographic Response to Economic Shock	Kenneth Hill	April 1991	WDR Office 31393
WPS653	The Effects of Option-Hedging on the Costs of Domestic Price Stabilization Schemes	Donald F. Larson Jonathan Coleman	April 1991	D. Gustafson 33714
WPS654	Reflections on Credit Policy in Developing Countries: Its Effect on Private Investment	Mansoor Dailami Marcelo Giugale	April 1991	M. Raggambi 37657
WPS655	Interest Rate Policy in Egypt: Its Role in Stabilization and Adjustment	Mansoor Dailami Hinh T. Dinh	April 1991	M. Raggambi 37657
WPS656	Relative Deprivation and Migration: Theory, Evidence, and Policy Implications	Oded Stark J. Edward Taylor	April 1991	M. Felix 33724
WPS657	Distributional Aspects of Debt Adjustment	Ishac Diwan Thierry Verdier	April 1991	S. King-Watson 33730
WPS658	Fiscal Policy with Fixed Nominal Exchange Rates: Côte d'Ivoire	Christophe Chamley Hafez Ghanem	April 1991	Raquel Luz 34303
WPS659	Inflation and Growth in the Transition from Socialism: The Case of Bulgaria	Andrés Solimano	April 1991	E. Khine 37471
WPS660	The Development of the Colombian Cut Flower Industry	José A. Mendez	May 1991	N. Artis 37947
WPS661	The Bretton Woods Agencies and Sub-Saharan Africa in the 1990s: Facing the Tough Questions	Richard F. Feinberg	May 1991	S. King-Watson 33730
WPS662	Trends in Social Indicators and Social Sector Financing	Jacques van der Gaag Elene Makonnen Pierre Englebert	May 1991	B. Rosa 33751
WPS663	Bank Holding Companies: A Better Structure for Conducting Universal Banking?	Samuel H. Talley	May 1991	Z. Seguis 37665

PRE Working Paper Series

	Title	Author	Date	Contact for paper
WPS664	Should Employee Participation Be Part of Privatization?	Barbara W. Lee	May 1991	G. Orraca-Tetteh 37646
WPS665	Microeconomic Distortions: Static Losses and their Effect on the Efficiency of Investment	Ramón López	May 1991	WDR Office 31393
WPS666	Agriculture and the Transition to the Market	Karen M. Brooks José Luis Guasch Avishay Braverman Csaba Csaki	May 1991	C. Spooner 30464
WPS667	VERs Under Imperfect Competition and Foreign Direct Investment: A Case Study of the U.S.-Japan Auto VER	Jaime de Melo David Tarr		
WPS668	Inflation Tax and Deficit Financing in Egypt	Hinh T. Dinh Marcelo Giugale	May 1991	L. Santano 80553
WPS669	Are High Real Interest Rates Bad for World Economic Growth	Nemat Shafik Jalaleddin Jalali	May 1991	M. Divino 33739
WPS670	Inflation Adjustments of Financial Statements: Application of International Accounting Standard 29	Yaaqov Goldschmidt Jacob Yaron	May 1991	C. Spooner 30464
WPS671	Lessons from the Heterodox Stabilization Programs	Miguel A. Kiguel Nissan Liviatan	May 1991	E. Khine 39361
WPS672	The Macroeconomics of Public Sector Deficits: The Case of Ghana	Roumeen Islam Deborah L. Wetzel	May 1991	R. Luz 34303
WPS673	The Macroeconomics of Public Sector Deficits: The Case of Pakistan	Nadeem U. Haque Peter Montiel	May 1991	R. Luz 34303
WPS674	Distributional Effects of Adjustment Policies: Simulations for Two Archetype Economies	Francois Bourguignon Jaime de Melo Akiko Suwa	May 1991	WDR Office 31393
WPS675	Are Buybacks Back? Menu-Driven Debt-Reduction Schemes with Heterogenous Creditors	Ishac Diwan Mark M. Spiegel	May 1991	S. King-Watson 33730
WPS676	Higher Education in the Republic of Yemen: The University of Sana'a	Viswanathan Selvaratnam Omporn L. Regel	May 1991	C. Cristobal 33640