An Analysis of Debt-Reduction Schemes Initiated by Debtor Countries

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Don't evaluate a debt-reduction scheme using present-value calculations alone. Look also for efficiency gains that allow both debtor and creditor to gain.

In evaluating the benefits of a voluntary debt-reduction scheme, look for efficiency gains that allow both debtor and creditor to gain. In particular, certain debt reduction operations can:

• Increase the incentives for growth in highly indebted countries.

• Allocate risk more efficiently between debtor and creditors.

• Signal the credibility of a country's willingness to "adjust" its economy to regain credit-worthiness.

• Strengthen the creditors' coalition.

Market-based debt conversion is more likely to improve the debtor nation's welfare when:

• The opportunity cost of foreign exchange is low relative to world interest rates.

• There is a great probability of default (rescheduling) with a deadweight loss to the creditor — and when the cost and uncertainties of reschedulings are high and borne largely by the debtor.

• Private rather than public debt is swapped for equity investments.

• The country has no other way of signaling its commitment and willingness to adjust.

• The country has an extreme case of debt overhang.

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1. Introduction.

Six years into the debt crisis, the prospect for a voluntary return to international financial markets has become more elusive than ever for a large group of debtor countries. In this context, proposals for general debt reduction and debt transformation schemes have been advanced. However, so far these schemes have only been implemented in limited form as commercial banks have opposed a "global", imposed solution that would imply forced write-offs. Banks have been reluctant to relinquish any claims that offer -in spite of the present gloomy situation- an upside potential on the debtors resources, and creditors countries' governments have opposed the use of public money to facilitate such write-offs on the grounds that this would in effect bail out the banks at the expense of the taxpayer.

As a result of the reluctance of the creditors to write-down their claims unilaterally and the limited amount of public support, there has recently been an interest in voluntary debt reductions and transformations (VDRT) initiated by the debtor countries themselves and negotiated on a voluntary, case by case basis using market mechanisms. It has been argued that debtor countries can improve their welfare through transactions that allow them to "capture" part of the discount at which their debts trade on the secondary market. However, the case for VDRT cannot simply be based on this sort of argument: the welfare gains for the debtor cannot be equal to the discount captured if at the same time, the discount is an adequate reflection of expected shortfall in repayments. From a narrow present value point of view, VDRT reallocate resources between the two parties involved with no overall gains. In other words, these schemes are likely zero-net-present-value

games when evaluated narrowly. Moreover, when the financing of the operation reduces investment in valuable economic projects, VDRT represent negative sum games. However, market based transactions require the agreement of not only just the participating selling banks but also of all other creditors,[1] implying that debt claims must increase in value (or at least remain constant). Accordingly, the sum of the present value of payments going to the participating and remaining creditors will not be allowed to decline as a result of VDRT. Thus, VDRT which are at best zero-net-present-value games can in the best circumstances offer no gain to the debtor.

As VDRT operations have been initiated at an increasing scale by debtor countries, it may be that they are non-negative sum games with associated efficiency gains. Pareto improvements can arise if debt reduction, or the contracts which replace the retired debt lead to overall gains which can then be shared between the creditors and the debtor country.[2]

What kind of efficiency gains can arise from debt reduction or debt transformation and how will these be divided among creditors and debtors given the modified structure of external obligations? Our analysis focuses on the following six factors: (a) capital might be misused domestically and thus, debt prepayments might be more productive than domestic investment; (b) debt is evaluated differently by the creditors and the debtor and the debtor country gains by capturing what it considers to be a large discount on its foreign debt; (c) debt reductions can lead to a reduction of dead-weight losses associated with a debt overhang and increase the incentives of the debtor country to adjust; (d) contract changes can lead to more efficient forms of

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[1] Typically the non-participating creditors must waive the sharing provisions that are included in most existing loan contracts.
[2] Of course, not all efficiency gains have to go to the either the debtor or the creditors. Some efficiency gains can be external to these parties.

financing, in particular better risk sharing between the debtor and the creditors and a larger supply of voluntary finance; (e) if small creditors exit, the creditors coalition can aim at longer term solutions; and (f) debt reductions that are in themselves costly to the debtor can act as a credible signal of a willingness to "adjust" the economy in a way that is (more) consistent with the country's debt obligations which produces secondary benefits.

The paper critically analyzes each of the above claims for overall efficiency gains in a unified framework that builds largely on recent developments in the academic literature on country debt. As a consequence, we can characterize the type of market based schemes that simultaneously improves the welfare of all the participants. The main conclusions are that such schemes are hard to find in practice. In particular, debt buybacks are unlikely to benefit both the debtor and the creditors simultaneously unless capital was misused domestically. The paper goes on to argue that the scope of Pareto-improving VDRT is further reduced based on (scant) empirical evidence which shows that only a few countries have a strong enough form of debt overhang that creditors would gain from collectively reducing debt, which also implies that VDRT are more likely to hurt the debtor and benefit the creditors. The paper also shows that the Pareto-improving benefits attributed to debt-equity swaps are only likely to exist under a set of fairly restricted conditions, in particular under the condition that the debtor country is more risk-loving than the creditors.

The outline of the paper is as follows: section 2 analyzes buybacks under a set of neutrality conditions (in particular risk neutrality, symmetric information and rational expectations). This section shows that these schemes are unlikely to improve both the debtor's and creditors' welfare unless foreign capital was initially "misused"

domestically. Section 3 analyzes the various efficiency gains that could be associated with debt buybacks and discusses the conditions under which buybacks could be a positive sum game as well as satisfy the condition that all the participants are at least as well off. Section 4 analyzes debt transformation mechanisms, in particular exit bonds and debt-equity swaps, and investigates how these new instruments score in relation to the generally desirable characteristics of external claims. Section 5 concludes. The appendices include a description of the most frequently used voluntary debt reduction and transformation schemes and a discussion of the recent experience, the proofs of some propositions and some worked out examples.

2. A Simple Analysis Of Debt Buybacks

Let us assume that a country's foreign debt is trading at a discount. What are the effects of a buy-back on the debtor's and on its creditors' welfare? We start the analysis in a simple and quite neutral framework. These assumptions are then dropped in subsequent discussions.

(A1) Both the debtor country and its creditors are risk neutral;

(A2) Both the debtor country and its creditors have similar rates of time preference;

(A3) Creditors are homogeneous and similar in all respects, and the secondary debt market is competitive and efficient, i.e., reflects correctly the anticipated stream of payments received by creditors;

(A4) All that is paid by the debtor accrues to its creditors; and

(A5) The debtor and its creditors have the same information set.

Debt buybacks are effectively prepayments of liabilities as they involve the use of current resources in order to lower future obligations. Given the neutrality assumptions (A1) to (A5), the operation can affect the debtor and the creditors through two channels:

(i) **A Risk Shifting Effect**: the reduction in future obligations makes the remaining debt less risky;

(ii) **A Creditworthiness Effect**: the expenditure of current resources can reduce investment and the future ability of the debtor to pay, increasing risk on the remaining debt.

In general, the resources used in the buyback will be divided between reductions .: consumption and investment in an optimal fashion.[3] To focus on the risk effect, we start the analysis by first considering that only consumption will be reduced. This allows us to analyze the benefits of a reduction in future obligations per se, not a simple matter once the riskiness present in external debt claims is recognized. In the second section, we analyze the creditworthiness effect by considering the case where all the funds used in the buyback come from a reduction in investment and where the resources available in the future are thus reduced.

2.1 The Risk Shifting Effect

With investment fixed, it is best to think of the relation between the two parties as a zero sum game: the debtor's current and (uncertain) future resources have to be divided between itself and its creditors. The buyback only affects the division of output in all periods. The key point is that as the buyback reduces the riskiness of the remaining claims, it shifts the sharing of future output to the detriment of the debtor.[4] To see that, it is important to recognize that in the case of heavily indebted countries, international debt contracts represent risky

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[3] Foreign exchange reserves are treated here as a form of investment.
[4] This is the reverse of a classical argument in corporate finance according to which a new issue of risky debt transfers wealth from the old bondholders to the shareholders. The issuance of "junk bonds" to finance takeovers leads to substantial reductions in the price of old bonds, while at the same time shareprices rise. Moreover, corporations seldom buy back their own bonds unless they are required to do so by the bond covenants. In the case of international debts, this argument is forcefully made in Bulow and Rogoff (1988b).

claims that might not get fully repaid in some circumstances. The actual repayment may deviate from the contractual repayment when the debtor can bargain for a smaller repayment, a situation that arises when output is relatively low, making the threat of default more credible.[5] The repayment in the states of nature where bargaining occurs will be independent of the size of the contractual obligation. As a marginal debt buyback will reduce the contractual future debt repayment in all future states of nature by the face amount of debt bought back and therefore the effective repayment only in the good states, it will only lead to a marginal reduction of the effective repayment in the good states of nature.

For a highly indebted country, it is likely that the probability of a full repayment, i.e., of good states of nature, is small. Accordingly, the expected savings implied by a marginal reduction of the contractual size of debt can be quite small. However, the price at which debt can be reduced through a buyback will reflect the creditors' valuation of the average, across both good and bad states of nature, rather than the marginal reduction in expected debt service. As a result, the debtor ends up overpaying for a marginal reduction in its future debt burden.

To see more precisely the influence of this risk shifting effect on the payoffs of the debtor and the creditors, we consider the simplest intertemporal model of a debtor country. There will be two periods, today (t=1), and the future (t=2). The debtor has an outstanding external debt obligation of D which falls due in the future. The risky nature of external debt is reflected by the fact that it is common

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[5] Output is to be interpreted here as the amount of resources available for external debt service. The threat of default is more credible when the opportunity costs of servicing the debt is relatively high, which is more likely to occur when output is low. This type of result has been derived in bargaining models of international debt either by using a Nash solution or the extensive form of a game. In particular, see Bulow and Rogoff (1988a) and Fernandez and Rosenthal (1988) for further details.

knowledge that the debtor country will only repay all its obligations in the future when the contractual repayment D is below a certain fraction (a) of its future, random output, $Y+f(I)$. Future output is uncertain as the endowment Y is a random variable which can described by a distribution function $G(.)$ and a density function $g(.)$, with a support of $[\underline{Y},\bar{Y}]$. $f(I)$ represents the gross return on the investment I which is undertaken in the first period, with $f'>0$ and $f''<0$. To summarize, the future debt repayment, denoted by R, will be the smallest of D and $a(Y+f(I))$, i.e., $R = \min[D,a(f(I)+Y]$. The secondary market price for debt, p, is taken to be determined by creditors consistent with this repayment behavior.[6]

If the debtor uses an amount X of current resources for a debt buyback at a price p (per unit of future obligations), a reduction in current consumption of X will allow for a reduction of (X/p) of future <u>contractual</u> debt obligations.[7] The actual future debt repayment R will now be given by:

(1) $R(X,p) = \text{Min } [(D-X/p), a(Y+f(I))]$

To close the model, assume that the debtor's welfare is given by a simple intertemporal expected utility function $E(W)=C_1+bE(C_2)$, where C_1 represents consumption in period i, $i=(1,2)$, b is the country's discount factor and E is the expectation operator. The debtor budget constraints are given by;

(2) $C_1 = E_1-X-I$ where E_1 is the endowment in period $t=1$

(2') $C_2 = Y+f(I)-R$

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[6] This assumes rational expectations and homogenous creditors.
[7] We ignore the change in the price of debt as a result of the (announcement of the) debt buyback. For small debt buybacks this assumption is justified. See further section 2.3.

For every level of the variables D, X, and I there will be a cut-off income level Y* below which the remaining debt obligation [D (X/p)] will not be fully serviced and the debtor partially defaults. Y* solves:

(3) $a(Y*+f(I)) = D - (X/p))$

The probability of this happening is G(Y*) (or short G*). We can then write the expected value of the debt service as a function of X and p as follows:

(4) $E[R(X,p)] = \int_{\underline{Y}}^{Y*} a[Y+f(I)]g(Y)dY + (1-G*)[D-X/p]$

We can also write the "price" of a unit of debt as the present value of the expected repayment divided by the amount of outstanding debt:

(4') $p = E[R(X,p)] / [r(D-X/p)]$

where r is the world interest rate. Assuming for simplicity that $r=(1/b)=1$, we can show that:

Proposition 1. A marginal buyback funded by a reduction in consumption is a zero sum game. The transaction **reduces** the welfare of the debtor by [1-(1-G*)/p] and **increases** the wealth of the remaining creditors by the same amount through an increase in the price of the remaining debt.

For a $1 reduction in consumption, the debtor can retire $1/p units of contractual debt obligation. However, this reduces the expected repayment only by (1-G*)/p, where (1-G*) is the probability of full debt service. It turns out that the reduction in the expected repayment will necessarily be less than the $1 used in the buyback.

Mathematically, this is simple to verify.[8] Using (3) and (4) we can prove that $(1-G*)/p < 1$:

$$p = \{ \int_{\underline{Y}}^{Y*} [a(Y+f(I))]g(Y)dY + [D-X/p](1-G*) \} / (D-X/p)$$

$$= \{ \int_{\underline{Y}}^{Y*} [a(Y+f(I))]g(Y)dY / [D-X/p] \} + (1-G*) > (1-G*)$$

Intuitively, the expected reduction in repayment, $(1-G*)/p$, is necessarily smaller than the initial expense of 1 because debt is retired at its average price which is always larger than the marginal reduction in future repayment. In fact, these two values are equal only if the debt is not risky and the price of a unit of debt is one (i.e., $G* = 0$).

The remaining creditors gains are reflected by an increase in the price of debt after the buyback as the remaining debt becomes more likely to be repaid. Differentiating (4) and solving using (3), we have:

(5) $dp/dX_{|X=0} = (1/D)[1-dE[R]/dp]$

$= (1/D)[1-(1-G*)/p] > 0$

Thus, the payoff of the remaining debtholders pD increases by $[(D-X/p)(dp/dX)]$ which, evaluated at $X=0$, is equal to $[1-(1-G*)/p]$. Their gain for a \$1 of buyback is thus \$1 less the discounted value of the expected reduction of future payments which is given by $(1-G*)$ --the probability of full repayment, times the quantity of debt retired $(1/p)$.

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[8] For more rigorous mathematical proofs we refer to Appendix 2.

To illustrate, we use an example where the outstanding debt stock is normalized to D=1. We initially set: r=b=1; a = 0.05; the gross return on investment in the future period is given by f(I)=10; the marginal return on investment is f'=1; the endowment component Y is normally distributed around 0 with a standard deviation of σ, with σ=5[9]. The critical level of Y for which the country will prefer to bargain over the repayment is given by equation (3), which for the chosen parameters implies Y*=10, two standard deviations from the mean of Y. The states in which the country defaults, Y<Y*=10, will then occur with a probability of G*≈0.95. Using (4'), one gets a price of $0.52. A marginal buyback of $X reduces the debt repayment in the good states by $X/p = 1.91X and in the bad states by zero. This implies an expected saving for the country of $.05*X/p = 0.1X, a much smaller quantity than $X, the amount initially spent. The debtor expected net loss is thus $(X-0.1X) = $0.9X. The participating creditors collect $X and are equally well off, as we assumed that the debt buyback was done at the pre-buyback price. The remaining debtholders gain as their expected payoff increases by $[1-(1-G*)/p]*X = 0.9X. Note that the gains for the remaining creditors is due to the fact that the buyback is funded by resources coming out of consumption, implying that new resources have now become available to them.

Figure 1 depicts the effect of different levels of (a) on the debt price, p(a), and the marginal gain for the creditors, g(a). As (a) gets larger, the probability of default decreases and in addition, the creditors can collect a higher fraction of the country's wealth in cases of default. As a result the secondary price is increasing in a. The gain of buybacks to the creditors g(.) decreases in (a) as [(1-G*)/p] goes to one. In fact, the higher the secondary market price, the smaller is the wealth transfer. In the example used, the marginal benefits for the creditors approach zero and the secondary market price approaches 1 when (a) significantly exceeds 0.3.

The effect of a mean-preserving increase in the uncertainty about the country's future endowment is simulated in figure 2 which depicts the effects of a change in σ on the debt price p(σ) and the creditors' marginal gain g(σ).[10] The effect of an increase in standard deviation on the secondary market price turns out, in the case of a normal distribution, to be ambiguous a-priori and the secondary price can decline as well as increase.[11] In the example used, the probability of

default decreases in σ, implying an increase in price and an associated reduction in the marginal wealth transfer to the creditors.

FIGURE 1
Effect of a on the debt price and on the creditors marginal gain in small buybacks"
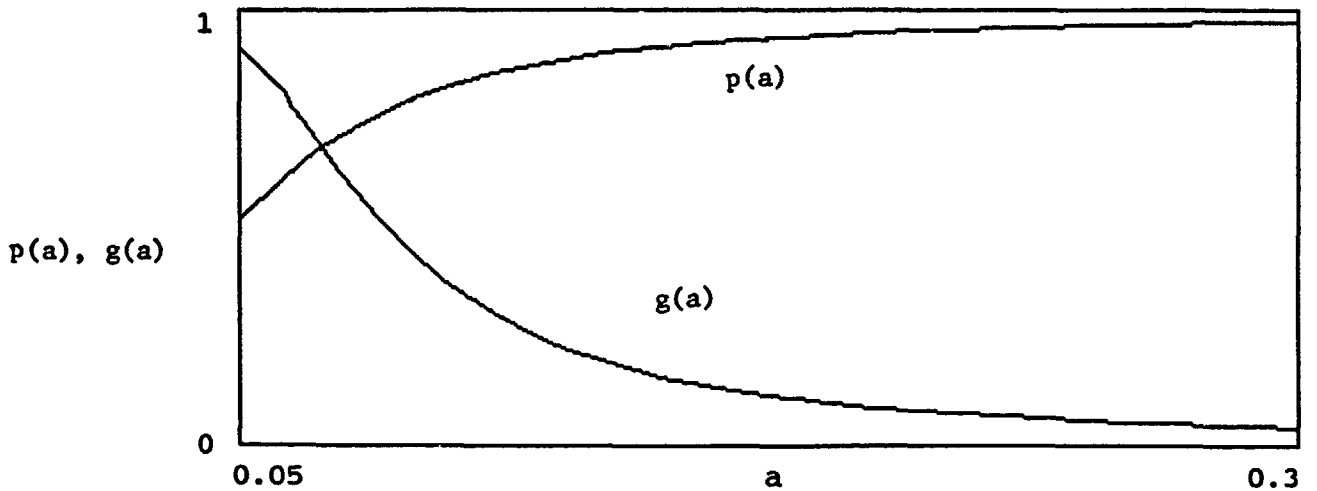
FIGURE 2
Effect of σ on the debt price and on the creditors marginal gain from a small buyback"
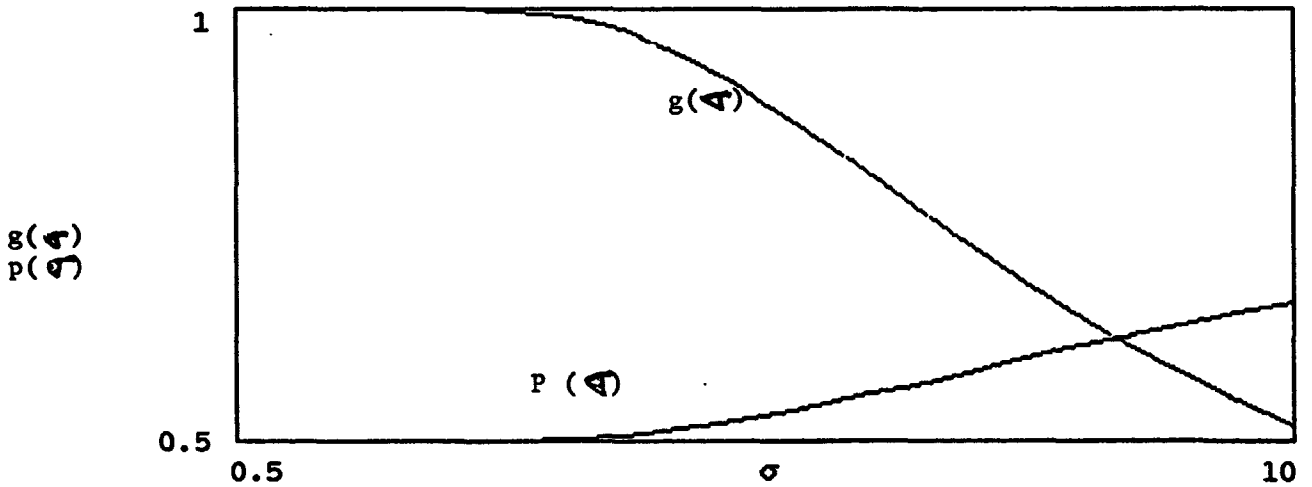
level of Y, the probability of default can go up or down.

2.2 The Creditworthiness Effect

It is unlikely that buybacks will be financed solely by a reduction in current consumption. In general, they would be accommodated by an optimal combination of consumption and investment cuts. If a reduction in investment is used to finance buybacks, the debtor's output is expected to decrease in the future, reducing its "creditworthiness". The remaining creditors will then implicitly pay part of the buyback costs as expected future resources decline. For example, if international reserves are depleted in the operation, expected future repayments can decrease. This creditworthiness effect counteracts the risk shifting effect and makes buybacks less attractive to the creditors and more attractive to the debtor.

In order to appreciate the importance of the source of funds used in the buyback operation, consider that the debt buyback is completely financed by an equal reduction in investment. In terms of our model, this fixes C_1 and implies that I decrease by an amount X. We can show that:

Proposition 2: A marginal buyback financed by a reduction in investment affects the payoffs of the debtor and the remaining creditors by:
$$(6) \quad dE[W]/dX \;=\; (1-G*)/p - f'(1-aG*)$$
$$(7) \quad Ddp/dX|_{X=0} \;=\; 1-(1-G*)/p - af'G*$$

A \$1 of buyback reduces the contractual obligation by \$(1/p) and increases the debtor's future consumption by that amount in the good states. The resulting expected gain in future consumption is \$(1-G*)/p. At the same time, investment goes down by \$1 which reduces expected future output in all states by f', the marginal return on capital. The reduced output in turn leads to a reduction in expected repayments of (af') in the bad states, implying an expected debt relief of G*af'. The remaining creditors gain \$1 minus the expected reduction in future repayments in the good states \$[(1-G*)/p] and in the default states

$[af'G*].[12]

The size of both (a) and (f') are thus crucial in determining the overall effect of a buyback on the debtor's welfare.[13] The debtor stands to gain and the remaining creditors to lose when: (i) (a) is large because in that case, a large part of the costs of the buyback would be financed by the creditors through smaller repayments in the bad states; and (ii) f' is small because the smaller is f' the less costly is the reduction of investment for the debtor.

But, beyond the accounting of gains or losses for each side of the debt contract, what is ultimately more important for debt reduction operations is whether they generate efficiency gains. In our model, efficiency gains can be only secured when funds are put to a better use, that is when f' is smaller than 1, the world's interest rate. Unless this holds, it is easy to show that one side of the debt contract has to lose if the other side gains.[14] To see why this is so, we can compute the overall value of the game by adding (5) and (6). We get:

(8) $[Ddp/dX]+[dE(W)/dX]= 1-f'$

The debt buyback operation is thus a positive sum game only if f'<1, i.e if capital was used inefficiently in the debtor country initially. The efficiency gains of reduced investment can then be shared between creditors and debtor. Otherwise, debt prepayments are a negative sum game and the economic pie gets smaller when loans are prepaid at the cost of reducing investment in ventures with a higher return than the world interest rate.

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[12] The expression for the price effect can be derived as for proposition 1 by differentiating (1) and using (4), and taking into account that the buyback is done at the original price. See further Appendix 2.
[13] Bulow and Rogoff (1988b) and Krugman (1988) present models that are more restrictive. The first paper implicitly assumes that f'=1 while the second takes a=1 and f'=1.
[14] It is also possible that both lose.

To illustrate consider the example of the previous section. Equation (6) implies that the country's welfare is unaffected iff $(1-G*)/[p(1-aG*)] = f'$. Equation (7) implies that the creditors' payoff is unaffected iff $[1 - (1-G*)/p]/[aG*] = f'$. Finally, equation (8) implies that the total economic pie increases iff $f'<1$. These equations, given certain values for σ, $f(I)$ and D, represent implicitly combinations of a and f' that leave respectively the debtor and the creditor indifferent to the buyback operation. Using similar values for the parameters as in the first example, the curves that leave the creditors and the debtor respectively indifferent are drawn in figure 3 in the (a, f') space.[15]

FIGURE 3
Effect of f' and a on the Payoffs
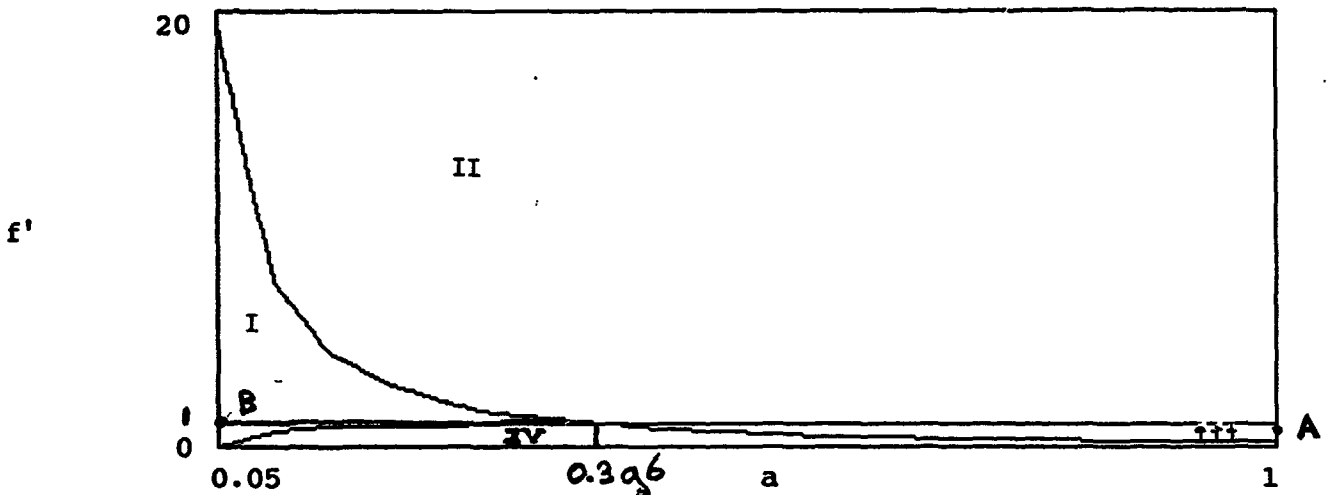
The debtor's indifference curve starts at the origin and flattens out quite rapidly. The creditors' indifference curve looks like a hyperbole, starting at high level of f' for low levels of (a) and approaching f'=0 for a=1. The intersection of the two indifference curves is at f'=1 and a=0.396. The two indifference curves divide the (a,f') space into four sections. When f'>1, at least one side, and possibly both sides lose, as we have shown in equation (8). On the other hand, at least one side, and possibly both gain, when f'<1. More precisely, in sections III and IV the debtor stands to gain as (a) is relatively large and f' is low and in sections II and III the creditors lose as f' and (a) are relatively high. The creditors tend to gain when both f' and (a) are low, which happens in sections I and IV. Only in section IV will buybacks be Pareto-improving.

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[15] Specifically, $\sigma = 5$, D = 1, and f(I) is assumed to be 10.

Some interesting special cases

(i) Assume first, as in the corporate bankruptcy case and in the case considered by Krugman (1988), that f'=1 and a=1 (this situation is represented in figure 3 by point A in section II). Buybacks will then increase the debtor's welfare and reduce the creditors' payoffs.[16] A $1 used for buybacks reduces debt repayment in the good states by $(1/p) dollars and by $1 in the bad states. The debtor comes out ahead because it manages to use its reserves to reduce its repayment in the good states without affecting its repayment in the bad states. With a=1, the country's foreign exchange resources, if not consumed, were always available to the creditors for future debt service. However, the country can use these reserves in the current period to reduce future debt by more than one unit and gain from it. The creditors subsequently lose.

(ii) In the other extreme case, when a≈0 and f'=1, considered by Bulow and Rogoff (1988b), these results are reversed (point B in section I in figure 3).[17] In this case, the debtor bears fully the output reduction in all states and thus finances fully the debt buyback. The risk shifting effect then dominates, and the debtor loses while the creditors gain at its expense. The resources used for the buyback could never have been extracted by the creditors, so effectively prepaying debt is a loss to the debtor.

The amount of resources transferred by debtor countries to (private) creditors in any given year has been at most 10% of GNP and at most 25% of exports. The 1988-1989 edition of the World Debt Tables indicates

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[16] It can be checked that in that case, $dE(W)/dX=(1-G*)(1/p-1)>0$ and $Ddp/dX=1-[G*+(1-G*)/p]<0$.

[17] In terms of the formulae in proposition 2, we have $dE(W)/dX=[-1+(1-G*)/p]<0$ and $Ddp/dX=1-1/r[(1-G*)/p]>0$. For (a) exactly zero the price of debt is zero as the country can always default without any penalty. The result of the limiting case a = 0 implies that $(1-G*)/p$ goes to zero and that $dE[W]/dX=-1$ and $Ddp/dX=1$.

that the highest ratio of debt service to GNP over the years 1980-1987
for the group of all developing countries as a whole was 4.5% in 1987
and 5% for the highly indebted countries. The highest debt service to
export ratio for all countries was 20.2% in 1986; for highly indebted
countries it was 29% in 1986.[18] Taking a debt service to resource ratio
of 10% and using $\rho = 10\%$ yields in our example positive sum outcomes
only when $f' < 0.2$ i.e for large negative returns on investment of the
order of -80 percent. This might be indicative of how "misused" foreign
capital must be in order for buybacks to be able to generate efficiency
gains.

Buybacks financed by cutting investments are thus unlikely to lead
to beneficial welfare effects for the debtor given the considerations
discussed so far. Thus, considering the recent popularity of voluntary
debt reduction and transformation schemes, and if we want to take
revealed preferences seriously, there must exist other ways through
which buybacks remove some inefficiencies. A number of these other ways
will be discussed in section 4.

2.3 Large Swap and Price Effect

So far, our discussion has been for small swaps, which implied that
the price at which the debtor could buy back its debt could reasonably
be assumed not to be affected. For large swaps this would not be
realistic. The country will only be able to buy up its debt at the ex-
post price, which will be higher than the current price assuming
competitive creditors. This is because a rational market will foresee
that a reduction in foreign debt increases the expected future repayment

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[18] The World Economic Outlook, which uses a broad definition of debt
service payments including interest on short-term debt, indicates in its
October 1988 edition that the highest ratio of debt service payments to
exports for countries with debt servicing problems was 39.5% in 1982 and
that the corresponding debt service to GDP ratio was 7%. The figures for
net transfers are even smaller.

per unit of remaining debt and will therefore only sell at the higher

ex-post price. This price effect makes buybacks more costly and less

desirable for the debtor. The extra gains for the creditors will now be

equally split between the participating and remaining creditors.[19]

Figure 4 demonstrates this price effect most clearly, as it plots
the secondary market price p(X) as a function of the relative amount of
debt bought back for the case where the buyback is funded by a cut in
consumption.[20] The variable X should be interpreted as the amount of
resources used for the buyback relative to the stock of debt
outstanding. As one can see from figure 4, the secondary market price
rises significantly with the relative size of the buyback, further
increasing the loss to the debtor and the gains to the creditors.

FIGURE 4
Price Effect of Large Buybacks

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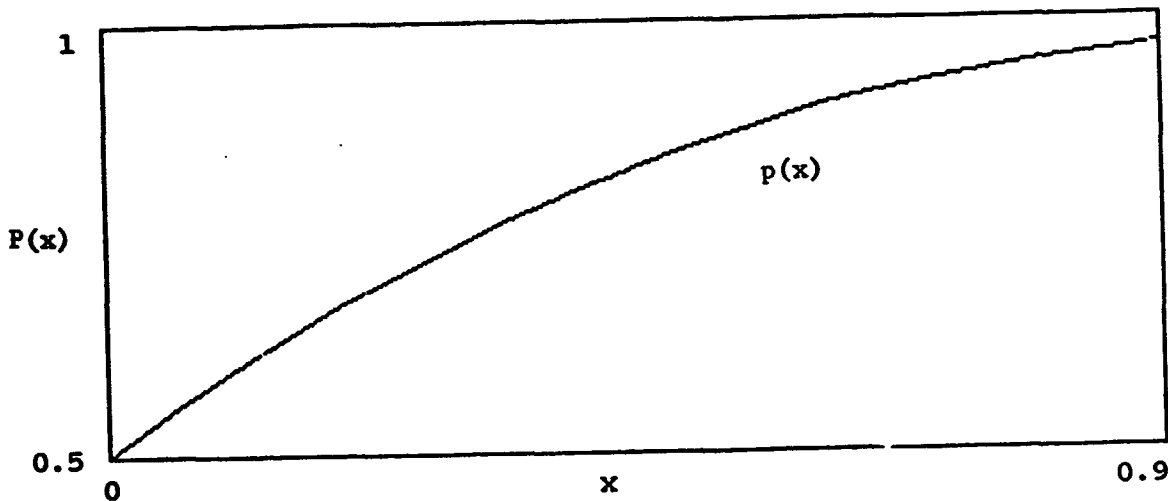
[19] Bulow and Rogoff (1988b) argue that the buyback by Bolivia has
harmed the country as the increase in the secondary market price after
the buyback was so large that the market value of debt (the expected
value of repayments by Bolivia) increased, leaving Bolivia worse off, in
spite of the fact that the funds used for the buyback were donated to
Bolivia. See further Helpman (1987), Dooley (1988) and Rodriguez (1988)
for the effect of large buybacks and the division of gains and losses.
[20] The parameters are a - 0.05, f(I) - 10, σ - 5, f(I) - 10, b-1/r-1,
and D - 1.

3. Positive Sum Games

As we have shown above that debt buybacks are unlikely to occur in the absence of efficiency gains (abstracting from situations where capital was misused initially) we are led to analyze various potential reasons for efficiency gains: (i) the debt contract may be valued differently by the two sides; (ii) with less debt outstanding, the debtor may be more inclined to expend more effort (on producing future resources) because relatively more of the future benefits of its "efforts" can be kept; (iii) a costly buyback (from the debtor's perspective) can signal that the debtor is relatively credit-worthy and willing to increase its investment effort; (iv) buybacks can reduce creditors' coalition problems as certain "problem" creditors exit; and (v) there might exist differences in valuation among creditors so that what was in the previous analysis a loser can be reinterpreted as a pessimistic gainer.

3.1 Differences In Valuation

Let us drop assumptions (A2) and (A4) of section 2 and explore the possibility that each side of the debt contract values the cash stream arising from the debt obligation differently. We use the basic case of the previous section, with the assumption that the funds for the buy-back are made available through a reduction in consumption.

In a rational and efficient market, the price of an asset is given by the sum of the discounted expected repayments **received** by the asset holders. Similarly, the value of a liability to the debtor country is given by the sum of the discounted expected payments **made**. Differences in valuation can only arise when: (i) future cash flows are evaluated differently, i.e., discount factors are not equal; (ii) the amounts paid by the debtor are different from those received by the creditors; and (iii) probabilistic assessments differ. In this latter case, it is

natural to believe that the debtor possesses superior information about relevant variables. However, unless the buybacks were kept secret, the operation would reveal favorable information and drive prices up. We leave the discussion of this factor to section 3.4 and analyze here (i) and (ii).

Let us denote by (c) the proportion of output received by the creditors in the bad states of nature which may be different from (a), the share of output paid by the debtor. The presumption is that (a) is larger than (c). One reason for this wedge is that the penalties that are imposed by the creditors in case of a partial default do not necessarily accrue to them as net benefits. For example, penalties as trade embargo do not benefit the creditors (c=0), but imposes costs on the debtor (0<a<1);[21]. Moreover, negotiations and constant rescheduling exercises are costly partly because of temptations for posturing in order to extract concessions[22] [23] and the uncertainty surrounding debt negotiations generates dead-weight losses in the debtor country as the private sector becomes less inclined to invest domestically, and more inclined to save abroad. Finally, regulatory and tax regulations in the creditors countries can also generate valuation wedges: for non-performing loans, an important cost to the lender will be the tying up of reserves due to regulatory guidelines. Moreover, selling loans at a discount allows the bank to take tax losses making the repayment

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[21] The notion that the payments made by the debtor can be significantly smaller than the payments received by the creditors has been disputed by Bulow and Rogoff (1988a) that stress the ex-post irrationality of such a Pareto dominated settlement; instead of punishing defaulting countries, debtor and creditors are better off (ex-post) agreeing on a partial default that divides the costs of the penalty among themselves.

[22] Rotemberg (1988) develops a more formal model in which debt repurchases are advantageous for all parties because of a reduction in bargaining costs. In his model, the bargaining costs are large when sovereign debts are large and the costs are borne by the creditors. As a result reductions in debt can lower bargaining costs and improve both parties' welfare. See also Morande and Schmidt-Hebbel (1988).

[23] For example, the cost of the Brazilian moratorium of 1987 has been estimated to about $12 billion. This includes the cost of reduced trade lines and of lost interest on official reserves.

received larger than the repayment made.[24] Thus, a strong case can be
made for (a) being larger than (c): not all costs and payments borne by
the debtor in case of a default or bargaining situation accrue to the
creditors.[25]

Let us also allow the creditors discount factor, $1/r$, to be
different from the debtor's discount factor, b. In a manner similar to
(but more general than) proposition 1, we can show that[26]:

Proposition 3. A marginal buy-back funded by a reduction in consumption
is a game with a total marginal payoff of

(9) $[(1-G^*)/p][b-(1/r)] + [g^*D/(apr)](1-c/a)$

The transaction affects the welfare of the debtor marginally by

(10) $dW/dX = -1+b(1-G^*)/p$

and the wealth of the remaining creditors marginally by

(11) $Ddp/dX = 1-[(1-G^*)/pr]+[g^*D/(apr)](1-c/a)$

The total payoff generated by the transaction is comprised of two
elements, one due to discount rate differences and the other due to
differences between payments made and received in the bad states.
Indeed, if $b=1/r$ and $a=c$, the payoffs in equation (9), (10) and (11)
reduce to the payoffs given in Proposition 1. In particular, the sum of
the game in (9) becomes zero.

The first effect, the discount rate effect, is positive when $b>1/r$,
i.e., when the debtor is less impatient than the creditors. In that
case, a Pareto improving transaction is for the debtor to lend, or
similarly, to prepay debt. When $a>c$, the second effect is positive and

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[24] However, a sale of a loan in the secondary market can oblige the
seller to take an accounting loss and may contaminate the rest of the
loan portfolio, obliging the seller bank to increase its loan loss
reserve considerably.
[25] See Eichengreen and Portes (1988) for similar arguments in terms of
the debt crisis of the 1920's.
[26] The secondary market price will now be defined as before with the
exception that a is replaced by c.

is due to the marginal saving of resources that would have been wasted in the event of a partial default.

The effect of a $1 of buyback on the debtor's expected future debt payments is given by a reduction in debt payment of $(1/p) in all the good states that occur with a probability of (1-G*). As (c) gets smaller, the price, which reflects the present expected value of what accrues to the creditors (see equation 4 with a replaced by c), decreases. Thus, the expected reduction in future repayments in the good states increases per unit of buyback. The debtor country will be relatively better off with a buyback when c is small and b and r are large, but in general, can still be expected to lose from a buyback. Indeed, it is easy to verify that even in the extreme case where c=0, the added benefit of a $1 of buyback does not offset the risk shifting effect unless the debtor's discount rate is smaller than the creditors discount rate. To see that, we can evaluate equation (10) at c=0[27]. The effect on the debtor of a marginal buy-back is then given by [-1+br] which is necessarily negative when b<1/r. As it is more likely that the country's discount rate will be higher than the creditors', it is more likely that the buybacks will hurt the country and benefit the creditors when funded by reductions in consumption, even for large differences in valuation.

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Some of these effects are illustrated in figure 5 which plots the total gains T(a) and the gain and losses for the debtor D(a) and the creditors C(a) as a function of the fraction (a) of output that the debtor repays while keeping (c) constant (alternative we could have kept (a) constant and changed (c)).[28] The total gains and the gains for the creditors initially increase with a and than decrease.[29] The debtor's

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[27] Impose c=0 in (4), p=(1/r)(1-G*) and plug in (10).
[28] The parameters used were f(I) = 10, σ = 5, c = 0.02, b = 0.95, r = 1.4.
[29] The reason is that, for b > 1/r, the total gains and the creditors gains depend positively on the marginal density function g*, which, in

loss is primarily due to the risk shifting effect and declines in (a).
With high levels of (a) the debtor is less likely to give up resources
through the buyback that were not already at the effective disposal of
the creditors.

As shown above, the debtor can only expect to increase its welfare
provided that $b \gg 1/r$. To show the range of $b > 1/r$ for which there is
room for gains for the debtor, we plot the total gains and gains and
losses for the creditors and the debtor as a function of b in figure 6,
where T(b) stands for total gains, C(b) stands for creditors' gains and
D(b) stands for debtor's gains as a function of b.[30] As can be seen from
figure 6, b has to be large to make the buyback welfare improving for
the debtor.[31] Creditors are unaffected by a change in b.

Similarly, the effect of different values of r on the gains and
losses can be plotted. Figure 7 does this.[32] The debtor's payoff D(r) is
only positive for large values of r, which would imply that the
creditors must be more impatient than the country, something that does
not seem likely given the high real interest rates in many HICs. The
marginal payoff for the creditors C(r) is not dependent on the level of
r. The intuition for this result is that the buyback allows the debtor
to prepay debt at a price which reflects the creditors' opportunity
costs r; as a result the creditors marginal payoff does not depend on
the level of r.[33] The total marginal payoff function T(r) runs parallel
to the debtor's payoff function.

3.2 Investment Incentives

Strong arguments for debt transformations and reductions can be

made in situations of a severe debt overhang. These arguments run

parallel to those made in the context of domestic bankruptcy or

financial distress:[34] not only does the negative transfer of resources

reduce the amount of savings that can be used for investment and growth,

but the prospect of constant rescheduling weakens the incentives of

debtor countries to cut consumption and increase investment sufficiently

to grow out of the crisis. In effect, the constant negotiations over the

"new money" packages that are needed to fill the financing gaps imply

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case of the normal distribution, first increases and then decreases.
[30] Other parameters are a - 0.5, c - 0.05 and r - 1.4.
[31] In terms of equations 9 and 10, b has to be larger than $(1/r)[1 + (\int c(Y+f(I))dG(Y))/(1-G*)]$.
[32] The parameters are σ - 5, b - 0.95, a - 0.08, c - 0.02 and f(I) - 10.
[33] This can also be shown using the equations above. As equation (11)
shows, the gains for the creditors are inversely related to the product
of p and r. However, as p is inversely related to r, the product pr is
independent of r. The creditors total value of the claim does depend of
course on the level of r.
[34] See Myers (1977).

FIGURE 5
Effect of a on the Payoffs
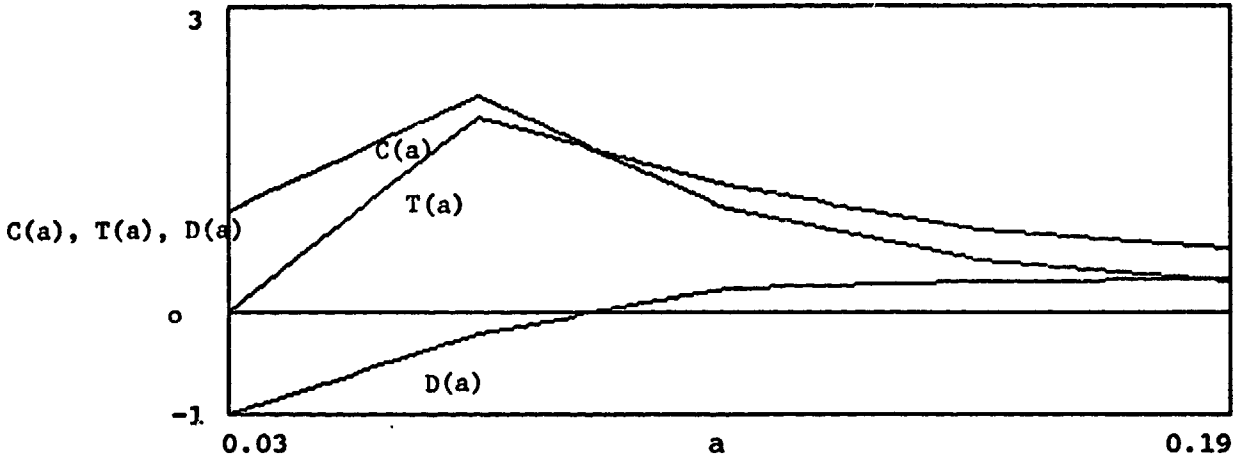
FIGURE 6
Effect of b on the Payoffs
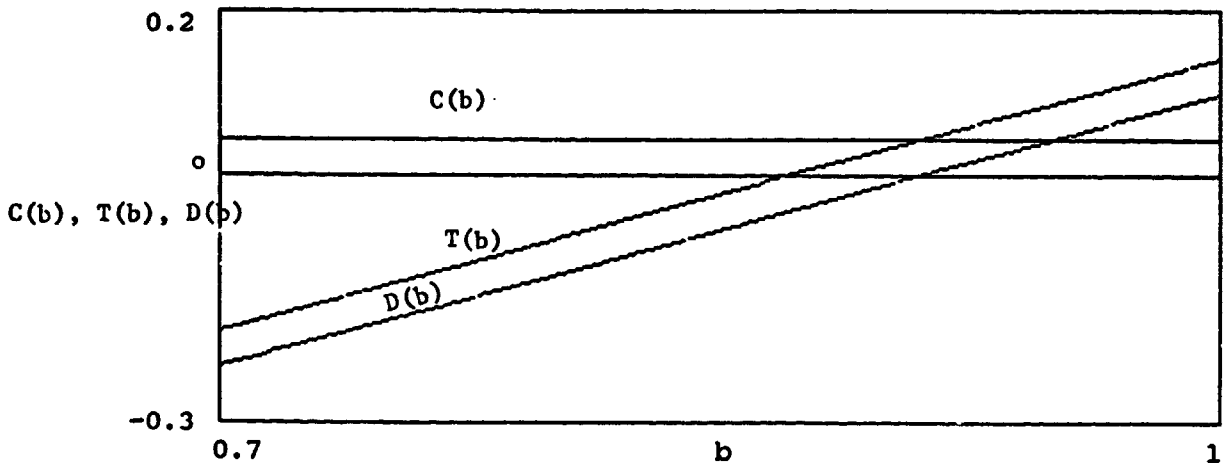
FIGURE 7
Effect of r on the Payoffs
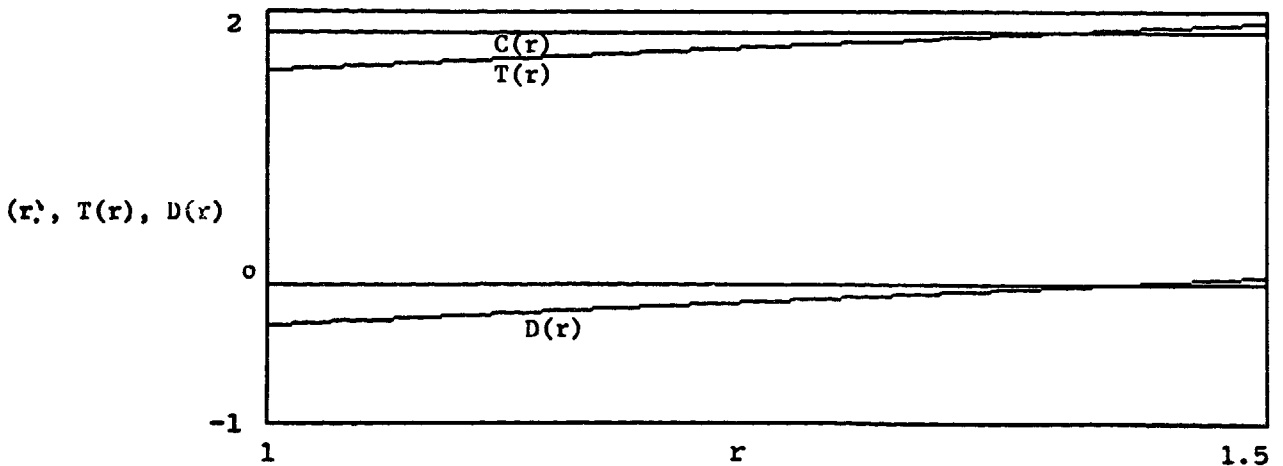
that, at the margin, any improvement in a debtor's balance of payments benefits first and mainly its creditors. This perverse incentive effect of a "Debt Overhang" is reinforced by the elusive nature of a potential restoration of creditworthiness and of a renewed access to the international financial markets.

This view about the interaction between investment incentives and the level of foreign debt has recently been described by Sachs (1988) and by Krugman (1988) in terms of a "Debt-Relief Laffer Curve". In this view, over-indebted countries have little incentives to adjust their investment/saving decision in a way that is more compatible with their foreign obligations. Equivalently, austerity measures (such as reduced public sector deficits) aimed at increasing investment, growth, and the future capacity to service foreign debts are less tempting when a large proportion of the return on these measures goes to the foreign creditors rather than to future consumption. As a result the market value of debt will fall when the nominal value of debt increases beyond a certain level. These considerations could provide the creditors as a collective group with a good reason to write down the nominal value of their claims (or to reduce the interest rate charged in rescheduling agreements), as it would increase the market value of claims.

At least conceptually, one can show that a reduction in the debt face value can increase the incentives to adjust. Actually, one can show that the first best cooperative response to an overhang involves contingent debt write-offs: in the aftermath of bad shocks, the debtor must know that it will not be asked to repay all the fruits of its adjustments efforts and in good states of nature the debtor must be asked and is willing to repay more.[35] But in reality, such agreements are hard to implement without a strong enforcement and monitoring agency, an identification of the truly exogenous shocks, and the

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[35] See Froot et al. (1988).

resolution of free riding problems. Short of a first best resolution, uncontingent debt transformations and reductions can be interesting for the creditors as a second best alternative for those debtor countries suffering from an acute overhang.

But creditors have consistently rejected the notion of simply writing off and extinguishing loans.[36] There are two possible reasons for this position: (i) empirical evidence shows that for most debtor countries it is likely that th value to the creditors of the option of collecting in good states of nature exceeds the efficiency gains generated by write-offs, i.e., most debtor countries are on the side of the Laffer-curve which is upwards sloping;[37] and (ii) in the rare cases where write-offs can become profitable to the creditors group as a whole, free-rider problems within the creditors coalition may prevent such actions, with small creditors refusing to sacrifice their claims for the good of the group and large creditors refusing to foot the bill all by themselves without a fair burden sharing.[38]

Given these constraints on creditors, market based debt operations initiated by the debtor could be a way to accomplish beneficial debt transformations and reductions within a competitive creditors coalition. The creditors may allow buybacks which directly reduces the total amount of nominal claims without the problems of free-riding. At the same time the buyback might provide on net the proper incentives for the debtor to

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[36] The Institute for International Finance has recently stated that debt forgiveness--that is mandatory debt cancellation-- is not in the interest of the highly indebted countries and that banks would require compensation if creditors' countries governments were to consider such scheme. Evidently, this organization representing the major banks does not consider collective debt write-offs to be in the collective interest of the creditors.

[37] In addition, very bad shocks for banks are likely to be met by government intervention and bail outs, either directly or though the forms of implicit and explicit deposit insurance, making write-offs less attractive.

[38] See further Sachs (1989) who argues that the free-rider problem is the main issue preventing writeoffs.

grow and adjust faster and thus to repay more in the long run. A precondition is that the debt reduction be a positive sum game, i.e., that the total future resources increase as a result of the buyback. We will model this by assuming that investment reacts positively to debt reduction.

We use the same setup as we did above. We will introduce the parameter d which indicates the sensitivity of investment to income, i.e., $dI/dX = -d$. A negative d implies that investment will increase as a result of the buyback as the reduction in the debt overhang removes some of the disincentives of investing. In section 2.1 and 2.2 we used $d=0$ and $d=1$ respectively. Aggregate consumption will thus be reduced by the amount of the buyback plus the increase in investment, i.e., $dC_1/dX = (-1+d)$.[39]

Doing the math, we can show that the welfare effects are given by:

Proposition 4. A marginal buyback that affects investment produces the following marginal effects on the value of the game and on the payoffs of the debtor and the creditors:

(12) $dE(W)/dX = -1 + d + b[-G*(1-a)f'd + (1-G*)/p - (1-G*)f'd]$

(13) $Ddp/dX = (1/r)[r - G*af'd - (1-G*)/p]$

(14) $dE(W)/dX + Ddp/dX = d + (b-1/r)[G*af'd+(1-G*)/p] - bf'd$

The special case $b=1/r$ (the total gains reduces to $d(1-f'/r)$) shows clearly that the buyback will only be a positive sum game when either

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[39] Froot (1988) derives d endogenously by the optimization of the country's welfare with respect to investment. Using that approach here, we can derive that $dI*/dX = -[f'g(Y*)/p]/[f''(1-aG*) + f'ag(Y*)f']$, which is > 0 by virtue of the fact that the denominator is the second order condition for the optimal level of investment. The lower the debt level, the higher the expected returns will be and the higher investment will be. Of course, it is assumed that the marginal utility of first and second period consumption are not affected. A more general utility function would be $U(C1) + b(U(C2))$. Future debt obligation will have in this case a proincentive and disincentive effect on investment: on one hand a large debt obligation spurs investment as the marginal utility of second period consumption is likely to be high; on the other hand, the large debt obligation reduces the effective return on the investment. In such a case, $dI*/dX$ can be positive or negative depending on the magnitude of the income and substitution effects, which, as Helpman (1987) shows, can depend on the degree of relative riskaversion. This issue is also discussed by Corden (1988).

d>0 and f'<r or when d<0 and f'>r. The first case was considered in section 2.2 where d=1: investment was reduced one-to-one with the resources required for the buyback. In section 2.1, we examined the case with d=0. The case d<0 is the one that ties in with the debt relief Laffer curve: the reduction in nominal debt leads to an increase in investment, which, assuming profitable investment opportunities evaluated at the world interest rate, leads to surpluses which can be divided between the debtor country and the creditors. For the appropriate combinations of parameters, both parties can gain from a debt buyback: the debtor gains as output at its disposal is sufficiently increased to compensate for the initial outlay for the buyback and the increase in investment; and the creditors gains as the market value of remaining claims increases.[40]

We can split up the interesting cases for d>0 and d<0 by f'>r and f'<r, and for a=0 or a=1. For convenience we assume that b=1/r and we further limit d<1, i.e. the buyback can not lead to more than a one-to-one reduction in investment. The different possible combinations, including the ones discussed in section 2.1 and 2.2, and the corresponding gains and losses, as far as they can be signed, are now indicated in Table 1.[41]

The table shows clearly that no combination of the important

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[40] Being on the wrong side of the debt relief Laffer curve is not a necessary condition for the existence of positive sum debt buybacks for the group of creditors as a whole and the debtor country nor a sufficient condition for debt buybacks that make both parties better off. To see this, one can use the following analysis. The slope of the debt relief Laffer curve, $dE(R)/dD$, is equal to: $\{+pG*af'd + (1-G*)\}$. Only when d is sufficiently smaller than 0 can the slope of the Laffer curve be negative. However, for positive sum games d only needs to be marginally smaller than 0 (and f'>r, equation 14). So, being on the wrong side of the Laffer curve is too strong a condition for efficiency gains achieved through simple debt reductions, but a necessary condition for implementation of market based debt reduction schemes. This is another reflection of the inefficiencies of non-contingent debt reductions.
[41] A detailed discussion of each of the cases is found in apppendix two.

variables assure that the debtor gains from the buyback: even if the buyback is an overall positive sum game the debtor can still lose. In five combinations of parameters it can not unequivocally be determined whether the debtor loses or gains. However, restricting the marginal return on investment to realistic values, it is more likely that the debtor loses.[42] The debtor is only likely to gain when (a) is large and the buyback is a positive sum game, i.e. either d>0 or f'<r or d<0 and f'>r. The creditors come out ahead in all but two cases. They are even likely to gain in cases of parameters which indicate that the buyback is a negative sum game.

Table 1.
Gains and Losses for Creditors, Debtors and Total

cases		Creditors	Debtor	Total
d>0	f'<r a=0	+	-	+
	f'<r a=1	?	?	+
d>0	f'>r a=0	+	-	-
	f'>r a=1	?	?	-
d<0	f'>r a=0	+	?	+
	f'>r a=1	+	?	+
d<0	f'<r a=0	+	-	-
	f'<r a=1	+	-	-

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[42] For instance for d=-1, a=0, r=1, f' has to be larger than two in order for the buyback to generate returns to the country. The incentive effects and the marginal returns would have to be quite large.

3.3 Empirical Evidence

A large number of theoretical observations have been made here, and at other places (Sachs (1988), Claessens and Diwan (1989), Aizenman and Borenzstein (1988), Krugman (1988), Froot (1989)), on the disincentive effects of a debt overhang. However, so far no empirical estimates of the exact magnitudes of these effects on investment and adjustment are available. What is available, are estimates of the relationship between the secondary market prices of LDC debt and the countries' respective amounts of external debt outstanding, the latter relative to standard creditworthiness variables. Examples of this works are Sachs and Huizinga (1987), Vatnick (1988), Purcell and Orlanski (1988) and Cohen (1988). Usually these equations relate, relying on estimates from cross-sectional pooled time series regressions, the secondary market price to variables like debt-to-GNP, debt-to-exports ratios, and dummies for factors such as time, the existence of a debt-equity program, arrears and the classification of loans to the country by regulators. A typical equation would be the one reported by Sachs and Huizinga (1987) where the secondary market price is a function of (with the sign of the parameter in parenthesis) the debt to GNP ratio (-), average GNP growth over the last five years (+), a dummy indicating whether the country has unilateral suspended debt service repayments (-) and a dummy indicating whether the US regulators have required an allocated reserve (-). In other equations, the existence of a debt-equity conversion program has been used and there the dummy entered positively.

These (cross-country) price equations can be used to derive individual country's debt relief Laffer curves, as for instance done by Claessens (1988) and indicated by Cohen (1988), assuming that the secondary market prices apply to all external claims. Basically Claessens uses the linear price equation from Sachs and Huizinga [i.e.,

P = a + b(D/GNP) + c(GNPgrowth) + ..] to derive the equation for the
market value of debt [V = P*D = aD + bD*(D/GNP) + cD*(GNPgrowth) + ..].
The latter equation is nothing else than the debt relief Laffer curve if
all "exogenous" variables, i.e., all non-debt variables, are entered
into the equation. Taking then the derivative with respect to D and
setting this to zero gives the debt-to-GNP level at which the market
value of debt is maximized.[43]

The conclusion of this usage of empirical evidence is that only a
few countries seem to be on the side of the Laffer curve for which the
market value of debt declines when the nominal face value of debt
increases. Claessens only found Bolivia, Zambia and Sudan to be on the
wrong side, with Peru and Ivory Coast being marginal cases, while, in
his research, Cohen only found Sudan, Nicaragua, Peru and Bolivia to be
within a 10% confidence level of being on the wrong side. In other
words, according to this evidence, only for a limited number of
countries is reduction of the nominal amount of debt in the interests of
the collective creditors.

This would imply that market implementation of debt reduction
schemes, when schemes are evaluated narrowly, would be precluded for
most countries as the market value of debt does not increase with a
reduction in the nominal amount of debt and subsequently the remaining
creditors would stand to lose and block the transaction. However, it
might still be that positive gains, other than those gains that reflect
themselves directly in the debt relief Laffer curve, can be achieved
through market based debt reduction schemes. To these other efficiency
gains we will turn now.

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[43] A similar approach would be to use the elasticity of the price
equation with respect to the level of nominal debt. The elasticity would
indicate on which side of the debt relief Laffer curve the country is:
an elasticity larger than one indicates that the market value decreases
as debt is increased, and vice-versa.

3.4 Signalling Creditworthiness with Buybacks

As mentioned in section 3.1, a wedge between expected repayments made and received can exist if the debtor ascribes a higher probability of full repayment than the creditors do and the creditors are not aware of this. However, public buybacks done consistently over a period of time would release this information and drive the price of debt up.

Another interesting hypothesis in this context is that large enough debt buybacks can act as a credible signal of creditworthiness and generate secondary benefits, even if (the announcement of) the buyback releases this information and drives up the price at which the transaction is operated. Thus, even when the buyback in itself hurts the debtor, the secondary gains from signalling its "true' creditworthiness can outweigh these primary losses. The secondary gains can include better terms on rescheduled debt, more financing from multilateral institutions, more direct investment, and a slow-down of capital flight as the government's adjustment operations become more credible.

Acharya and Diwan (1988) present such a signalling argument in the context of a debt rescheduling model. The starting point of the analysis is that, due to investment incentive considerations, debt relief can be profitable when given to patient countries (with a high discount factor b), but not when given to impatient countries (with a low b). The rationale for this is that a lot of relief is needed to get the impatient countries to increase investment and thus increases debt collection in the bad states, and that this will not be profitable for the creditor banks given the prospects of collecting the whole debt in the good states. It will be profitable to give relief to patient countries as those will invest in response. However, the rate of time preference b is unobservable by the creditors and they might be better off not giving relief to any debtor rather than giving relief to all debtors. In the absence of debt relief for the patient debtors, an

opportunity for Pareto improvement is lost. Acharya and Diwan (1989) show that debt buybacks and debt equity swaps could be a costly mechanism which signal the willingness of the debtor to use the future resources made available by debt relief to increase investment rather than consumption. As a result, countries with large debt equity swap programs will be given relief, which is hypothesized to occur through relatively better terms on rescheduled debt, than for those countries with no or small swap programs. Empirically, the hypothesis that bank spreads are lower when a swap program is in place could not be rejected at a significance level of 5 percent. This fact that swap programs are perceived by the market as good news is also confirmed by various secondary market price regressions. In particular, Purcell and Orlanski (1988) report that the existence of a swap program increases a country's debt price by about 16 percent over the debt price of a country with otherwise similar characteristics.[44]

3.5 Creditors Coalition Concerns

As we saw, coordination failures within the creditors coalition can prevent debt reductions even when the group benefits as a whole. In particular, individual creditors will realize that they can potentially get a better deal by refusing to participate in coordinated debt reduction attempts and by free riding on other parties. The net effect of is an increase in the bargaining power of the creditor group.[45] But

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[44] Another analysis of asymmetric information in the context of debt-equity swaps, however with a different conclusion, is Errunza and Moreau (1987). In their model the asymmetric information is between the bank selling its claim and the multinational investing in the country. The multinational is assumed to posses the same set of information as the country does. Under the postulated information setting, and assuming rational expectations, a debt-equity swap can not be strictly preferred by any party. Any activity by the multinational will reveal any "inside" information and prevent any positive-sum game. In essence, Errunza and Moreau (page 2) find that: "a lemons market holds, but in reverse since the seller (the bank) is less informed".

[45] The reservation utility of the creditors will not be the one under a scenario of collective action but the one under the constraint of the

In a situation of a debt overhang this is not necessarily in the interests of the creditors: the debtor country will correctly perceive the implicit tax rate on future output to be larger with a creditors coalition which is not coordinated, and investment will be lower.[46]

For this reason, debt buybacks (and exit bonds) might be profitable to the debtor and to large creditors as they allow certain "fringe" creditors such as small banks to withdraw, strengthening cooperative behavior and allowing for more efficient agreements.[47] The banks that remain in the lending business will be those that have some long term strategic interest in the countries involved and might be more inclined to search for long term, efficient solutions.[48]

It is interesting to note that regulatory and accounting practices in the US encourage small creditors relatively more than large creditors to participate in VDRT. Current accounting and regulatory practices can oblige a bank which sells a part of its loans to a given country to mark

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freeriding, something which, in the case of a debt overhang, will not necessarily be in the group interest of the creditors. See Fernandez and Kaaret (1988).

[46] This can been easily shown in the model of section 3 by increasing (a). This will produce a Laffer type of curve as investment reacts negatively to the size of (a). Of course, current, as opposed to future, taxing power is also increased, which increases the current transfers to creditors, something which has to be weighted against the incentive effects on investment.

[47] Valdes-Prieto (1987) presents what he calls the "weakening of the bank cartel theory" to explain debt conversions. As debt conversions affect the bargaining game between the bank cartel and the debtor country, it matters whether debt conversions are permitted after a rescheduling has been agreed upon. Under his theory, the creditors groups as a whole looses from debt conversions, but international banks, which will convert early in comparison to regional banks, will gain. The country will gain from debt conversions, but will default with a higher probability. There is an incentive for the individual bank to convert first as the converted claims are senior to the old claims. However, Valdes-Prieto does not address the issue of the sharing clauses which would prevent individual banks from converting their claims against the interests of the remaning banks.

[48] The fact that the relative exposures of the large banks have increased in the recent years suggests indeed that smaller banks have relatively withdrawn, and thus, that potentially the chances of cooperative behavior have increased. Sachs (1989), however, argues that the bargaining power will more likely be increased as a result of the concentration of claims and that the country will be worse off.

down its whole portfolio of loans to the country. For large US banks, this would mean taking losses that are so large as to wipe out a large portion of reserves. This could be a further reason why large banks' participation in VDRT has been minimal.[49]

3.6 Differences Among Creditors.

There have been a few recent attempts to formalize behavior within the creditor group (Williamson (1988), Fernandez and Kaaret (1988) and Bulow and Rogoff (1988)). Williamson (1988) uses differences in valuation between a "pessimist" and a "optimist" group to argue that debt transformation schemes are Pareto improving operations. In his framework, pessimists sell at a price above their own valuation and gain from their point of view. The optimists and the country are glad to see the debt reduced at a price they consider a bargain. In fact, Williamson chooses a quite neutral setup to make his point: the funds used for the buyback would have been paid to the creditors anyway. In this case, buybacks do not affect the welfare of either creditor group as long as there was no probability of the country fully repaying its debt. But now, this neutrality is somewhat offset by differences in valuation among creditors. Because of valuation differences between pessimists and optimists both group of creditors will perceive that they have gained in the transaction: the debtor remains indifferent.[50] The buyback remains in these examples a zero-sum game with apparent rather than real gains.

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[49] For some information on the distribution of claims among banks and the capacity of individual banks around the globe to sustain losses on their LDC exposure see: Huizinga (1989), a report by the Government Accounting Office in early 1989, and statements made for House and Senate Committees in January and February, 1989 by federal bank supervisors in relation to the debt crisis.
[50] Williamson's example can be easily translated in terms of equations (6) and (7) of section 2.2. The country never fully repaid its obligation and therefore $G^*=1$ and $(1-G^*)=0$; as the foreign exchange is always available to the creditors, $a=1$ and thus, $f'(1-aG^*)=0$ implying that $dEW/dX = 0$ and $Ddp/dX = 0$.

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To see this more clearly, consider Williamson's example: optimists hold 80% of a claim on a debt service of $100 and pessimists hold 20%. The possible states of nature are good with a foreign exchange surplus available for debt service of $80 and bad with a surplus of $20. In addition the country has $10 in foreign exchange reserves which is available either for debt service next period or for a debt buyback this period. Optimists attach a probability of 2/3 to the good outcome and 1/3 to the bad. The pessimists believe that the probability of the good outcome is only 1/3 and the probability of a bad outcome is 2/3. Assuming risk neutrality, the optimists will value the debt service then at $0.70 and the pessimists at $0.50. The "correct" debt price is taken to be $0.66, the weighted average of the optimists' and pessimists' valuations.

For any price in between $0.50 and $0.66 the country can use its reserves to buy out the pessimists, making them better off, while at the same time, the remaining creditors' welfare will be increased, as their valuation of the debt rises from $0.70 to $0.75, assuming the buyback was done at $0.50. The country is equally well off and pays the same in all states of nature as it would have foregone, under Williamson's assumptions, $10 of foreign exchange reserves for debt service anyhow.

The results are, however, drastically different if we would have assumed that debt service was only $80 instead of $100. In this case the country would have been able to keep some of the foreign exchange in the good states of nature. As it turns out in this case the buyback, even at the pessimists' price would have _hurt_ the optimists, and the country would have _benefitted_ as total payments would have decreased.[51] The basic reason, as explained in section 2.2, is that for a=1 and for the buyback coming out of investment with f'=1, the country gains and the creditors lose as the buyback increases the chances for the debtor of getting a good state using resources that would have been at the disposal of the creditors in the next period otherwise. This reasoning is of course conditional on the country being able to keep some of it reserves in some states, something Williamson assumed was not the case.

In Williamson's setup optimists would have gained if they bought out the pessimists at their own, low price and a buyback by the country would not have been necessary for "overall" gains. Williamson mentions some reasons why optimists do not buy out the pessimists themselves if they really perceive the pessimists' price to be too low. Regulatory constraints and strategic considerations can partly explain why these market equilibrating phenomena will not take place. However, it might be that these differences alone can not account for the differences in prices which might be necessary to make debt buybacks under Williamson's scenario "profitable" for all involved. In addition, the reason why the country would want to engage in debt buybacks is unclear. Assuming that the country holds the "average" beliefs of the pessimists and the optimists regarding the possible states of nature, one can show that the country is worse off if it had to buy back the pessimists above their ex-ante valuation, a likely possibility. Large price differences might be necessary to make debt reduction schemes work under this scenario.

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[51] See Appendix 3 for a detailed analysis of the sensitivity of Williamson's model.

4. Contract Transformation

The issue of contract transformations of external obligations, predominantly swapping existing general obligation finance for other forms of external finance, should be discussed against a standard of what characteristics constitute "good" external finance. A transformation of claims could provide the possibility of gains for both the debtors and creditors when better characteristics are introduced. Lessard (1989) and Lessard and Williamson (1985) provide a very useful taxonomy of the characteristics of good finance. We will use Lessard's taxonomy here to discuss some of the characteristics found in debt transformations. We will then evaluate two common forms of contract transformation, exit bonds and debt-equity swaps, along these lines as they are often thought to be "better" contracts.

4.1 More efficient financial contracts

Lessard classifies alternative forms of finance along three dimensions: 1) costs, 2) degree of risk-sharing and, 3) degree of managerial participation in the project or enterprise financed. Instruments that score low on costs and high on the other dimensions are in general preferred. General obligation finance, as in the form of commercial bank lending for example, is low on expected costs, but involves little or no ex-ante risk sharing and no managerial involvement. Other alternatives, commodity bonds, direct investment, portfolio investment, quasi-equities, non-recourse finance, etc., can be similarly be classified along these dimensions.[52] As perhaps can be expected, several of these external financing instruments can be shown to dominate traditional forms such as commercial bank lending on one or more aspects. All financial instruments can (potentially) be ranked

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[52] Many existing (and potential) instruments can be shown to be combinations of these instruments.

through (welfare) comparisons involving, for example, a comparison of the relative tradeoffs of the debtor vis-a-vis the tradeoffs of the creditors regarding the level of costs versus the uncertainty of costs, e.g., the relative degrees of riskaversions. As a consequence of the dominance of, or preference for, some other than existing forms of external financing, contract transformations that result in a larger component of these type of instruments in the overall basket of the country's external liabilities can represent a positive-sum game.[53]

4.2 Exit Bonds

Exit bonds amount to a reduction in the future nominal claims of the creditors on the country with no effect on the availability of current resources. Thus, the debtor country cannot lose. However, the creditors as a whole will lose unless efficiency gains are unlocked. If the exit bond is made senior to the remaining debt, the remaining debtholders stand to lose even more.[54] In order for the exit bond to be acceptable to all parties -- a precondition to make the instrument more senior compared to the remaining debt, new and remaining debtholders must be at least as well off. For new debtholders the issue is clear: they would not convert their existing claims in the new instrument if they did not perceive it to be of at least equal value. The voluntary character of the transaction will take care of this. Remaining creditors would only be willing to decide jointly to make the exit bonds legally senior if they are at least as well off afterwards, i.e., if their existing claims do not decline in value by becoming junior, which requires positive sum gains. Some efficiency gains from debt reduction

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[53] In Lessard's words, the debt relief Laffer curve moves up as a result of the introduction of better forms of external finance through debt transformations.
[54] To the extent that the reduction in future nominal claims reduces the second period marginal rate of utility, optimal investment may be reduced.

are thus necessary to make the exit bond acceptable to all creditors.[55]

Important points for the efficiency gains are: (i) If the remaining creditor's claims are reduced, they will only allow the swap if they believe that there are some offsetting gains.[56] (ii) If indeed the remaining debtholders gain, the debtor must gain at least as much to compensate for the larger expected repayments.(iii) The debtor does not need to sacrifice any current resources in an exit bond (as in the debt buyback) and stands thus more likely to gain from an exit bond than from a buyback. The Pareto-improvement might, thus, be easier to establish for exit bonds than for debt buybacks as the effect of exit bonds is limited to an incentive effect on investment.[57] But, in practice, it is difficult to legally establish the seniority of the new instrument without some assurances in the form of collateral. However, a cash collateral makes the exit bond a partial buyback with no efficiency gains.

4.3 Debt-Equity Swaps

To analyze debt-equity swaps more clearly, it is useful to split up a debt-equity swap into two transactions: a buyback of debt in the secondary market using foreign exchange and a selling of rights to

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[55] Froot (1988) discusses the similarity of exit bonds and pure debt relief.

[56] Valdes-Prieto (1987) presents some further explanation for debt conversion schemes which he calls the "claims dilution theory". Debt equity swaps by moneycenter banks result in claims on the country which have priority over claims of remaining banks on the country's foreign exchange, which leads to wealth transfers between the creditors from regional to moneycenter banks. Regional banks will not lend to the country anymore and secondary market prices will fall as debt-equity swaps get implemented over time.

[57] An additional gain of exit bonds for the debtor can be that, if the debtor structures the exit bond correctly and makes a credible take-it-or-leave-it offer, the country might be able to maximizes the amount of debt relief. By reducing the nominal value of debt, a take-it-or-leave-it offer of exit bonds can bring the country from the wrong side of the Laffer curve to a point on the other side of the curve while keeping the market value of the creditor claims constant. The exit bond maximizes in this way the amount of "extractible" debt relief.

domestic investment for foreign exchange. The transaction usually
involves a sharing of the discount in the secondary market between the
new investors and the country. The first step has been analyzed above
and was shown to be unlikely a positive sum game if either consumption
or investment were cut. But, even if the debt buyback itself does not
lead to overall welfare improvement, efficiency gains of debt-equity
swaps could still arise from the second step, the promotion of another
financial contract that is indexed to domestic variables.

The most cited reasons why converting debt to equity or to claims
indexed to domestic variables generates gains are: (i) the subsidy or
preferential exchange rate that is implicitly granted to investors which
use the swap program when the discount is shared between them and the
government attracts foreign investment[58]; (ii) the allocation of
resources improves because of the development of the domestic equity
market and new regulations that remove restrictions on foreign direct
investment, portfolio investments and foreign ownership in general lead
to more foreign investment;[59] (iii) better risk sharing can lead to
gains; (iv) the domestic resource transfer can be less binding than the
external transfer constraint leading to reduced overall costs; (iv) the
incentives to invest increase; and (v) the supply of voluntary finance
increases as the debtor contracts to sell its upward potential.

The first two arguments can be dismissed as a source of efficiency
gains. Subsidizing foreign investment through shared discounts is not an
efficient tool when compared to policies that attract foreign investment
without being tied to debt buybacks. If the macro-economic enviroment is
not conducive to foreign investments, investment subsidies will end up
being quite costly. Similarly, financial liberalizations and the sale of
domestic assets to foreign investors can be achieved without linking the

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[58] This is analyzed by Roberts and Remolona (1987) who point out the
importance in additionality in investment.
[58] See for instance Gill (1987).

proceeds to debt buybacks. In effect, if swaps are costly, it would be more efficient to use other means to subsidize investments, develop the domestic financial markets and restore appropriate macroeconomic conditions for foreign investments.

A. Risk Sharing

Risk sharing can be a source of positive sum games. A swap replaces a (implicit) risk sharing rule by another. If this increases the gains from trading in risk between the debtor and the international financial community, efficiency gains will be generated. For example, if the new contract reduces the risks of the debtor, there are efficiency gains whenever the debtor is more riskaverse (or less diversified) than the creditors. But even though equity contracts do imply risk-sharing, once one accounts for the implicit risk sharing already embodied in existing debt constracts, the conditions for positive sum games due to risk-sharing for small debt-equity swaps are not as easily established.[60]

Moreover, risk sharing arguments become even less appealing in the case of the swapping of public debt. In that case, one also needs to consider the effect of the swap on the variability of the debtor's government financing costs. In most instances, the governent ends up reducing its foreign debt and increasing its domestic debt (or stock of money).[61] If the government is less able to default on its domestic debt than on its foreign debt, risk is increased as total financing costs

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[60] See Helpman (1988) for a similar graph and for a detailed analysis of the necessary conditions on the levels of relative riskaversion for positive sum debt transformations. In figure 9 40% of the debt was swapped for an equity stake in the country that paid 3% of output. The value of the reduction in debt is equal to the value of the new equity.
[61] Valasco (1988) develops a simple macro framework in which he analyzes more rigorously some of the domestic effects of a debt-for-equity swap and analyzes the differences between debt-for-domestic-government-bonds and debt-for-domestic-money swaps in terms of inflation, fiscal effects and consumption and current account behavior. See Oks (1989) for an assessment of the macroeconomic implications of debt reduction schemes for Mexico and Morande and Schmidt-Hebbel (1988) for Chile.

increase in the bad states and decrease in the good states.

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We can illustrate the effect of a swap on the schedule of payments made by the debtor across states of nature. The equity contract pays out a proportion (e) of output in all states of nature while debt pays out a proportion (a) in states below Y* and a fixed D in the good states. We take output Y to be uniformly distributed on $[0,\bar{Y}]=[0,20]$. This allows us to interpret the area under each repayment curve as the expected repayment arising of that instrument. As the swap is operated through a competitive market, we restrict the price at which claims are exchanged so that the expected value of the old and new contracts are the same.

This is achieved in figure 8 for the extreme case in which foreign debt D(Y) is entirely swapped for domestic equity. For the creditors to be indifferent between the two instruments, the areas under the two curves have to be equal, i.e, (e) must be large enough. Because equity gives the creditors a larger payoff for large values of Y, (e) is smaller than (a).[62] Note that the standard debt contract allows for some risk sharing when Y<Y*, but that equity claims allow for risk sharing over a larger spectrum. Thus, if the debtor is more risk averse than the creditor, he would gain by swapping all its debt into equity.[63]

But the analysis does not carry through completely for small and medium sized swaps. In fact, as illustrated in figure 9, as a result of a small swap, the debtor's cost of financing is actually increased in the very bad and the very good states, and is only reduced in the intermediate states, between Y1 and Y2. Depending on the exact weighing of the state contingent payments, these small swaps can increase or reduce the welfare of a risk averse debtor[64].

Finally, let us illustrate the effect of a swap of external public debt into internal public debt. This is depicted in figure 10 for the extreme case where domestic debt does not allow any risk sharing. Foreign debt D(Y) allows some limited risk sharing for low values of Y; on the other hand, domestic debt B(Y) pays out a costant amount of B. Swapping half the foreign debt into domestic debt results in a total government obligation [D'(Y)+B(Y)] which allows less risk sharing than the initial situation: in fact, risk is now shared only on states where Y<Y1, while previously risk was shared for all states up to Y=Y2. As a result, Pareto improving external public debt for domestic public debt swaps require that the foreign creditors be more risk averse than the debtor government. This seems unlikely given the rich portfolio choice in the developed world. Moreover, the increase in risk is exacerbated when domestic financing is expensive, either because of high real interest rates or because of the inefficiency of the inflation tax.

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[62] The value of the parameter imply that with a=0.10, we must have e=0.075 in order for the two areas to be equal in size.
[63] The fact that this does not happen is presumably explained by moral hazard considerations. See Cole and English (1988) for such a model.
[64] In figure 9, 40% of the debt was swapped for an equity stake in the country that paid 3% of output. The value of the reduction in debt is equal to the value of the new equity.
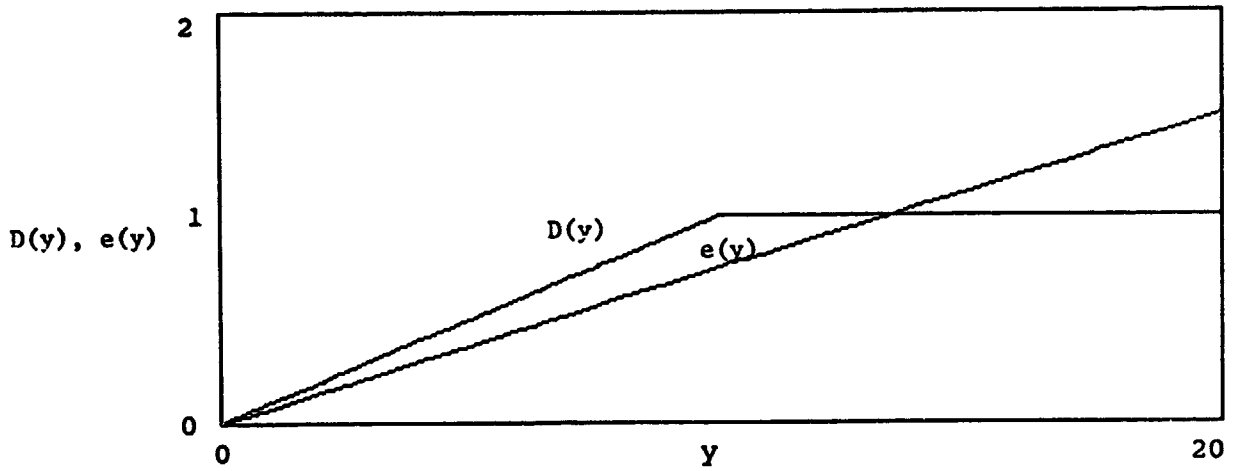
FIGURE 8
Swapping all the Debt for Equity

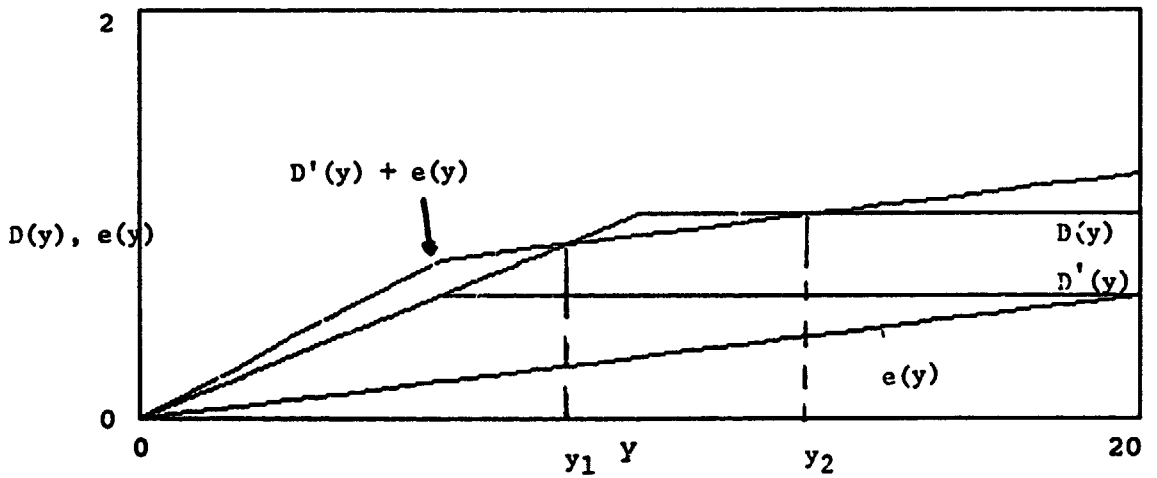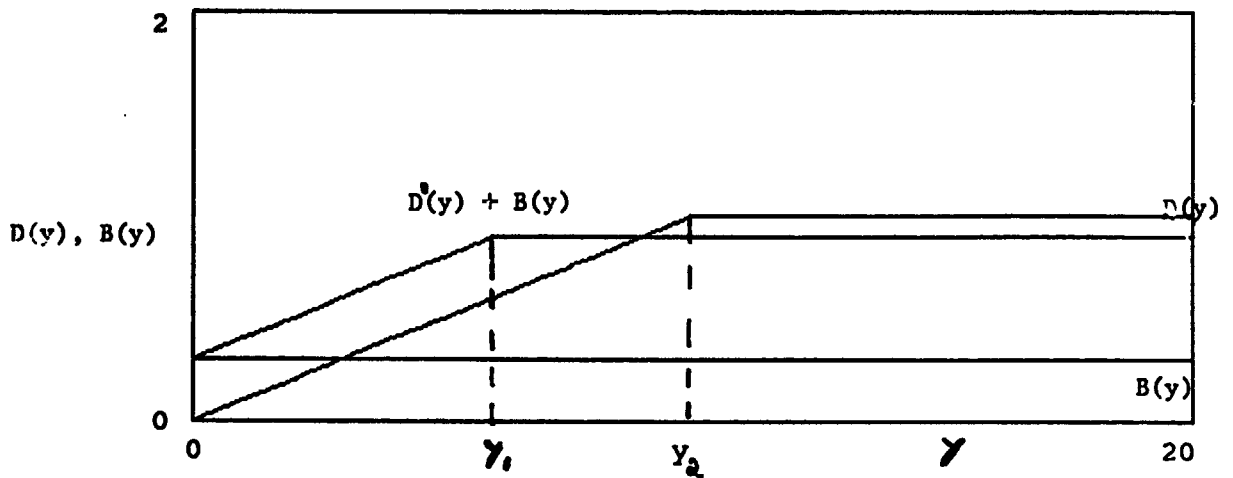Figure 9
Small Debt for Equity Swap

FIGURE 10
Public Foreign Debt to Public Domestic Debt Swap

B. External and Internal Transfers

The substitution of a foreign exchange denominated liability by a domestic liability in the government budget constraint can have, in general, a real effect on various macro-economic variables. External debt servicing requires two types of transfers: one from the private sector to the government, and one from the government to the foreign creditors. The first transfer imposes costs to the debtor in terms of austerity, crowding out private investment, and of inflationary pressures (cost-push). Moreover, financial repression, disintermediation, and capital flight are also possible outcomes, especially, if the government taxes the financial sector inefficiently. Finally, to the extent that deficit financing raises real interests rates, it increases the costs of servicing the domestic public debt.

The second transfer requires an expansion of the tradeable sector and thus a combination of expenditure switching and reduction through quantitative restrictions and relative price changes. In general, these policies weaken the fiscal budget: import quotas reduce economic activity, export subsidies exercise direct budgetary costs, and real devaluations increase the domestic burden of foreign debt in domestic terms[65]. As Rodrik (1988) has shown, because government's revenues in non-traded goods are likely to exceed its expenditures on them, the real depreciation required to generate the public and private sector external surplus will result in an additional burden on the public budget, as the "terms-of-trade" of the government vis-a-vis the private sector deteriorate.

The two transfers have thus quite different effect on the government's budget and quite different costs. The implications of this for debt-equity swaps are not straightforward, as at least three elements complicate the analysis:

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[65] See Corden (1989) for an elaboration.

(i) If the new domestic claims are held by foreigners, their servicing will ultimately require an internal and external transfer in any case.

(ii) Debt-equity swaps may lead to a more favorable timing of debt service, especially of the external transfer.[66]

(iii) In general, highly indebted countries' governments service external debt at less than par while domestic firm have to deposit domestic currency at the central bank at the official rate and for the totality of their required debt service. In this case, external debt reduction and debt-equity swaps at a discount imply an external price for foreign exchange which is different from the one at which private and public enterprises service their external debt internally. In effect, domestic companies can then have incentives to buy external debt at a discount to extinguish their external claims at the central bank at par. This forces an arbitrage condition between the discount on external debt, the black market premium and the official exchange rate.

C. Incentive Effects

The positive effects of the risk sharing created by of debt-equity swaps do have some bearing on the incentive argument of the associated debt reduction. Debt-equity swaps can more closely mimic a policy of state contingent write-offs, a policy which can constitute the first best solution to a debt overhang problem. Indeed, when the investment decision is made after some more information about the exact magnitude of Y is revealed to the country (and risk-sharing considerations do not play as large a role), the first best solution for the creditors is to index the debt reduction with respect to Y. A debt-equity contract could mimic such a policy as it reduces debt and substitutes it with an indexed claim. Debt-equity swaps could for that reason reduce the

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[66] Repatriation of capital and dividends on equity acquired through debt-equity programs is often restricted for a certain period.

inefficiencies of a debt overhang and lead to a positive sum game.[67]

D. Selling the Upward Potential

Indexed contracts can increase the credit ceiling of a debtor because they credibly allow foreign investors to extract larger resources in the good states of nature when the costs of default are large[68]. As a result properly indexed instruments are welfare increasing for countries that are attempting to regain creditworthiness by increasing their credit ceiling above their stock of inherited external claims.

5. Conclusions

This paper has shown that there might exist combinations of prices and types of contracts under which market based debt reduction and transformation schemes can benefit a highly indebted country, and, by virtue of their market character, not hurt the creditors. No general statements can be made regarding the welfare implications of these schemes. The schemes will have to be evaluated individually for a specific country, for which, as the paper shows, simple present value calculations will not be sufficient. The benefits of debt reduction and transformation schemes, if any, will often have to be due to positive efficiencies associated with the schemes. Specifically, the paper discusses changes in the expected repayments on the remaining debt as a result of incentives for investment and adjustment, different divisions

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[67] See Froot et al. (1988) and Lessard (1989). In general however, risksharing and incentive considerations will point in different directions. An indexed debt contract can lower the after-servicing return on investments, reduce incentives, and can thus lead to lower investments: only because the uncertainty is additive (Y) in our example, this effect was not present in our example.

[68] Diwan (1989) derives the form of the financial contract that maximizes the voluntary supply of external finance and shows that it completely insures the debtor.

of repayments between creditors, risksharing aspects and signalling values which can be associated with certain debt reduction and debt transformation schemes. In general, the paper finds that the conditions that have to be satisfied in order for these voluntary schemes to benefit both creditors and debtor country are fairly strict and, on the basis of (scant) empirical evidence, not easily observed.

As a result, we can state that market based debt reduction and debt transformation schemes are only likely to be welfare improving for the debtor when:

(i) the debtor's opportunity cost of foreign exchange is low relative to world interest rates;

(ii) when there is a large probability of a default (rescheduling) with a deadweight loss to the creditors and when the cost and the uncertainties of reschedulings are high and largely borne by the debtor;

(iii) when private rather than public debt is swapped for equity investments;

(iv) when the country has no other way of signaling its commitment and willingness to adjust;

(v) when the country has an extreme case of debt overhang.

(vi) when the level of the country's tradeable resources is highly sensitive to external developments and risk sharing generates benefits.

(vi) when a country is attempting to regain creditworthiness by selling its upward potential.

The next research step in this area will have to be careful empirical investigations on whether some of these conditions are satisfied. An evaluation of these schemes requires that we get a handle on the disincentive and proincentive effects of a debt overhang, the opportunity costs of foreign exchange, and the dead-weight losses of bargaining. For this, it will be necessary to get a better understanding of the formation of prices on the secondary markets of LDC debt.

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Appendix A.1

A Description f Debt Reduction and Transformation Schemes[69]

A.1.1 Buybacks

Debt buybacks involve a cash purchase of existing debt on the secondary market. The resources for the buyback usually come from the country's foreign exchange reserves, but they can also come from outside grants given for this specific purpose. In order for a debtor to be able to openly use its reserves in a buyback operation, it needs the consent of all its creditors. There are two good reasons for this. First, the use of reserves to repurchase debt may impair the debtor's ability to service the remaining debt. Second, there is a moral hazard problem: countries could take actions to lower the price at which their debt is trading, allowing them to repurchase debt at low prices, which would reward and possibly encourage this behavior.

For these reasons, two amendments to the loan contracts have to be made in order to allow an open buyback: first, the debtor must be allowed to prepay its loans; and second, participating banks must be given waivers from sharing provisions so that they do not have to share the payments they receive from the debtor country with non-participating creditors. Thus, in order for the transaction to be allowed to proceed all the creditors must believe that the operation will not hurt them.

A recent example of an open buyback of public debt is provided by the Bolivian 1988 operation in which more than forty percent of Bolivia's commercial indebtedness (about $270 million of debt face value) was extinguished at a price of 11 cents per dollar using donated funds.[70] It has furthermore often been reported in the financial press that governments -but more often private firms, have been buying back their debts through intermediaries on the secondary market.

A.1.2 Securitization

An "exit bond" is a buyback financed by future cash flows. A recent example is provided by the Morgan-Mexican conversion operation of January 1988. This was in fact a combination of a buyback using reserves and an exit bond swap. The Mexican offer was as follows: all creditor banks under the 1987 restructuring agreements were invited to bid for an exchange of its loans against a bond with a collateralized principal. The bond had a 20 year maturity, paid 1.625 % over LIBOR and the principal was fully secured by non-marketable, zero-coupon US Treasury securities. The 1987 restructuring agreement exempted the transaction from the sharing provisions but the negative pledge still had to be waived in order to allow the use of reserves to collateralize the principal of the new bonds. The exit bond part consisted thus of the stream of interest payments on the reduced principal. Creditors had furthermore not made the interest payments on the bonds more senior compared to other, existing claims on the country.[71]

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[69] For a more complete description, see for example World Bank (1988)
[70] The buyback was financed by funds donated for this purpose. However, it appears that most of these funds were diverted from aid-budgets which were aimed at Bolivia in any case. See further Lamdany (1988).
[71] Presumably, if the creditors thought this to be in their interest, they could have made the bonds more senior than existing claims through the appropriate legal measures.

From the result of the auction, it appears that the bidders decided on their offering price by looking at the collateralized bond as a collection of two instruments: the fully collateralized principal as a US Treasury risk, and the promised interest payments as a Mexican risk valued at the discount rate implicit in the secondary market price of Mexican commercial bank debt. Therefore it appeared that, in spite of Mexico's assurances on the seniority of the interest payments, the market did not perceive the unsecured portion of the exit bonds to be senior to Mexico's remaining outstanding debt.[72]

Other forms of securitization have involved (or are rumored to involve) exchanging commercial bank debt at a discount for commodity price-indexed instruments and for bonds that are collateralized through essentially escrowing future export receipts.[73]

A.1.3 Debt To Equity Conversions

Debt-equity swap mechanisms have been instituted in a number of countries including Argentina, Brazil, Costa-Rica, Mexico, the Philippines and more extensively, in Chile. A debt-equity swap involves an investor exchanging a country's debt at the central bank for local currency to be used in equity investments (usually with some restrictions on remittances rights, on the type of investments and on the sale of the equity). Debt-equity swaps fall into four categories: 1) a sovereign or public sector debt is exchanged for equity in a private sector enterprise, either in the form of direct equity or as portfolio equity; 2) debt of a private sector company is exchanged for an equity investment in the same company; 3) sovereign or public sector debt is exchanged for equity as a part of a privatization program of public sector enterprises; and 4) private external debt of one company is exchanged for equity of another private company. Debt-equity swaps have predominantly been public-external-debt-for-private-equity swaps, but some amount of private-debt-for-private-equity swaps have been done. Similar to debt buybacks, debt-equity conversions require special provisions in order not to trigger the mandatory prepayment clauses. The special provisions are commonly inserted in rescheduling agreements. Restrictions on repatriation of remittances serve to prevent the new investors from obtaining more advantageous terms than bank creditors. Recently, some debt-equity conversions have been done through conversion funds where foreign debt is converted into risk capital which is pooled and used to fund longer term investment projects.

There is some evidence suggesting that equity-like instruments are perceived by creditors to be more valuable than debt. In Chile and Brazil, where debt-equity swap rights are auctioned, debt is typically retired at a price above secondary market prices (but still below par). The enhanced value of these claims can be due to their (perceived) seniority status and/or to the fact that these equity claims can be sold on the domestic market and perhaps even be exchanged for foreign currency without the approval of the authorities.

A.1.4 Magnitude

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[72] This analysis is from Lamdany (1988).

[73] Venezuela has raised approximately $500 million through essentially selling its oil exports receipts forward. The deal involved collateralizing a bonds issued on the US market with the exports receipts from oil.

Table one presents some (preliminary) indications of volumes or transactions on the secondary market for different heavily indebted countries.[74] The volume figures include interbank transactions and thus do not necessarily represent debt reductions or debt transformations.

Table 1
SECONDARY MARKET FOR DEVELOPING COUNTRY DEBT 1984-1988

	1984	1985	1986	1987	1988a
DEBT CONVERSIONS a/					
Argentina	31	469	--	35	1328
Brazil	731	537	176	1800	8643
Bolivia	--	--	--	1	349
Chile	11	313	987	1983	3205
Costa Rica	--	--	7	146	17
Ecuador	--	--	--	125	258
Honduras	--	--	--	6	11
Jamaica	--	--	--	2	100
Mexico	--	769	1023	4804	7402
Peru	--	--	--	--	15
Philippines	--	--	15	266	382
Uruguay	--	--	--	--	97
Venezuela	--	--	--	--	130
Yugoslavia	--	--	--	--	50
Sudan	--	--	--	--	1
Zambia	--	--	--	--	3
Nigeria	--	--	--	--	120
TOTAL b/	773	2088	2208	9167	22110
DEBT SWAPS c/	2000	4000	7000	12000	40000

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a - Identified to date in 1988.
b - Debt for equity and domestic debt swaps, conversions and debt repurchases and other transations excluding interbank trading.
c - All transactions, including interbank trading.

Table 2 indicates an approximate division of the secondary markets transactions over debt-equity swaps, informal conversions, exit bonds, buybacks and other type of transactions involving the debtor country.

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[74] Source for Table 1 and 2: estimated and compiled by IECDI, The World Bank. The figures are very preliminary. See the March 1989 issue of the Quarterly Review of Financial Flows to Developing Countries for some more definite figures and additional information.

Table 2
ALL COUNTRIES

	DbtEqty	Infmls	ExtBds	BuyBcks	Other
1984	773				
1985	1843				245
1986	1494				714
1987	3435	4500	15		1216
1988	8810	5545	4725	648	2382

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APPENDIX A.2: Proofs

A.2.1 Proof of equation 5:

Since:

$$p = \{1/[D-X/p^\bullet]\} \ \{\int_{\underline{Y}}^{Y*} [a(Y+f(I))]g(Y)dY + [D-X/p^\bullet](1-G*)\} \text{ it follows that:}$$

$$dp/dX = \{1/[D-X/p^\bullet]^2\} \ \{ \ [-(1/p^\bullet)(1-G*)][D-X/p^\bullet] -$$

$$[\int_{\underline{Y}}^{Y*} [a(Y+f(I))]g(Y)dY+[D-X/p^\bullet](1-G*)](-1/p^\bullet) \ \}$$

where $p^\bullet$ is the ex-post price of the remaining debt which, at the margin, is not effected by the debt buyback as the buyback is assumed to occur at the average, ex-ante price and not at the marginal, ex-post price and where $Y* = [D-X/p^\bullet]/a - f(I)$. The equation implies that at X=0:

$$dp/dX|_{X=0} = [-(1/p^\bullet)(1-G*)D + p^\bullet D/p^\bullet]/D^2$$
$$= [1 - (1-G*)/p^\bullet]/D$$
$$= [1 - (1-G*)/p]/D$$

A.2.2 Proof of equation 7

(we assume in the text that $dI/dX = -1$)

$$dp/dX = \{1/[D-X/p^\bullet]^2\} \ \{ \ [-(1/p^\bullet)(1-G*)-af'G*][D-X/p^\bullet]$$

$$+[\int_{\underline{Y}}^{Y*} [a(Y+f(I))]g(Y)dY+[D-X/p^\bullet](1-G*)]/p^\bullet \ \}$$

The equation implies that, at X=0 where $p^\bullet = p$,

$$dp/dX|_{X=0} = [(-(1/p)(1-G*)-af'G*)D + pD/p]/D^2 =$$

$$= [1 - (1-G*)/p-af'G*]/D$$

For large debt swaps the only way to calculate the effect on the price and value of the remaining debt is to postulate a distribution function for Y, a production function f(I) and solve implicitly (or obtain an explicit expression if possible) for p in terms of ex-post debt levels.[75] To work out the example mentioned in the text, and plotted in figure 5, requires solving for p as a function of X such that $p = p^\bullet$ in the equation:

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[75] Dooley (1988) has done this for a debt facility, with funds for the buyback coming from outside the country and has shown how the gains/losses are divided between the participating creditors, the remaining creditors, the country and the debt facility.

$$p = [1/(D-X/p^\bullet)] \{ \int_{\underline{Y}}^{Y*} [a(Y+f(I))]g(Y)dY + [D-X/p^\bullet](1-G*) \}$$

where $Y* = [D-X/p^\bullet]/a - f(I)$.

For the chosen distribution function this can only be done iteratively as this expression does not have an implicit solution.

A.2.3 Proof of Equation 11.

$$p = [1/(D-X/p^\bullet)] \{ [\int_{\underline{Y}}^{Y*} [c(Y+f(I))]g(Y)dY + \int_{\underline{Y}}^{Y*} [D-X/p^\bullet]g(Y)dY]/r \}$$

with $Y*=[D-X/p^\bullet]/a-f(I)$.

it follows that:

$$dp/dX=N/[D-X/p^\bullet]^2 \quad \text{with}$$

$$N = [-(1/p^\bullet r)((1-G*)-g*[D-X/p](1/a-c/a^2))][D-X/p^\bullet]$$

$$-[\int_{\underline{Y}}^{Y*} [a(Y+f(I))]g(Y)dY + [D-X/p](1-G*)](-1/p^\bullet r)$$

$$= -(1/p^\bullet r) \{(1-G*)-g*[D-X/p](1/a-c/a^2)\}[D-X/p^\bullet] - E[R(X,p^\bullet)](-1/p^\bullet r)$$

evaluating at $X=0$, we have:

$$dp/dX|_{X=0} = [(1/pr)(-(1-G*)+g*D(1/a-c/a^2))D + pD/p]/D^2$$

$$= [1 - (1-G*)/pr+g*D(1-c/a)/(apr)]/D$$

Equation (10) follows similarly.

APPENDIX A.3

Welfare effects in the general case

Table 1.
Gains and Losses for Creditors, Debtors and Total

Cases		Creditors	Debtor	Total
d>0	f'<r a=0	1	d(1-f'/r)-1<0	d(1-f'/r)>0
	f'<r a=1	1-(1/r)[(1-G*)/p] -df'G*/r<>0	-1+(1/r)[(1-G*)/p] d[1-(1-G*)f'/r]<>0	d(1-f'/r)>0
d>0	f'>r a=0	1	d(1-f/r)-1<0	d(1-f'/r)<0
	f'>r a=1	1-(1/r)[(1-G*)/p] -dG*f'/r<>0	-1+(1/r)[(1-G*)/p]+ d[1-(1-G*)f'/r]<>0	d(1-f'/r)<0
d<0	f'>r a=0	1	d(1-f'/r)-1<>0	d(1-f'/r)>0
	f'>r a=1	1+(1/r)[-(1-G*)/p -G*f'd]>0	-1+d+(1/r)[(1-G*)/p -(1-G*)f'd]<>0	d(1-f'/r)>0
d<0	f'<r a=0	1	d(1-f'/r)-1<0	d(1-f'/r)<0
	f'<r a=1	1+(1/r)[-(1-G*)/p -G*f'd]>0	-1+d+(1/r)[(1-G*)/p -(1-G*)f'd]<0	d(1-f'/r)<0

We consider the cases where d<0, the buyback leads to an increase in investment more carefully. For f'>r and when a=0 the country gains from a debt buyback as it leads to an increase in profitable investment but loses from the drop in consumption. As a result dE(W)/dX = d(1-f'/r)-1<>0. The marginal return on investment has to be high enough to make up for the opportunity costs of investment and the drop in consumption. For example, for d=-0.5 and r=1, f' has to be larger than 3, i.e. investment must yield more than 200% marginal return. However, when a = 0 it is unlikely that a buyback leads to an increase in investment as there are no disincentive effects on investment associated with a debt overhang: the 'tax' effect of debt in bad states is zero as a is zero and the buyback is thus not necessary to remove any disincentive effects. The debt buyback is more likely to reduce than to increase investment because of its claim on current resources. Creditors as a group will gains as dE(R)/dX = 1; if there is any market value to the debt at all, remaining debtholders will be indifferent or lose at the benefit of the participating debtholders.

For f'>r and a=1, the results are as follows: dE(W)/dX = -1+d + (1/r)[(1-G*)/p-(1-G*)f'd] and dE(R)/dX = 1 + (1/r)[-(1-G*)/p-G*f'd]. Apart from the riskshifting effect, which makes the country lose and the creditors gain, the benefit for the country and the creditors as a whole are respectively -d((1/r)f'(1-G*)-1) and -(1/r)G*f'd. This implies that the country can only gain if the effective marginal return on the

additional investment, $(1-G*)f'$, is high enough to make up for the opportunity cost of first period resources used for the investment as well as for the negative riskshifting effect. Assuming that the probability of full repayment $(1-G*)$ is 0.50 and $r=1$, the marginal return f' has to be larger than 2 just to make up for the opportunity costs of investment, without considering the negative risk shifting effect. For the creditors, the benefits of riskshifting are increased by the benefits of a higher marginal output in states in which the country defaults and as a result creditors are more likely to come out ahead. In some sense with $a = 1$, the resources, if invested, were at the disposal of the creditors all along but have been earning a rate of return above the world interest rate which further increases the creditors' payoff.

For $f'<r$ and $a=0$, the country will lose from any additional investments as the gross return is not even sufficient to recover the investment. The buyback in itself will lead to no gains as the country is only prepaying debt it did not need to pay in the first place as a is zero. As a net result the buyback will hurt the country. The creditors will gain as they receive payments they did not expect.

For $f'<r$ and $a=1$, the country will lose because of the risk shifting effect, $-1+(1-G*)/p<0$, and, because the additional investment will be at a loss, $d(1-f'(1-G*))<0$, the country will lose on the whole. The creditors will still gain even though investment in itself is inefficient and overall there is a loss. The reason is that the additional investments allow resources to be carried over to next period, even though at an opportunity loss compared to the international interest rate, in which period the resources are at the disposal of the creditors ($a = 1$) instead of being spent on consumption in the first period.

APPENDIX A.4

Differences of valuation among creditors:
some further examples

Table 1 through 4 show how sensitive Williamson' example is to minor changes in assumptions. For convenience, Table 1 indicates the payoffs for each group of creditors, the probabilities and the expected (probability weighted) payoff in case of the original example. The last line indicates the sum of the expected payments in each states, the resulting price and the resulting expected payoff to the creditors as the payments get shared. For example, the optimists expect (probability weighted) total payments of 10 in the bad states, 60 in the good states, indicating a total payoff of 70, a price of 0.7 and an expected share of repayments for them of 56. The country expects to repay 66, the weighted average of the optimists and pessimists expected payoffs.

Table 1
Case 1: Debt Service 100, no buyback

State of Outcome	Available FX	Country's Payments	Optimists' Prob.	Exp.	Pessimists' Prob.	Exp.	Country' Prob.	Exp.
Bad	20 + 10	30	1/3	10	2/3	20	0.4	12
Good	80 + 10	90	2/3	60	1/3	30	0.6	54
			56 = 0.7 = 70		10 = 0.5 = 50		0.66 = 66	

Table 2 illustrates the effect of the buyback: the pessimists receive 10 for sure, the optimists hope for 60, which would make them better off, while the country still expects to pay 66. There is "value" created, as the country, the optimists and the pessimists have different expectations regarding the repayments.

Table 2
Case 2: Debt Service: 100 - Debt reduction through buyback (20) = 80

State of Outcome	Available FX	Country's Payments	Optimists' Prob.	Exp.	Pessimists' Prob.	Exp.	Country' Prob.	Exp.
Bad	20 + 10	30	1/3	6 2/3			0.4	12
Good	80 + 10	90	2/3	53 1/3			0.6	54
			0.75 = 60			10		66

Table 3 illustrates the situation in which the debt service is below the available foreign exchange in the good state of nature, 88 below 90. As a result the country expects to pay only 64.8, optimist creditors expect the country only to repay 68 2/3 as opposed to 70, implying that they themselves expect to receive only 54.9, as opposed to 56, on a contractual debt service of 0.8*88 = 70.4, which leads to a optimists price of 0.78 which is higher than in case 1. The pessimists expect payments of 9.9 and a price of 0.56, on a contractual debt service of 0.2*88 = 17.6. The country expects to pay 64.8.

Table 3
Case 3: Debt Service: 88

State of Outcome	Available FX	Country's Payments	Optimists' Prob.	Exp.	Pessimists' Prob.	Exp.	Country' Prob.	Exp.
Bad	20 + 10	30	1/3	10	2/3	20	0.4	12
Good	80 + 10	88	2/3	58 2/3	1/3	29 1/3	0.6	52.8
			54.9=0.78=68 2/3		9.9=0.56=49 1/3		0.74=64.8	

The pessimists can now be bought out using the 10 in foreign exchange which brings the debt service to 70.4, the optimists' debt service. The optimists expect now total payments of only 53.6 and feel that they are worse off than under the no-buyback scenario. The optimists would have gotten to share in the country's repayment in the good states if the debt had not been reduced, but now they lose out as the debt is reduced. The optimists will thus be inclined to block the transaction. The country gets to keep 90-(10-.8*88)=9.6 in the good states as opposed to only 2 before the buyback. The country is better off as it expects to repay less. The debt reduction allows the country to reduce its payment in the states of nature in which it expected previously to lose (almost) all its foreign exchange.

Table 4
Case 4: Debt Service: 88 - Debt Reduction (10/.56=17.8) ≈ 70.4

State of Outcome	Available FX	Country's Payments	Optimists' Prob.	Exp.	Pessimists' Prob.	Exp.	Country' Prob.	Exp.
Bad	20 + 10	30	1/3	6 2/3			0.4	12
Good	80 + 10	80.4	2/3	46.9			0.6	48.2
			0.76 = 53.6		10			60.2

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