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Sovereign Debt: A Survey of Some Theoretical and Policy Issues

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Abstract

This paper surveys the literature on sovereign debt that deals with the issues of a country's ability-to-pay, its willingness-to-pay, and the policy responses to the debt crisis of the 1980s. The existence of an ability-to-pay problem suggests a need for debt reduction, but plans for debt relief face potential incentive problems, and sovereign debt repurchases are not always a welfare maximizing method of debt restructuring. The paper synthesizes the main conclusions on these issues. With a willingness-to-pay problem, the potential penalties for debt repudiation are important in the endogenous determination of the repayment outcome. Penalties that are intertemporal in nature have different implications for debt repudiation than do intratemporal penalties. In addition, the asymmetric distribution of the costs of default can lead to a recurrent cycle of debt accumulation and default.

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Summary

The debt crisis of the 1980s raised a number of issues that invited new research. This paper surveys the recent literature on some of these issues in order to provide a synthesis of the main results.

The distinction between the ability-to-pay problem and the willingness-to-pay problem is seen to be important for understanding a debt crisis. In the case of a willingness-to-pay problem, in which a country that has the resources to repay its debt may find it optimal not to do so, there is a strategic interaction between the borrower and lenders, and the level of debt repayment is endogenously determined. The paper discusses several conceptual frameworks used for analyzing a willingness-to-pay problem, in which the potential penalties for debt repudiation are seen to play an important role in determining the repayment outcome. In particular, if the borrowing country has access to asset markets in a third country, potential intertemporal penalties, such as the denial of future credit by private lenders, may not be sufficient to deter debt repudiation, while potential intratemporal penalties, such as trade sanctions, may prove more effective. If the costs of debt servicing and debt repudiation are distributed unevenly across the population, political considerations may give rise to a recurrent cycle of debt and default.

If a borrower has a debt level that exceeds in an intertemporal sense the resources available to it to repay that debt, it has an ability-to-pay problem. However, if a country's debt to GDP ratio is used to assess its ability to repay the debt, some additional information is needed, including the share of tradable goods in GDP and the level of the real exchange rate. Moreover, if the government is the major borrower, as in the recent debt crisis, the government's intertemporal budget constraint, rather than that of the country as a whole, is appropriate for assessing the ability to repay. Domestic economic policies, in particular fiscal consolidation, can thus play an important role in averting a debt crisis. The existence of an ability-to-pay problem suggests a need for debt reduction. However, another argument in favor of debt reduction--that the existence of a "debt overhang" lowers a country's investment, growth, and repayment capacity--encounters conceptual as well as empirical difficulties.

Debt reduction can be effected through debt relief or debt restructuring. The incentive problems typically associated with plans for debt relief can be overcome either by coordination by a special institution or by a market solution, such as the provision of tax credits to private creditors in exchange for debt relief. Perhaps the most common method of debt restructuring is for the debtor country to repurchase its debt at a discount in the international market. These "buy-backs," which might not on their own be an efficient means of debt reduction, are seen to play an important role in a broader debt-reduction strategy.

Introduction

The international debt crisis of the last decade or so, like all global disturbances, has been followed by a rash of short-term policy actions, heated political debate, and an outpouring of academic literature. The literature on sovereign debt is vast and encompasses both theoretical and policy concerns, with a substantial overlap between the two. The advances in economic theory in the years between the debt crises of the 1930s and the 1980s have stimulated a more rigorous examination of the issues raised by sovereign lending. This recent literature allows a clearer understanding of future debt crises and provides a policy guide to current debt restructuring and relief issues. This paper surveys the literature on debt relief, debt restructuring, and frameworks for the analysis of debtor behavior, as well as the closely related areas of the effects of debt on investment, and the costs of default.

Section I reviews some of the theoretical literature on sovereign debt, risk, and repudiation. Section II examines the costs of default, and discusses how the unequal distribution of these costs amongst economic agents can affect the borrowing and debt repudiation decisions. Section III deals with the effects of debt on investment, and Section IV with debt restructuring and debt relief. The last section concludes the paper.

I. Sovereign Debt: Theoretical and Conceptual Issues

The theoretical literature is divided into two fundamental approaches. First, there is disagreement on whether the recent debt crisis reflects a problem of ability-to-pay or willingness-to-pay. A related question is whether the crisis is a long-run problem of insolvency or a short-run problem of illiquidity. As a result of the disagreement on the nature of the debt crisis, there is no agreement on a suitable framework within which to analyze these two approaches to sovereign debt.

Before the 1980s crisis, there was a widespread belief that insolvency could never be a problem. In the famous words of Walter Wriston, the then Chairman of Citicorp, "nations don't go bankrupt." Even later many economists, including Cline (1983) and Krugman (1985), stressed that the problem was one of illiquidity rather than of insolvency. This distinction is often used to draw important policy implications. It is sometimes argued that if the problem is one of illiquidity then it can be solved by new lending, which helps nations tide over current, transitory repayment problems. The debt will be repaid in the future since borrowing countries are still technically solvent. If, however, borrowing nations are insolvent then new lending is irrational.

With the collapse of growth rates during the 1980s in almost all developing countries with high external debt (Indonesia, Korea, and Turkey being notable exceptions), the long-term nature of the crisis came to be understood. Krugman (1990), for example, now believes that the crisis is one of insolvency ("...and, indeed, of insolvency on a dramatic scale"). However, Eaton (1990) cautions that the nature of the crisis varies across

countries--that insolvency is the case in sub-Saharan Africa, but illiquidity is the case in Latin America.

The sharp distinction between these two concepts is misleading, partly because the concept of "illiquidity" is not well defined. Insolvency, on the other hand, has a clear meaning: if the present value of a country's current and future income is less than its debt obligations then the country is insolvent. However, if a country is illiquid, it is generally taken to mean that the country is solvent but does not have the ready cash to service its immediate debt obligations. But if a country is solvent it is hard to understand why it lacks the resources to make current repayments, and lenders should always be willing to lend to a solvent country unless they expect it to repudiate its debt. It is also not correct to argue that the country is currently insolvent but will "become solvent" at some time in the future. Insolvency by definition means that the net present value of the country's net income stream, less repayment obligations taken over *the whole future*, is negative. Formally, (following Sachs (1990a)) the simplest description of solvency requires that the following inequality be satisfied:

$$D_0 \leq \int_0^{\infty} [Q_t - A_t] e^{-rt} dt, \quad (1)$$

where D_0 is the current stock of outstanding debt, Q is national output, A is national absorption ($A = C + I + G$), and r is the interest rate on the debt. ^{1/} Absorption may be influenced by many factors, such as the rate of time preference, the incentives for investment, and political considerations, but it will not be zero.

Equation (1) also illustrates the importance of economic growth. If the rate of growth of output is larger than the interest rate then the debt can be serviced without any reduction in absorption: the economy can "grow out of debt." While constraint (1) does make points such as these clear, it does not necessarily present an accurate picture of whether or not ability-to-pay is likely to be a problem.

A country whose debt obligations are well below its annual GNP still might face an ability-to-pay problem if the government does not have access to a sufficiently large fraction of national output (e.g., due to costly and inefficient tax collection mechanisms). Since most developing country debt--about 80 percent in the majority of Latin American cases--is owed by the government, it is the government's, rather than the country's, solvency constraint that is important in assessing ability-to-pay. Thus, for policy purposes, a statement such as "this country's debt is 90 percent of annual

^{1/} We have made use of the transversality condition $\lim_{t \rightarrow \infty} D_t e^{-rt} = 0$, which restricts the growth rate of the debt to be less than the interest rate.

GNP, therefore it is technically solvent" is not useful. The basic government budget constraint is:

$$D_0^G \leq \int_0^{\infty} [T_t - G_t] e^{-rt} dt, \quad (2)$$

where D_0^G is the government's net debt (i.e., excluding reserves); G and T represent government spending and tax revenues, respectively. Kharas (1981) and Sachs (1984) have studied the case in which a sovereign government has limited taxing authority over national wealth. The main point is that a country's solvency constraint is not necessarily a good indicator of its capacity to repay. From condition (2), if T is low relative to G , 1/ then the repayment capacity of the country will be lower; again, constraint (1) would understate the magnitude of the crisis.

The importance of domestic economic policies is evident from condition (2). For example, with unchanged output, a reduction in sovereign borrowing requires a fall in the government's primary deficit. However, this requirement may often conflict with a political constraint; the government may also resort to money financing of the deficit, which, if there are collection lags in the tax system, will worsen the problem by an endogenous widening of the deficit (the Tanzi effect). In light of condition (2) an overvalued exchange rate, which can induce capital flight, would, by raising D_0^G , lower a country's ability to pay. Another consideration that is raised by the constraints is that the debt-GDP ratio might understate the magnitude of the ability-to-pay problem. A level of debt that appears low relative to GDP may actually be high when examined in the context of the government's budget constraint, especially after taking into account political and structural considerations. Furthermore, to the extent that a country's trade balance is a more accurate indicator (than GDP) of its debt-servicing ability, it is necessary to look at the fraction of output composed of tradable goods rather than at the aggregate (Sachs (1990a)). If nontraded goods comprise a large fraction of GDP then a low debt-GDP ratio may not be inconsistent with a repayment problem. 2/ The debt-GDP ratio is also sensitive to fluctuations in the real exchange rate; for example, a depreciation of the real exchange rate can raise a country's debt-GDP ratio even if its physical output and the stock of debt remain unchanged. 3/ To make repayments on the external debt, a country needs to

1/ The reasons for such an occurrence are widely discussed in the literature on fiscal policy, political economy, and debt.

2/ The debt-exports ratio in this regard is a more accurate indicator of a country's ability to pay, but it too is not directly in the context of the government's budget constraint.

3/ The consideration that a real depreciation raises the value of imports in the short-term needs to be taken into account if the debt-exports ratio is used instead.

increase its trade surplus. The implied increase in the production of tradable goods requires a real depreciation, which may itself adversely affect the solvency constraint. These are some of the factors to be taken into account when using a country's debt-GDP ratio to assess its ability to pay.

It is noteworthy that a country facing a liquidity problem will have an *ability-to-pay* problem in the short run if it cannot borrow to meet its current servicing commitments. In that sense the distinction between insolvency and illiquidity is not crucial for understanding the motivations behind the borrowing country's actions. What is important is the case where the borrowing country has the resources for repayment but finds it optimal not to repay. In this case there is a *willingness-to-pay* problem and strategic considerations become important. Of course, such considerations are of less relevance if the crisis represents a problem of *ability-to-pay*, as many now believe. From condition (1), if the time path of Q is suddenly lowered, or if r is suddenly raised, then the solvency condition can be violated. The issue then becomes one of *ability-to-pay*. The drop in growth rates in many indebted countries might indicate that the problem was, after all, one of insolvency so that the solution lies in debt relief. The effects of indebtedness on investment and growth, and the question of debt relief, are discussed in sections 3 and 4 below. For now we turn to the theoretical issues raised by the *willingness-to-pay* problem.

The introduction of strategic considerations presents the problem of a suitable framework of analysis. There are at least four such frameworks: pure reputational analysis, Bulow and Rogoff's bargaining theoretic framework, Atkeson's contract-based approach, and the signaling equilibrium approach. The theoretical literature up until 1986 is comprehensively surveyed by Eaton, Gersovitz, and Stiglitz, in which the *willingness-to-pay* nature of the problem is emphasized. A main theme in that paper is the one mentioned above: that "traditional concepts of solvency and liquidity are of little help in understanding problems of sovereign debt." There is also the additional consideration of sovereign risk, first developed in the current literature by Eaton and Gersovitz (1981). Since sovereign debt cannot be legally enforced, unlike private debt, the primary consideration in lending to a sovereign entity should not be just the size of the sovereign's assets but also the fraction of those assets that lenders expect will be devoted to debt servicing. This is related to the penalties that lenders can inflict in the event of a default. (It also relates to the uses to which borrowed resources are put, and the extent to which this decision can be influenced by lenders--a theme to which we shall later return.) The sovereign's debt repayment decision can then be looked at as an assessment of the costs and benefits of debt repudiation. The benefits of repudiation consist of the real value of the outstanding debt. The costs of repudiation are more controversial and are discussed in more detail below.

One way to model such behavior is to assume that lenders are atomistic while the sovereign government behaves strategically in the sense of being able to influence lenders' expectations. Reputational analysis (e.g., Eaton and Gersovitz (1981); and Grossman and Van Huyck (1988a) and (1988b)) is the

best example of such a framework. Typically, in such models a sovereign government issues debt to shift risk associated with "bad states of the world" (e.g., adverse technology shocks) to its lenders. Sovereign debt is thus interpreted as a contingent claim. Lenders are atomistic in the sense that each lender's actions are taken without regard to those of other lenders and the only cost that lenders can inflict on the sovereign is to deny it access to loans (possibly temporarily) in the future. A sovereign's "reputation" is its ability to use its current actions to influence lenders' expectations of its future debt servicing behavior. The cost to the borrower of an unjustifiable debt repudiation is a loss of reputation, which denies access to future loans. An unjustifiable repudiation is one that occurs in the absence of a bad state of the world in the borrowing country. On the other hand, an excusable default (i.e., one that follows an adverse shock) does not result in a loss of reputation. The threat of autarky provides an incentive for borrowers to validate lenders' expectations for repayment and so to maintain a trustworthy reputation for debt servicing. Reputation thus provides the link between the borrower's current actions and the lenders' expectations about future debt repayment. In the reputational equilibrium the borrower (sovereign) will validate lenders' expectations because the cost of losing a trustworthy reputation exceeds the benefit. The reputational equilibrium is thus self-confirming.

Reputational analysis has been criticized on theoretical grounds by Bulow and Rogoff (1989a) and (1989b) and on empirical grounds by Lindert and Morton (1989). Bulow and Rogoff argue that the loss of a trustworthy reputation for debt servicing is not a viable disincentive for debt repudiation. Their point is that as long as a country has access to international capital markets, rather than to repay its debt, the country would find it optimal in so called "good states" to use its resources to buy a portfolio of assets--for example, Treasury bonds--whose payoff is negatively correlated with the country's output, so as to allow risk shifting. (Since the country is willing to pay "up front" with its resources, it should be able to obtain these assets.) This transaction, however, amounts to an "unjustifiable repudiation" of its debt servicing obligation and the country loses its reputation and access to future loans. In spite of this, the country still finds this stance optimal because it achieves the desired objective of insuring itself against bad states of nature. In short, the threat of losing its trustworthy reputation for debt-servicing is not sufficient to induce the country to honor its debt service obligations. According to Bulow and Rogoff, the important penalties for default are the trade sanctions imposed by creditors, which force the defaulting country to forfeit its gains from trade.

This argument is logically correct but raises a few questions. The most obvious one is whether such assets markets actually exist. It is not clear that any of the problem debtors has actually built up an *official* stock of such assets (capital flight is a different consideration). If we interpret the "assets markets" as markets for insurance it is also not clear whether a borrowing country with a history of defaults will be able to purchase insurance. Diamond (1989) and Hart and Holmstrom (1985) discuss the role of reputation in insurance contracts, although reputation in these

papers refers simply to the borrower's record of past repayments and not to its ability to influence lenders' expectations. Also, Kletzer and Wright (1990) make the point that the Bulow and Rogoff argument implicitly assumes that the new lender is able to make a binding precommitment to the borrower to perform on the contract. In fact, "the new lender's equilibrium action is to pocket the transfer." ^{1/}

However, the Bulow and Rogoff argument would in principle go through even if the country were to simply keep the amount it borrowed and use these resources for "lending to itself". Also, the Bulow and Rogoff papers are able to analyze two key features of international lending. Firstly, countries rarely announce outright repudiations of their debts or even permanent partial defaults. Rather, they seek to restructure or reschedule their debts when experiencing servicing difficulties. Secondly, this process of rescheduling, or "recontracting", is *ongoing*. This is captured by means of a dynamic bargaining-theoretic framework. It allows us to study how creditor-country factors affect the outcome of negotiations (this is the subject of the 1988b paper) and also has some surprising implications. For example, the 1989a paper argues that an increase in interest rates on outstanding loans may benefit the *debtor* country. This is because higher interest rates increase the present value of repayments to creditors and thus increase the value of creditors' losses in the event of a default. This strengthens the debtor country's bargaining position vis-a-vis its creditors and may allow it to extract increased benefits in negotiations. The framework also allows for the analysis of other features of the debt crisis such as sidepayments and buybacks (section IV).

Lindert and Morton (1989) study the history of sovereign lending and default since the mid-19th century and conclude that "investors...do not punish governments with a prior default history, undercutting the belief in a penalty that compels faithful repayment." They find that the typical pattern of foreign lending was a burst of lending followed by widespread defaults. Moreover, countries that defaulted were seldom punished by their creditors, "either with direct sanctions or with discriminatory denial of later credit." This is troublesome not only for reputational analysis but also for analyses which posit that the actual costs of default are direct sanctions.

Eichengreen (1989) concurs with the finding that lending to defaulting countries was usually resumed after a few years with the only cost being smaller *private* capital flows. Again, these reductions of capital flows were not discriminatory (i.e., limited to those countries that actually defaulted) but were spread among all indebted countries. Even in the late 1980s, a country like Colombia, which had kept up its debt payments and had austere domestic policies, faced similar problems with getting new loans as did countries with worse records. This negative externality accruing from default has been empirically documented by Cardoso and Dornbusch (1989) and Jorgensen and Sachs (1989), among others. A conclusion of Eichengreen's

^{1/} Kletzer and Wright (1990), page 56.

paper is that a country's debt-servicing history is one of several factors that enter into creditors' calculations. They also consider factors such as country size, the variability of export earnings and the share of imports in domestic consumption. Another conclusion of this paper--that the bond market for sovereign debt was not "perfectly rational"--appears to be incorrect (see Appendix).

Ozler (1993), in contrast, finds empirical support for the general reputational prediction that previous defaults have a significant impact on the current terms of credit. One of the main findings is that, although defaults that occurred before the 1930s did not appear to affect credit terms in the post-war period, countries that subsequently faced repayment difficulties were charged higher interest rates than countries that did not. Ozler examines the expansionary phase of international lending so as to avoid the possible identification problem raised by the negative externality effect discussed above. Her paper also distinguishes between countries with unblemished records and those with no record of repayment difficulties--a distinction that it claims drives the results of papers such as Lindert and Morton's but which "is not validated by the data" (p. 8).

However, the finding that a country's credit terms are significantly affected by its history of debt servicing is not necessarily supportive of formal reputational models. In these models there is, as discussed, an important distinction between excusable defaults and repudiation, and an empirical test would have to make this distinction before it can provide meaningful results. The reputational models discussed here assume that lending is cut off in the event of debt repudiation; the resumption of lending, if it occurs, is determined by factors such as the memory of lenders and possibly by political changes in the debtor country (discussed below). The predictions are that either lending is cut off, in which case the interest rate is irrelevant, or that lending is resumed (e.g., in the event of an excusable default) with no penalties, in which case the interest rate should be no different from what it would have been in the absence of default. The finding is thus more relevant in the context of "reputation" as used by Diamond (1989) than in the above models. Another similar finding (Ozler (1992)) is that the interest rate spreads available to a borrowing country decrease as creditors gain more experience with the country, where "experience" is defined as the "cumulative number of months over which the borrower received a loan." This observation presumably reflects the high initial costs of information, and leads to the issue of information asymmetries.

An early study of the implications of informational asymmetries for country risk and thus for the pattern of international borrowing is that of Kletzer (1984). More recently, Atkeson (1991) studies a model of international lending with moral hazard--that is, where there is asymmetric information about the actions of borrowers. This model allows the borrower to consume out of current debt. This is an important feature that many models of debt assume away. The moral hazard problem arises because lenders are unable to ascertain the relative amounts of debt used for consumption and investment. (Using inordinate amounts of the debt directly for

consumption restricts countries' repayment capabilities; so the lender must ensure that the borrower spends a sufficient amount on investment.) Because of moral hazard, borrowers are unable to completely smooth their consumption streams by issuing debt. The optimal debt contract under such conditions is found to be consistent with the puzzling stylized fact that "countries with temporarily low output and good investment opportunities experience capital outflows" (p. 2).

Apart from moral hazard problems (i.e., asymmetric information about the actions of borrowers), there may also be problems of adverse selection (asymmetric information about their attributes). Cole, Dow, and English (1989) study the issue of the voluntary resumption of lending to a country that has been in default. The asymmetric information is about the type of government in the borrowing country. The government's type (myopic or far-sighted) is unknown to lenders and evolves according to a Markov matrix. A reputational model is then used to explain why defaulting countries experience different periods of exclusion from capital markets. The use of a reputational model is justified by assuming that institutional restrictions prevent the existence of the kinds of assets markets needed for the Bulow-Rogoff critique to work.

The main argument of Cole, Dow, and English is that the defaulting country need not be excluded from capital markets for a fixed length of time. Rather, if it can signal to lenders that the type of government has changed it will be able to resume borrowing. This signal takes the form of a repayment some time after the country's exclusion from capital markets (i.e., when repayment is not expected). In the signaling equilibrium, the size of the signal is large enough for a myopic government not to find it optimal to make it. The borrower may thus be able to resume borrowing before the fixed punishment period has elapsed. Resumption of lending following such a signal rather than at the end of a fixed period is optimal for lenders as well. This is because lenders will not know at the end of a fixed period whether the country's government type has changed. If it has not, then the imposition of a fixed punishment period is meaningless because after this period creditors will still be lending to a myopic regime. If the type does change before the completion of the period then it does not make sense to continue the punishment when the government is no longer myopic. This model is different from the pure reputational model because here defaults and repayments do not convey any information about long run debt servicing behavior.

In sum, the penalties for default have implications for the behavior of debtors and creditors, and for the usefulness of a particular framework of analysis. The notion that the bargaining framework can be used only when lenders have recourse to an exogenous penalty is dispelled by Kletzer's paper, which uses such a framework but in which lenders withhold loans to the debtor in the event of default.

II. The Costs of Default

The foregoing discussed two penalties for debt repudiation: the denial of access to credit markets and trade sanctions. The framework of analysis depend on which penalty is considered appropriate. In this section we discuss the costs of default. For clarity we use "penalty" to mean an action taken by lenders, in response to a default, with the intention of lowering the welfare of the defaulter. By a "cost of default," we mean any negative effect on the welfare of the borrower as a consequence of default. (The costs of default are thus a larger set than penalties.)

The absence of collateral and use of legal recourse as penalties for default is an important difference between sovereign and private lending. (This was not always the case. In the late 19th and early 20th centuries, the U.S. marines seized customs houses five times in Caribbean islands that had defaulted on their debts to the United States.) Kaletsky (1985) argues that in the case of debt default, retaliation depends to a large extent on political considerations and that although the power of creditor country governments to inflict penalties is large, on purely economic grounds the motivation is limited.

A *private* institution, however, may have responses to a default that are different from those of creditor country governments and indeed different from those of other private institutions. Private institutions may be categorized (Kaletsky (1985) as: (a) lenders, (b) direct equity investors, (c) traders of goods and services, and (d) institutions granting trade finance. International banks that lend, invest, and provide trade finance, and large multinational corporations that invest and trade in goods and services, are the private institutions that can inflict the largest penalties. Banks can withhold loans and trade finance to a country in default while multinationals can lower investment or withdraw completely from the country. Conflicts of interest can arise, not only between the different creditors, but between the different private institutions that can inflict penalties. While banks are concerned about the profitability and timely repayment of loans, multinationals are mainly concerned about the growth prospects of the country and the security offered to foreign investors. These concerns may be independent of one another. In fact, if a country defaults it will have more foreign exchange immediately available for imports and trade finance. Exporters to the country and firms providing only trade finance may thus even gain from a default. Kaletsky points out that short-term trade finance itself is "a highly profitable and not very risky business if it is conducted on a genuinely self-liquidating basis." ^{1/} Firms that deal only in trade finance would not have an incentive to interfere with trade credit, nor would banks that do not hold the country's debt. The incentive for creditor banks to impose penalties may be small, *ex post*, particularly if penalties also impose a cost on the creditors (see for example Calvo (1989)), which may explain why they are rarely imposed.

^{1/} Kaletsky (1985), page 38.

To the extent that actions by creditor country governments are influenced by the consequences of default for these private institutions, incentives for retaliation by these creditor governments are not unambiguous. Moreover, if sanctions are imposed, the debtor and creditor countries both forfeit their gains from trade. Finally, the government's decision to retaliate is, as noted, as much a political as an economic one. This suggests that the penalties creditors can or would choose to impose are more modest than supposed in the previous section.

However, if the penalties for default are actually quite small then it may seem puzzling that countries should choose to repay at all. Dooley and Svensson (1990) explain why it is rational for the debtor to continue repayment even though "the costs that creditors could impose are small and temporary." The argument is as follows. A country's announcement of a permanent default might not be credible. This is because a country that suspends debt service payments does not need to tax new investors in order to repay its creditors. Investment and domestic income would therefore grow after a default. But with higher domestic income, the marginal cost of repayment falls. It could fall sufficiently, relative to the benefits, to induce repayment. Repayment would require taxation. Investors understand this and do not believe an initial announcement of permanent default. However, if the announcement is not credible then the increase in investment will not be forthcoming, making the benefits of default quite low. In fact, the benefits can be lower than the penalties for default, which themselves are small, thereby explaining why continued repayment by debtor countries is rational.

The cost of a temporary suspension of debt service is that the debt continues to grow at the rate of interest. However, it is not clear that this imposes an additional burden on the debtor. The present value of the repayment stream, calculated by using the debtor's discount factor, is lower if the discount rate is greater than the interest rate. For a debtor such will be the case. The debtor thus gains by postponing repayment indefinitely into the future and will always choose to do so unless there is a penalty. This is true irrespective of the relative magnitudes of the discount rate and the interest rate.

The foregoing discussion ignores the importance of the distribution of the costs of default or debt servicing within the debtor country. If the costs are, or are expected to be, borne unequally across the population then the predicted pattern of borrowing, and debtor behavior in general, can be altered dramatically. The possibility of an unequal distribution of these welfare-losses raises the need for a deeper discussion of the government's behavior, and, in particular, of how its political motivations can affect economic outcomes. A growing literature in political economy is making important contributions in this direction by formalizing the treatment of political variables, adding political constraints to standard models of lending, and as a result enabling government policy to be formulated endogenously. Several interesting relationships then emerge between political variables (such as instability) and economic outcomes (such as external borrowing).

Alesina and Tabellini (1989) examine the implications of political uncertainty in a model in which two governments with conflicting distributional objectives randomly alternate in office. The governments represent different interest groups, this being reflected by transfers from the current government to its constituent interest group. The transfers are financed by taxing the other group and by borrowing. However, the government recognizes the possibility of a different type of government coming to power in the future and having to service the debt. To the extent that the future cost of debt servicing is not fully internalized in the borrowing decision, the result will be an above-optimal level of borrowing. 1/ Private agents realize that the future costs of debt servicing will fall disproportionately on one group depending upon which government is in power. They accumulate foreign assets as insurance against the risk of future taxation. 2/ Political uncertainty thus generates overborrowing, capital flight, and low domestic investment. Ozler and Tabellini (1991) corroborate the finding on overborrowing and show that political uncertainty and polarization lead to a stronger preference for present government consumption, and so to overborrowing. 3/ As a general observation: in this framework overborrowing emerges as a rational response to political uncertainty, even when the costs of default are high *ex ante*. That is, the approach tries to explain how the level of debt can be over-optimal *ex ante*, rather than only over-optimal *ex post*--for example with the occurrence of negative external shocks.

Some conclusions of the political economy approach receive empirical support from a study by Berg and Sachs (1988), which empirically examines the relationship between the structural characteristics of an economy and the likelihood of debt rescheduling. One of the findings is a positive relationship between extreme income inequality and the probability of rescheduling. The interpretation is that the political pressure for redistributive spending is high in such cases, and foreign borrowing is a way in which to raise the necessary resources without having to incur the political costs of higher taxation or the inflationary costs of money-financed deficits. Berg and Sachs also report a negative relationship between outward trade orientation and the likelihood of debt rescheduling. This is possibly because of the positive effect that external orientation has on the trade balance and hence on foreign reserves. 4/

1/ That is, the level of debt will be higher than that dictated by considerations of intertemporal economic efficiency; it will, of course, still be constrained by the lending limit of lenders.

2/ The idea of private capital flight being a response to the risk of future taxation was earlier presented by Khan and Ul-Haque (1986).

3/ "Polarization" is defined as the extent of disagreement over the composition of public goods.

4/ Another interpretation might be that, in a strategic setting, external orientation could make defaults more unlikely by increasing the costs of trade sanctions on the debtor. This point is made by Aizenman (1990).

Alesina and Tabellini argue that the costs of debt repudiation also may fall unequally across the population, thereby affecting the incentive of the government to repudiate its debt. For example, if one of the penalties for repudiation is the seizure of private assets held abroad, then repudiation is less costly for the government that represents the interest group holding fewer such assets. ^{1/} Repudiation will occur if this government unexpectedly gains power and the external debt is sufficiently high. The general point is that a change in government, by implying a change in the welfare loss from penalties, alters the incentives for debt repudiation.

To sum up, the costs of default on sovereign debt include the additional burden implied by the outstanding debt, which continues to grow at the rate of interest, in addition to the penalties that may be inflicted by lenders. The penalties may be intertemporal, in the form of the denial of access to credit markets in the future, or they may be intratemporal, in the form of direct penalties, such as trade sanctions. The form the penalty takes is seen to be an important factor in determining debtors' behavior. Finally, possible asymmetric distribution of the costs of default or debt servicing leads to considerations of political economy; this literature provides an explanation for why political factors might lead to overborrowing and low investment, and hence to low growth. The next issue to be examined is the link between indebtedness, investment, and growth.

III. Debt, Investment, and Growth

The effect of indebtedness on investment and growth has received much attention in the literature. Sachs (1986) propounded the debt-overhang argument. This says that beyond a point high external debt acts as a marginal tax on investment since a fraction of the gain in output resulting from increased investment accrues to creditors in the form of debt repayment. High indebtedness can therefore lead to low investment, low growth, and ultimately to low repayment. A simple version of the argument is as follows. Let Q denote output in each period (it depends positively on investment), D the repayment obligation, and t the maximum fraction of output that creditors can collect. Then repayment will be:

$$\begin{aligned} R &= D \text{ if } D < tQ \\ &= tQ \text{ if } D > tQ. \end{aligned}$$

If the debt is high enough, the debtor knows it will have to pay a fraction t of any increase in output to the creditor. This is treated as a tax on investment when the investment decision is made. The policy conclusion of the argument is clear. Reducing the face value of the debt would increase the incentives for investment, thereby raising output. Krugman (1988) and (1989) adds uncertainty to the model and derives a debt-

^{1/} Given that the seizure of private external assets is not traditionally a penalty for sovereign debt repudiation, this example should perhaps be regarded as illustrative.

relief "Laffer curve", according to which if the level of indebtedness is high enough then reducing the face value of outstanding debt will increase the present value of repayment. The intuition is the same as in the overhang argument. However, at least one empirical assessment of such a Laffer curve--Claessens (1990)--finds that although the present value of repayment, measured by the secondary market price, is concave with respect to the face value of outstanding debt--there are very few cases for which it actually begins to slope downward.

There are several objections to the overhang argument itself. Eaton (1990) argues that if such a Laffer curve exists it means that creditors, being rational, have knowingly taken losses for a number of years. Also, arguing that the overhang is largely responsible for slow growth lessens the importance of exogenous shocks and domestic economic policy--both of which were central to the crisis. Bulow and Rogoff (1990) point out that much of the slowdown of growth in Latin America occurred in 1980-83, or before these countries were required to make large repayments. However, this was not the case for the fifteen most heavily indebted countries, where the slowdown in growth, from 6 percent per year in the 1970s to -1 percent per year in 1981-83, occurred simultaneously with a jump in the ratio of external debt servicing to exports from 28 percent to 44 percent. ^{1/} Further, investment and growth have indeed been lower in more indebted countries (Chart 1). Yet nothing definite emerges from simple observations of this kind, partly because of the endogeneity problem of which countries got into the crisis in the first place (Fischer (1992)). The ambiguity suggests the need for empirical analysis (to establish among other things the direction of causality) as well as for an understanding of the distortion to incentives imposed by a high level of debt.

Warner (1990) presents an empirical analysis that raises further skepticism about the argument that the debt overhang was empirically significant in explaining low investment. Aizenman and Borensztein (1989) show that, in a strategic investment framework, the effect of the overhang on incentives to investment are ambiguous. In particular, there are conditions under which the overhang acts as a subsidy to (i.e., increases the incentives for) investment. In their model, if a debtor is unable to meet its repayment obligations then the level of repayment is determined by a bargaining game. The argument is that if domestic capital is a good substitute for imported inputs then the threat of autarky is less potent than if it were a poor substitute. Thus, it is possible that an increase in investment (which increases the stock of domestic capital) strengthens the country's bargaining position and therefore reduces its level of repayment. In such a case the incentives for investment are *increased* with high indebtedness. A possibility that could be considered in future research is

^{1/} The numbers and classification are taken from the IMF's World Economic Outlook (1992). The fifteen countries are Argentina, Bolivia, Brazil, Chile, Colombia, Cote d'Ivoire, Ecuador, Mexico, Morocco, Nigeria, Peru, Phillipines, Uruguay, Venezuela, and Yugoslavia.

whether high indebtedness *itself* strengthens a country's bargaining position.

Another effect on investment could operate through the absence of seniority clauses proving a disincentive to new lenders, in cases in which the outstanding debts are already large. This could lead to an illiquidity problem, with the implication that profitable investment projects will go unexploited. However, Cohen (1992) provides some empirical evidence against this kind of argument. More generally, his paper finds that although the large debtors experienced a marked slowdown in growth rates in the 1980s, the slowdown did not seem to be a function of variables that were highly correlated with the debt crisis, for instance the stock of debt and the flow of net repayments.

Perhaps the overhang argument does overstate the effect of indebtedness on growth; but the argument for reducing the debt burden does not depend only on the overhang. The problem of providing incentives to repay is relevant only insofar as a country *can* repay. The collapse of growth rates in most of the heavily-indebted countries in the 1980s (Chart 1), and the realization of an insolvency problem, could make full repayment of the current debt outstanding impossible despite any incentives.

IV. Debt Reduction: Debt Relief and Debt Restructuring

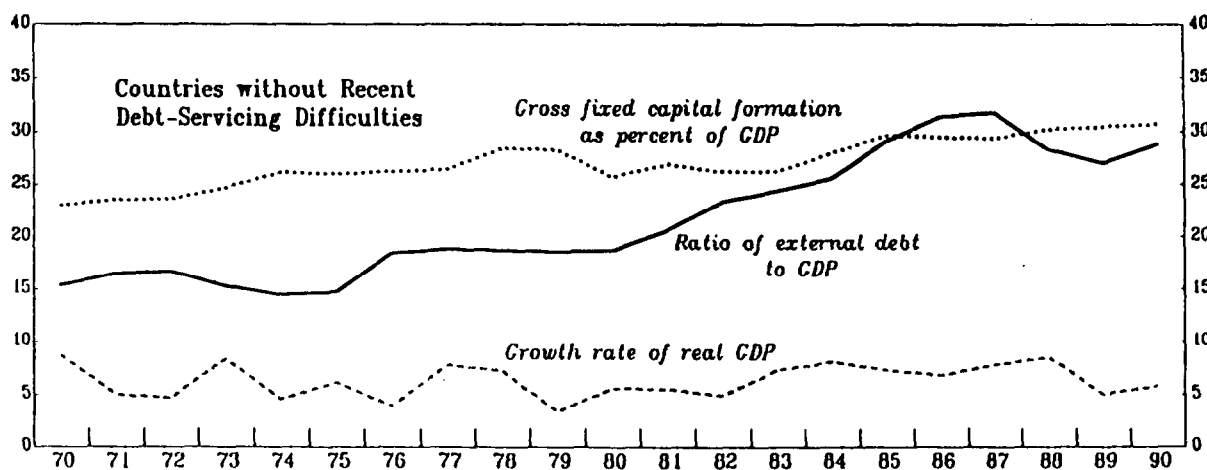
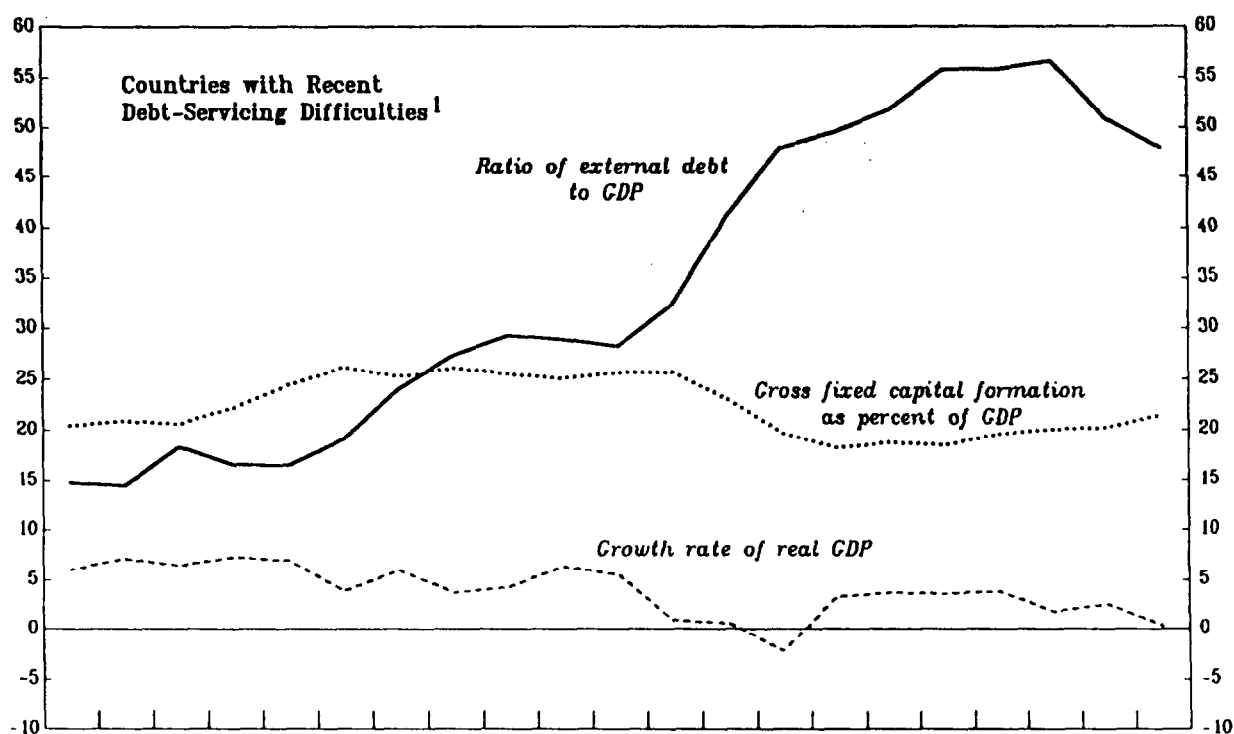
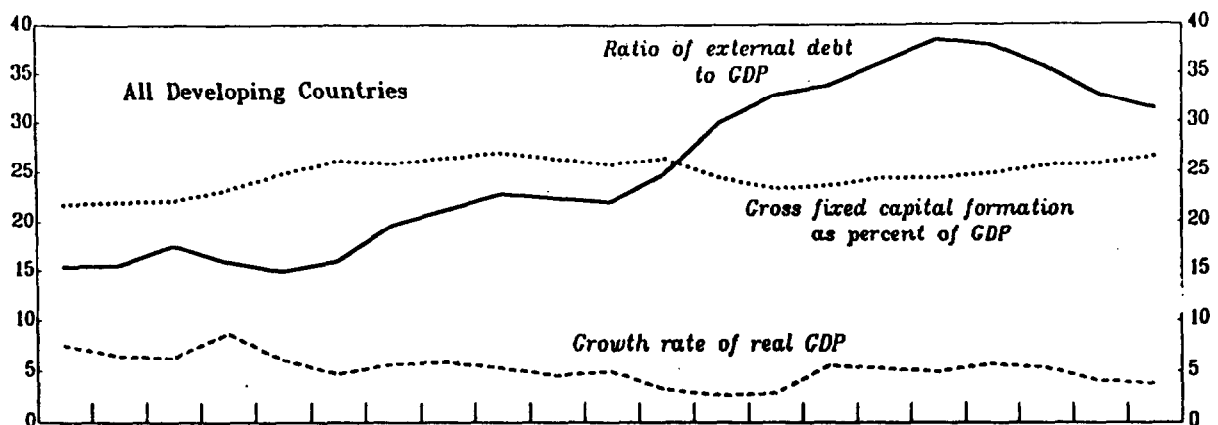
Debt reduction typically takes the form of debt relief or debt restructuring. From the point of view of creditors, the case for debt relief is based on the incentive considerations in the debt overhang argument and on the contention that debt relief directly increases the likelihood of repayment. The latter consideration reflects the recognition of an ability-to-pay problem, in the sense that the relevant solvency constraint is violated and no realistic reduction in spending can make it hold. In fact, an important difference between the former U.S. Treasury secretaries' Baker and Brady debt-reduction plans was precisely that the former treated the crisis as a short-term liquidity problem that could be solved by new lending, while the latter recognized the possible existence of a solvency problem that called for debt relief.

The objections to debt relief are based on the "precedence" problem and the free rider problem. The first says that providing debt relief to one debtor weakens the banks' bargaining position vis-a-vis remaining debtors. The free rider problem arises because when a country receives debt relief the market price of its remaining debt increases. Since holders of this debt receive a capital gain each creditor has an incentive to refrain from providing debt relief but gains if other creditors do so.

Such considerations have prompted the proposal for an International Debt Discount Corporation (IDDC): an institution which, among other things, would coordinate debt relief and get rid of the free rider problem (perhaps by penalizing banks that do not participate). This was propounded by Kenen (1983) and has been more completely discussed by Kenen (1990) and Sachs

Chart 1. Developing Countries: Debt and Growth, 1970-90

(In percent)



Source: World Economic Outlook database.

1 Defined as those countries that incurred external payments arrears or entered into official or commercial bank debt-rescheduling agreements during 1986-90.

(1990b). The idea is opposed by Bulow and Rogoff (1990) who contend that the inception of an IDDC would lead to even more fractious and inconclusive negotiations, since "the presence of official creditors has tended to ossify the negotiating position of the banks and countries." ^{1/} However, the free rider problem has often emerged in attempts to coordinate debt relief by banks, and the proposal for an IDDC at least addresses this problem. Recent attention has, however, shifted away from an IDDC to other institutional plans such as the Brady plan.

The above propositions for debt relief focus on the incentives for the debtor and its creditors, stating that both would benefit by it. Dooley (1988b) argues that such analyses ignore the potential role of new investors. While debt relief could benefit both parties, it leaves unexploited economic profits. An alternative scenario would be one in which a new investor buys the debt, grants the same amount of relief as existing creditors would, and is repaid the remaining debt. The investor then borrows capital on the international market, at the world interest rate, and invests it in the country. Since the rate of return to capital in debtor countries is typically greater than the world interest rate (one reason for borrowing is to take advantage of profitable investment projects), the project can be expected to yield positive profits. If the profits exceed the direct loss from debt relief and the investor has claim to a sufficient amount of the profits then such a "leveraged buy-out" of creditors will be a profitable strategy for the investor. This introduces an important incentive for collective action since the project could also be profitable for a group of new investors who act as a bloc.

In cases where the outstanding debt is high, in the sense that the solvency constraint is violated, attention again focuses on debt relief. Plans for debt relief suffer from the collective action problems discussed above. Dooley and Helpman (1992) have a proposal that avoids these problems. The proposal is to provide tax credits to creditors in exchange for debt reduction. Debtors see the removal of disincentives for investment and have a lower contractual amount of debt to repay. Creditors receive tax incentives for investment, since future investments will be susceptible to lower tax rates than they would have been without the tax credits. If a particular creditor does not wish to invest in a particular country, it could sell its tax credits to a third party which does. Notice that a tax credit scheme of this kind can be implemented unilaterally by the debtor country government. It thus escapes the kinds of bargaining problems inherent in other plans for debt relief such as unconditional debt reduction.

We turn now from debt relief to the related issue of debt restructuring. With the opening of a secondary market for developing country debt in the 1980s, and the low prices at which the debts of some countries traded, probably the most common method of market-based debt reduction has been the debt buy-back, in which the debtor repurchases debt

^{1/} Bulow and Rogoff (1990), page 35.

on the secondary market. ^{1/} However, there has been some debate on the question of whether buying back debt at a discount is an efficient method of debt reduction, and even whether it benefits the borrower. It is generally accepted that buy-backs by themselves are not as attractive as they might have at first appeared. One caveat concerns whether the country is ever going to be able to retire all of its debt; another is about where the resources for the buy-back come from.

Bulow and Rogoff (1988a) show that buy-backs typically harm the debtor country unless accompanied by direct debt relief. This is because of the difference between "average" and "marginal" debt. In a buy-back a country pays the full market price for its debt. (That is, it retires marginal debt at the price of average debt.) The lowering of the outstanding debt is meaningful only if the country is going to be in a position to service all of its debt in the first place. If not, then buying back debt at the margin does little to change the market value of outstanding debt and is "essentially a gift to creditors." They cite the Bolivian buy-back of March 1988 as a case in point. The total market value of the Bolivian debt, which was trading at 6 U.S. cents to the dollar, was \$40.2 million. Bolivia used \$18.5 million to buy back just under half of its total outstanding debt. The price of its debt increased to 11 U.S. cents per dollar and the remaining debt had a market value of \$39.8 million. If Bolivia could have retired all of its debt with the buy-back then of course such a move would have made sense; but, as it happened, the repurchase of a fraction of its debt hardly changed the market value of the country's obligations or, thus, its ability to reduce the debt burden through future buy-backs. We will return to this case.

In fact, a country can end up unambiguously worse off by engaging in a buy-back even if it is able to capture the full secondary market discount. Van Wijnbergen (1990) derives this result for the case in which a country uses its own foreign exchange reserves for the buy-back. The argument is that since the debtor's degree of risk aversion is greater than that of its creditors, reserves have an "insurance value" for the debtor. In bad states of nature the debtor can choose to devote resources to consumption rather than to debt service. If the debtor engages in a buy-back it loses its reserves and hence this option.

It has been pointed out (Sachs, 1988) that the funds for the Bolivian buy-back were provided by third parties who might not have provided them otherwise (this escapes the insurance value criticism). Further, the

^{1/} Another common method is the debt-equity swap, in which lenders' sell the debt at a discount to a third party, who in turn first redeems the loan paper for domestic currency from the central bank of the debtor country, and then acquires an equity claim on a firm in that country. The discount implies that, for the investor, the transaction is more favorable than a straight foreign exchange market transaction. A detailed analytical discussion on debt-equity swaps is provided by Helpman (1989), and the recent experience is reviewed by Blackwell and Nocera (1989).

reduction in Bolivia's outstanding debt and its strict adjustment program enabled it to come to an agreement with its official creditors whereby it can settle its remaining debt on terms similar to the buy-back. Sachs concurs with the general Bulow and Rogoff argument that buy-backs harm a country if it is never going to be able to repay all of its debt, but contends that the argument fails to take into account the potential costs of default. To the extent that lenders can impose penalties on a defaulting country a buy-back benefits the country since it can "cancel the overhang of bad debts." However, our earlier discussion warrants two qualifications to this argument. First, the penalties that creditors inflict are actually small. This might be because they have recourse to only small penalties or simply that the incentives to impose penalties *ex post* are small (see Calvo (1989)). Second, even if we allow for penalties that are large enough to influence debtors' behavior, a partial buy-back reduces potential penalties only if penalties are dependent on the size of default. ^{1/}

Moreover, even if the market value of the debt does not change, the reduction of the face value of outstanding debt implies that the country's stream of future interest obligations is reduced. The effect would be the same as if the country paid its creditors in cash to have the interest rate on its debt reduced. It is possible that the country can find an optimal tradeoff between losing current reserves and reducing future interest payments.

There is a suggestion (Acharya and Diwan (1989)) that, even though the debtor typically gains less by spending a dollar on a buy-back instead of on domestic investment or consumption, there is an informational role to buy-backs. Banks systematically grant debt relief to countries that engage in buy-backs since, as the title of their paper suggests, "debt buy-backs can indicate sovereign countries' willingness to raise investment and repay debt when partial debt relief is offered." Their empirical conclusion is that this indeed is how banks behave. However, reducing the amount of debt outstanding by engaging in a buy-back or by other means increases investment and repayment only if the reduction is large enough to cause a move up the wrong side of the debt relief Laffer curve. If the burden of debt is as large as in the Bulow and Rogoff (1988a) argument, then it is difficult to see why banks infer increased repayment capacity from even a small reduction in outstanding debt.

Another argument for debt buy-backs is that in the case of a debt overhang, buy-backs are optimal for both debtor and creditor because, by lowering the outstanding stock of debt, the incentives for investment are increased. This argument is contradicted by Bulow and Rogoff (1991). They

^{1/} This possibility is explored in Arora (1990). The incentive to engage in buy-backs is found to depend mainly on three variables: the country's rate of time preference, the secondary market price of the debt, and the probability of negative shocks to future output. However, the finding of a positive optimal level of buy-back is still sensitive to the assumption of a default-dependent penalty.

make the case that, even if buy-backs result in increased investment, the debtor would always be better off using the resources to increase consumption and investment proportionately rather than to engage in a buy-back, given the availability of high-yielding investment projects. First, this alternative results in a direct increase in investment in the high-yielding projects. Second, if a buy-back is believed to stimulate domestic investment, and therefore output, then the repurchase price will be higher and creditors will in this way extract more than the full efficiency gains resulting from the debt reduction. ^{1/} Buy-backs are thus not an efficient way to raise investment in a debtor country.

Dooley (1988a) and (1988c) shows that there is no general structure of benefits associated with a buy-back. Each case depends on the alternative uses of funds expended. For example, a buy-back that is financed by the sale of assets does not result in a rise in the market value of a country's debt. In fact, Froot and Krugman (1990) caution against self-financed buy-backs by "cash starved countries" since the shadow value of reserves for a country with a liquidity problem is greater than its face value. They also argue that buy-backs are not a realistic solution to the crisis because it is unlikely that there will be deep discounts on the debts of those debtors who have the resources to make large repurchases. All of this suggests that "one ought to be skeptical of overly general answers to the buy-back question." ^{2/}

However, these arguments are not inconsistent with buy-backs being part of a debt-reduction *package*, in which external financing may play a part. External financing on its own will not be enough for reasons already discussed: if the country is insolvent then additional borrowing merely pushes the debt-servicing problem into the future. If this "financing gap" exists then buy-backs can be part of a package of debt reduction, in which additional financial flows may be induced by the availability of a broad menu of assets with different contractual characteristics. ^{3/} Dooley and Symansky (1989) consider the decision problem of a country that faces a financing gap and must decide whether to use its resources for making debt repayments, or for debt repurchases, or a combination of the two. Debt buy-backs (or market-based asset exchanges in general) that follow market prices retire more debt than do interest or amortization payments that follow the original contractual terms. Further, the creditor gains the resources to purchase a safe financial asset.

The buy-backs that occur in an agreement between debtor and creditors, such as those following the Brady plan, can be conducted at a price that is agreed upon *ex ante*. This circumscribes the free rider problem that would

^{1/} Dooley (1988a) earlier made the point that with complete information a repurchase can only occur at the *ex post* price because otherwise there is no incentive to sell.

^{2/} Froot and Krugman (1990), page 2.

^{3/} Including, for example, debt-equity swaps, exit bonds, and domestic currency bonds.

otherwise arise amongst creditors and allows the country to retire more of its debt than would a repurchase at the *ex post* price. Moreover, buybacks that are conducted "secretly", through a third party for instance, can permit reductions in the debt with no rise in the market price (see Cohen and Verdier (1992)). This is because if the repurchase is by a market participant other than the debtor then it need not imply a decrease in the outstanding debt and hence need not raise the market price. Finally, the insurance value arguments against buy-backs depend almost entirely on the assumption that the borrower is risk averse, and may not be relevant in the context of an overall debt reduction strategy.

V. Conclusion

The debt crisis of the 1980s received much attention in terms of both academic research and policy discussion. This paper has sought to review some of the literature on the theory of sovereign debt, debt buy-backs, and debt relief. The basic theoretical literature was reviewed, and the costs of default were discussed. The distinction between the ability-to-pay problem and the willingness-to-pay problem was seen to be important both for understanding the debt crisis and for determining the appropriate policy response.

It was noted that, in the case of a sovereign debt crisis, a country's ability to pay needs to be assessed in terms of the intertemporal budget constraint of the government, rather than that of the country as a whole. This should be taken into account when the debt-GDP ratio of a country is used in order to assess its ability to pay, especially when the government's ability to collect revenues is constrained by political or structural factors. Further, at least in the short run, it is the tradable goods component of GDP, rather than the aggregate, that is important in determining a country's capacity to service its external debt, so that again a low debt-GDP ratio may not be inconsistent with an ability-to-pay problem. If a debt overhang exists then the high level of debt, by acting as a marginal tax on investment, may itself adversely affect a country's repayment capacity; however, there are conceptual as well as empirical reasons for doubting the existence of an overhang. Associated with the existence of an ability-to-pay problem is the issue of debt reduction, through debt restructuring and debt relief. There are several methods of market based debt reduction, the most common being debt buy-backs. While buy-backs may not always be an efficient method of debt reduction, conditions were discussed under which they can play an important role in a debt reduction strategy. Plans for debt relief are typically difficult to coordinate, in part due to the precedence problem and the free-rider problem, but these difficulties can be overcome, either by the creation of a special institution, or, perhaps more realistically, by market solutions.

If the problem is one of willingness to pay then the costs of debt default are an important consideration in the repayment decision. The nature of the penalties for debt repudiation--whether they are intratemporal or intertemporal--is important in determining which among several

theoretical frameworks is most appropriate for analyzing a debt crisis. The possibility of the asymmetric distribution of the costs of debt default leads to considerations of political economy, and provides a possible reason for the recurrent cycle of debt accumulation and default in some countries.

The Eichengreen Model

Eichengreen's model is set up as follows. The expected rate of return on risky loans should be equal to the risk free rate plus the risk premium. That is:

$$i(r) = i(f) + \delta\sigma \quad (3)$$

where σ stands for default risk and $\delta\sigma$ for the "premium on risky loans." The expected rate of return (ex ante of default) exceeds the required rate by an amount $\beta\sigma$ so that:

$$i(\text{ex ante}) = i(r) + \beta\sigma \quad (4)$$

The ex post rate of return is then given by:

$$i(\text{ex post}) = i(r) + \epsilon \quad (5)$$

where ϵ is the expectational error of investors. The model is then solved --incorrectly, as discussed below--for the ex post return to get:

$$i(\text{ex post}) = \frac{\beta/\delta}{1+(\beta/\delta)} i(f) + \frac{\delta+\beta}{\delta} i(\text{ex ante}) + \epsilon \quad (6)$$

Since δ and β are both positive, the claim is that regressing ex post on ex ante returns, if the ϵ 's have mean zero, should yield a coefficient on $i(\text{ex ante})$ which is greater than one. Finding it to be much less than unity, the conclusion is made that the data are "inconsistent with the joint hypothesis of rational expectations and market efficiency."

The correct derivation of equation (6) is as follows. Solving equation (4) for σ and substituting into equation (3) we have that:

$$i(r) = i(f) + \frac{[i(\text{ex ante}) - i(r)]}{\beta/\delta}$$

That is:

$$\frac{\beta + \delta}{\beta} i(r) = i(f) + (\delta/\beta) i(\text{ex ante})$$

Substituting for $i(r)$, from this equation, into equation (5) we have that:

$$i(\text{ex post}) = \frac{\beta/\delta}{1+(\beta/\delta)} i(f) + \frac{\delta}{\beta+\delta} i(\text{ex ante}) + \epsilon \quad (6B)$$

Notice that in equation (6B) the coefficient on $i(\text{ex ante})$ is less than one. It is thus incorrect to state that in order to not reject "the joint hypothesis of rational expectations and market efficiency" the coefficient should be greater than one.

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