Sovereign Debt, Structural Adjustment, and Conditionality[1]

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Abstract

The lack of proper enforcement mechanism for sovereign debt generates a commitment failure. As a result, a sovereign may seek to improve its position in debt renegotiations and thus evade its debt obligations by reducing exports. Conditionality seeks to provide a solution to the incentive problem by addressing the commitment failure. Formalizing this argument, we show that conditionality helps the repayment of sovereign debt. In certain circumstances, it can eliminate debt overhang, especially when it is coupled with concessionary lending of sufficient magnitude. It is, however, unable to restore first best. When it is anticipated by lenders, conditionality may get IFIs and sovereign debtors into a trap where the debt overhang persist, debt rescheduling takes place periodically, and conditionality continues indefinitely.

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The last decades have seen an ever increasing involvement of International Financial Institutions (IFI)[2] in the renegotiation of sovereign debt. With IFI's involvement, these renegotiations have emphasized *conditionality*, meaning that the rescheduling and reduction of debt are made conditional on the adoption of policy packages that, among other things, emphasize structural adjustment through trade liberalization *(IMF Survey*, December 1991d).[3] This paper develops a formal model to examine the role that structural adjustment and conditionality play in sovereign lending. Conditionality is shown to help resolve a debt crisis and do away with debt overhang.[4] If anticipated by lenders, however, it also favors overborrowing and creates the conditions for its self-perpetuation.

The starting point of our enquiry is the recognition that sovereign borrowing is characterized by a failure of commitment: contractual obligations cannot be enforced with a sovereign the same way they are enforced with a private individual. As a result, debt renegotiations lead to incentive issues that are particular to sovereign borrowing. Conditionality is an effort to resolve these incentive problems by addressing the commitment failure. To understand why structural adjustment and trade liberalization have become a center piece of many conditionality plans, one only needs to recognize the role of international trade in debt renegotiation. A sovereign's leverage in renegotiating its repayment obligations often depends on its level of exports, either because higher exports mean higher ability to pay, or because more involvement in trade increases the penalty that could be imposed by creditors through trade sanctions. A sovereign may

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[2] Mainly the International Monetary Fund, the World Bank, and to a lesser extent the Bank for International Settlements.

[3] In practice, conditions often are imposed on private creditors and bank syndicates as well - for instance, that all creditors contribute to debt rescheduling in proportion to their original claim (Sundaram, 1989). In this paper, we focus exclusively on conditions imposed on the debtor.

[4] Defined as the situation in which the nominal debt obligations of a country surpass its ability or willingness to pay (Claessens and Diwan, 1990).

therefore seek to evade its debt obligations by withdrawing from trade. This is what structural adjustment conditionality strives to prevent in exchange for a rescheduling of debt obligations.

In section one, we introduce key stylized facts and theoretical arguments on sovereign debt as they have appeared in the literature. In section two, we construct a simple model of debt renegotiation that captures these facts and arguments in a stylized fashion. The efficiency loss and incentive problem resulting from commitment failure are illustrated and the welfare enhancing role of conditionality demonstrated. The role of IFIs in debt renegotiations is also brought to light. Section three introduces uncertainty to generate debt overhang and debt discounts on the secondary market. We show that concessionary lending can in principle resolve any debt overhang problem. When anticipated by lenders, however, conditionality may get IFIs and sovereign debtors into a trap where the debt overhang persists, debt rescheduling takes place periodically, and conditionality continues indefinitely. Conclusions and possible extensions are discussed in the end.

Section 1. A Brief Review of the Issues

The Commitment Failure

Traditionally, debt crises are defined in terms of ability to pay: a country defaults on its debt because it has run out of foreign exchange. One would be hard pressed, however, to define precisely what proportion of a country's exports can be earmarked for debt service before the country's ability to pay has been exceeded. Another, more theoretically satisfying approach is to focus on the sovereign's willingness to pay and posit that a debtor who is unable to pay is, by definition, also unwilling to pay.

To understand why a debtor is willing to pay his debts, one must uncover enforcement mechanisms that make the respect of debt contracts incentive compatible. From this perspective, sovereign borrowing stands in a category of its own since courts cannot compel a sovereign to pay its debts (Eaton and Gersovitz, 1981).[5] Other enforcement mechanisms therefore must exist that incite a sovereign not to breach debt contracts and that make the commitment to repay credible.

Two categories of enforcement mechanisms have been proposed in the literature. The first, initially put forward by Eaton and Gersovitz (1981) and revisited by Kletzer (1984), Eaton, Gersovitz and Stiglitz (1986) and Grossman and van Huyck (1988) among others, uses a repeated game argument to explain debt repayment. A sovereign, the story goes, has an incentive to repay its debts whenever the failure to do so would endanger its reputation and preclude access to loans in the future. Inducing repayment by the denial of future loans may not always work, however. It requires the cooperation of all sources of credit, something that may be difficult to obtain (Eaton and Gersovitz, 1981; Kletzer, 1984; Sachs, 1984). It can account for repayment when credit is used for consumption smoothing, but is ill suited to enforce the repayment of growth financing (Eaton and Gersovitz, 1981; Kletzer, 1984; Worrall, 1990). It is ineffective if sovereigns have other means of insuring themselves (Bulow and Rogoff, 1989b; Rosenthal, 1991).

The threat of reduced aid flows is a variant of the above argument that has not received much theoretical attention but is perhaps more relevant in practice (Starrels, 1991). A large portion of the external debt of many countries, particularly poor African

[5] For surveys of the literature on sovereign lending, see for instance Eaton, Gersovitz and Stiglitz (1986) and Kletzer (1988). For evidence that willingness to pay is the major obstacle to debt collection, see Lee (1991) and the references cited therein.

nations, is indeed held by bilateral and multilateral donors (Greene, 1989; Humphreys and Jaeger, 1989). The threat of reduced aid has been used, for instance in Kenya, by a consortium of bilateral and multilateral donors as a bargaining chip during debt renegotiations.

The second enforcement mechanism discussed in the literature does not require repeated interaction between borrowers and lenders, or implicit cooperation among lenders to punish defaulting borrowers. It relies on decentralized initiatives by creditors who seek to recover their money through legal means and, in the process, penalize the defaulting country by interfering with its international trade. Initiatives by creditors essentially take three forms (Gersovitz, 1983). First, creditors may offset the sovereign's debt obligations against international payments and short-term commercial credit that transit through their hands. At the time the Mexican debt crisis erupted, for instance, most of the privately held sovereign debt outstanding was in the hands of the nine so called money centers, which are also involved in most international commercial transactions (Sachs, 1984, p. 36; Kyle and Sachs, 1984; Sachs and Huizinga, 1987, Table 1). Second, creditors may initiate legal action in their home country, either directly against the defaulting government,[6] or against anyone who maintains commercial or financial relations with it.[7] Finally, unpaid lenders can lobby for trade sanction and enlist the help of their government in renegotiating the sovereign's debt obligations (Eichengreen and Portes, 1986, 1989; Eichengreen and Lindert, 1989; Lindert and Morton, 1989). It is true

[6] For such an action to be successful, the legal system of the creditor's country must waive sovereign immunity in case of default. In the United States, this was achieved by the Foreign Sovereign Immunities Act of 1976 and the State Immunity Act of 1978 (Gersovitz, 1983; Worrall, 1990).

[7] It is the purpose of many of the legal clauses entered into international loans -- e.g., seniority, sharing, cross-default -- to ease recourse from one creditor to another (Sundaram, 1989).

that the sovereign can evade bank offsets and trade sanctions by reorganizing its international transactions around shady intermediaries and smoke and mirrors deals. But doing so significantly increases the cost of trade. This cost, discounted over the number of years during which the debt issue is not resolved, may be sufficient to motivate a sovereign to repay its foreign debt.

The Incentive Problem

By threatening to deny future loans, reduce aid flows, or interfere with international trade, creditors can put pressure on a recalcitrant sovereign. There is, however, a limit to the pressure they can bring to bear. Whenever that pressure is not sufficient to ensure full repayment, the debt has to be renegotiated. In particular, net financial flows have to remain at all times commensurate with what the sovereign is able and willing to pay (Bulow and Rogoff, 1988, 1989a; Fernandez and Rosenthal, 1990; Krugman, 1988; Kletzer and Wright, 1990).

When the sovereign anticipates that its bargaining power in future debt renegotiations are influenced by its current actions, an incentive problem may arise. Numerous contributions[8] have emphasized the negative effect of future debt payments obligations on current investment whenever the current debt servicing capacity of the country has been surpassed. This idea is sometimes presented as the debt Laffer curve (Claessens, 1990; Krugman, 1988; Cohen, 1990). More recently, it has been argued that, since indirect sanctions cannot in practice tax the domestic income of the defaulting country, it is more appropriate to consider their incentive effects on trade policies and trade related

[8] Gersovitz (1983), Sachs (1984, 1989), Krugman (1988), Helpman (1989), Claessens and Diwan (1990), Claessens (1990), Cohen (1990), Eaton (1990).

investment (Aizenman (1991); Diwan (1990); Gersovitz (1983)). This is the approach adopted here and to which we now fully turn.

Section 2. The Role of Conditionality

The Enforcement of Sovereign Debt Obligations

The incentive problem that conditionality attempts to solve is best illustrated with the help of a simple, formal model of sovereign lending. Assume that creditors can credibly threaten to impose a penalty h indefinitely on a sovereign debtor. The penalty is an increasing function $h(T)$ of the debtor's level of international trade T. As we shall see, $h'(T) > 0$ is critical for conditionality to play a role in our model. It may be taken to mean that the sovereign's level of exports determines its exposure to trade interference and thus defines its bargaining position with lenders; $h(T)$ is then a measure of the sovereign's willingness to pay. Alternatively, it may be interpreted as implying that actual debt repayments depend on the sovereign's ability to meet foreign debt obligations and thus, ultimately, on its exports earnings. Irrespective of the interpretation favored by the reader, a potential incentive problem arises that is the object of this paper: sovereign debtors may attempt to lower debt repayment by reducing their involvement in international trade -- as Latin American countries did in the wake of the 1930's debt crisis (Eichengreen and Portes, 1986, 1989).

Let us now derive the maximum debt repayment a sovereign can be forced to repay when faced with a penalty for default $h(T)$. The sovereign's economy is summarized in a production possibility frontier between non-traded goods N and exported goods T, i.e., $N = g(T)$ with $g'(T) < 0$. Imports are equal to exports T minus net debt repayment R. The sovereign's welfare depends on domestically produced commodities N and imports, i.e., $U(N,\ T-R)$. With the help of various domestic policy instruments, the sovereign is able to allocate domestic productive resources between traded and non-traded goods. The sovereign's choice of policy can therefore be represented as the following social planner problem:

$$Max_{\ T}\ \ U(g(T),\ T-R)$$

We begin with the simplest possible case in which the sovereign's economy is stationary, that is, in which $g(T)$ is constant over time. The sovereign is assumed to have received, some time in the past, a series of loans. We abstract from coordination problems among creditors and assume that lenders can form a syndicate and act in unison. From here on, therefore, lenders are referred to collectively as 'the creditor'. The creditor's problem is to maximize the discounted value of future loan repayments while respecting the debtor's sovereignty. Debt repayment is subject to negotiation between the creditor and the sovereign. For the sake of simplicity, all the bargaining power is assumed to reside with the creditor (Kletzer (1989)). The creditor can make a take-it-or-leave-it repayment offer R_t to the sovereign. The sovereign can then decide to accept the creditor's offer and repay R_t. Alternatively, it can refuse the offer, default on the loan and incur the penalty $h(T)$ indefinitely.

Let us first consider what would happen if the sovereign and the creditor were to negotiate all future debt repayments $\{R_t\}$ at time $t=0$. Assume that the agreement they would reach is perfectly enforceable. The creditor's problem in deciding what offer to make to the sovereign can be formally represented as the following principal-agent model:

$$J^* \equiv Max_{\ \{R_t,\ T_t,\ T_t^d\}}\ \sum_{t=0}^{M} \beta^t R_t$$

subject to

$$\sum_{t=0}^{M} \delta^t U(g(T_t^{d*}),\ T_t^{d*} - h(T_t^{d*})) \le \sum_{t=0}^{M} \delta^t U(g(T_t),\ T_t - R_t) \tag{1}$$

$$T_t^{d*} = arg\ Max\ U(g(T_t^d,\ T_t^d - h(T_t^d)) \text{ for } all\ t \tag{2}$$

$$D_0 \ge \sum_{t=0}^{N} \beta^t R_t \tag{3}$$

where β and δ are the creditor's and the debtor's discount factors respectively, M is the horizon of the relationship, possibly infinite, and D_0 is the stock of debt at time 0. The first constraint requires that the debtor is not better off by turning down the creditor's offer and incurring the sanction. The second constraint determines what the sovereign's policy choice is in case of default. The third constraints states that the creditor may not ask for more than what is owed; if it is not binding, the debtor suffers from debt overhang. The incentive compatibility condition that T_t must be optimal from the point of view of the debtor was dropped because it is automatically satisfied at the optimum.

The solution to the above optimization problem can easily be characterized. T_t^{d*} is not affected by the creditor's offer, and it is constant over time. Provided that N and imports are normal goods, the first constraint is always binding. T_t is then set to satisfy static allocative efficiency, i.e.:

$$U_N g' + U_T = 0 \text{ for } all\ t$$

The above implicitly defines exports T as a function of debt repayment R. Denote this relationship $T(R)$. We are interested in the case where $1 > T' > 0$, that is, where the sovereign shifts domestic resources away from domestic production toward exports in order to service the debt, but not so much as to increase the consumption of imports.

Proposition 1: $1 > T' > 0$ when (A1) $U_{NT}g' + U_{TT} < 0$ and (A2) $U_{NN}g' + U_{NT} > 0$.

Proof: In appendix.

Now consider the case where the third constraint is not binding, that is, when the sovereign is suffering from debt overhang. The optimal choice of repayment R_t must satisfy:

$$-U_N g'T' - U_T(T'-1) = U_T = \lambda \left[\frac{\beta}{\delta} \right]^t \qquad (4)$$

where λ is the Lagrange multiplier of equation (1). If the creditor is less impatient than the debtor, repayment of the loan is postponed:

Proposition 2: Suppose that the creditor and sovereign can make future binding agreements. Then repayments increase (decrease) over time if $\beta > (<) \delta$.

Proof: In appendix.

Commitment Failure

So far we have assumed that creditor and sovereign can make binding agreements about loan repayments over time. In practice, however, such agreements suffer from commitment failure. Assume that the sovereign cannot commit to a particular choice of T in the future. Debt repayment must then be negotiated in each time period. Suppose that the renegotiations can be summarized as follows (Figure 1): in each period t, the sovereign first chooses T_t, then the creditor makes a repayment offer R_t, and finally the sovereign decides whether to accept the offer and pay R_t or to refuse and to incur the sanction $h(T_t)$. The sovereign refuses any offer that asks for more than $h(T_t)$. The highest offer that the creditor can make without being turned down is thus $R_t = h(T_t)$. Anticipating this, the sovereign should choose a level of exports T_t that reduces $h(T_t)$ and thus R_t, i.e., pick T_t so as to:

$$Max_{T_t} \;\; U(g(T_t),\, T_t - h(T_t))$$

Dropping redundant constraints, the creditor's problem can be written as:

$$J^d \equiv Max_{\{R_t,\, T_t,\, T_t^d\}} \sum_{t=0}^{M} \beta^t R_t$$

subject to

$$\sum_{s=t}^{M} \delta^s U(g(T_s^{d*}),\, T_s^{d*} - h(T_s^{d*})) \le \sum_{s=t}^{M} \delta^s U(g(T_s),\, T_s - R_s) \text{ for } all\ t \tag{5}$$

$$T_t^{d*} = arg\ Max\ U(g(T_t^d,\, T_t^d - h(T_t^d)) \text{ for } all\ t \tag{6}$$

$$R_t = h(T_t) \text{ for } all\ t \tag{7}$$

$$D_0 \ge \sum_{t=0}^{N} \beta^t R_t \tag{8}$$

Proposition 3: Suppose that the creditor and sovereign can not make future binding agreements. Then $R_t = R^{d*} = h(T^{d*})$ when $D_0 > \sum_{t=0}^{N} \beta^t h(T^{d*})$.

Proof: In appendix.

Debt repayment with debt overhang is constant over time and equivalent to the maximum penalty that could credibly be inflicted on the sovereign if it were to always refuse the creditor's offers. A corollary of the above is that, in case of debt overhang, an impatient sovereign is unable to persuade a patient creditor to postpone actual net repayments for fear that the sovereign would reduce its future repayment obligations by revising its domestic policies unilaterally. The sovereign's inability to commit forces the creditor to insist on full payment of $h(T^{d*})$ in every period.

Proposition 4: $J^* \ge J^d$.

Proof: The optimization problem without commitment is a constrained version of the optimization problem with commitment. The proposition is established by applying the Le Chatelier principle.□

Proposition 4 summarizes the efficiency loss generated by the commitment failure: the discounted value of future repayments the creditor can credibly negotiate with the sovereign is lower if the sovereign remains free to choose its domestic policies. Proposition 4 also implies that a given level of outstanding debt may be credibly repaid if the sovereign could commit its future policies, but would not be repaid if the sovereign could not commit:

Corollary: There exist a level of outstanding debt $\tilde{D}$ such that $J^{*} \geq \tilde{D} \geq J^{d}$.

Finally, if creditors limit their loans to what they can credibly recover, proposition 4 implies that the sovereign's inability to commit its future domestic policies reduces its ability to raise credit. The inability to perfectly enforce commitments leads to credit rationing.

Commitment and Conditionality

Conditionality can be seen as a partial effort to restore commitments. Suppose that the negotiation process between creditor and sovereign can now be summarized as the following extensive form game (Figure 2). In each period *t*, the creditor begins by offering a conditional repayment of the debt. The sovereign is asked to take policies that implement T^{c} in exchange of which the creditor promises to limit repayment to R^{c}. The sovereign then chooses whether to accept or reject the offer. If the offer is rejected, negotiations break down and the sovereign incurs the sanction from then on. If the offer is accepted, the sovereign chooses T, possibly different from T^{c}. After observing T, the creditor makes an offer R^{c} if action T^{c} was taken, and makes an alternative offer if $T \neq T^{c}$. The sovereign then decides whether to accept the offer or incur the sanction.

The subgame perfect equilibrium of the game can derived as follows. At the end of the period, a sovereign who has chosen T^c and thus been offered R^c decides to pay if $R^c \leq h(T^c)$. If the sovereign has adopted $T \neq T^c$, the creditor offers the sovereign to repay $h(T)$. Anticipating this, the sovereign chooses to adopt action T^c whenever $U(g(T^c), T^c - R^c) \geq U(g(T^d), T^d - h(T^d))$ where T^d maximizes $U(g(T), T - h(T))$. This defines the locus of conditional rescheduling offers that will be accepted and complied with by the sovereign.

If the conditional offer game is repeated M times, the creditor's problem becomes:

$$J^c \equiv Max_{\{R_t,\, T_t^c,\, T_t^d\}} \sum_{t=0}^{M} \beta^t R_t^c$$

subject to

$$\sum_{s=t}^{M} \delta^s U(g(T_s^{d*}), T_s^{d*} - h(T_s^{d*})) \leq \sum_{s=t}^{M} \delta^s U(g(T_s^c), T_s^c - R_s^c) \text{ for } all\ t \tag{9}$$

$$T_t^{d*} = arg\ Max\ U(g(T_t^d, T_t^d - h(T_t^d)) \text{ for } all\ t \tag{10}$$

$$R_t^c \leq h(T_t^c) \tag{11}$$

$$D_0 \geq \sum_{t=0}^{N} \beta^t R_t \tag{12}$$

Proposition 5: Suppose the negotiation game is as detailed in Figure 2. Then, when $D_0 > \sum_{t=0}^{N} \beta^t R_t$, (1) $R^{d*} \leq R_t = R^{c*} < h(T^{c*})$ and $T^{c*} > T^{d*}$ when $h' \neq 0$; and (2) $R^{d*} = R_t = R^{c*} = h(T^{d*})$ and $T^{c*} = T^{d*}$ when $h' = 0$.

Proof: In appendix.

Proposition 6: (1) $J^* \geq J^c \geq J^d$. (2) $J^c = J^d$ if $h'(T) = 0$.

Proof: In appendix.

Proposition 5 states that, in the presence of incentive problems, repayment with conditionality is constant over time but higher than repayment without conditionality.

Also, to be induced to accept a higher repayment R^{c*}, the sovereign must keep some of the gains from trade over and above what it could be forced to repay given the choice of policy T^c. In other words, the creditor must show restraint and refrain from confiscating all the gains from increased allocative efficiency by offering $R = h(T^c)$ after the country has already implemented T^c. Proposition 6 states that conditionality enables the creditor to collect higher loan repayments. It also implies that a given level of outstanding debt may be credibly repaid with conditionality even though it could not be repaid without it. Conditionality thus can help solve a debt overhang problem. If properly anticipated, it can also increase the sovereign's ability to raise credit. The second part of propositions 5 and 6 reminds us that in the absence of incentive problem, conditionality plays no role.

Conditionality and the Role of IFIs

The conditionality process summarized in Figure 2 raises several delicate issues of policy design, monitoring, and trust between sovereign and creditor, as well as among creditors themselves. Private banks and most small bilateral creditors are usually neither competent to design policy packages that seek to increase the debtor's trade flows nor equipped to monitor compliance with such packages.[9] As a result, it may be difficult for them to design and negotiate a reasonable $\{T^c, R^c\}$ package. They may also be unable to ascertain whether the sovereign has indeed implemented T^c. IFIs, on the other hand, often have both the expertise and the monitoring capabilities that are required to make conditionality work.[10]

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[9] A failed 1976 attempt by a bank syndicate to enforce conditionality on Peru without help from IFIs is discussed in Sachs (1984), p.36. Eichengreen and Portes (1986, 1989) show how, in previous debt crises, the absence of coordinating and monitoring organization made lenders more vulnerable to default risk.

[10] See Matin (1990), however, for a dissenting opinion on this matter.

The sovereign must also be reassured that the creditor will not renege on its promise and ask for $h(T^c)$ once the sovereign has made irreversible trade policy choices. For the same reason, creditors might worry about free riding among themselves, as some may refuse to reschedule their debt obligations or hide some of their claims on the sovereign in order to capture a higher share of repayments R^c (Caskey, 1989).[11] The role of the IFIs is consequently to minimize opportunistic behavior and establish enough trust for negotiations to proceed among all parties.

Section 3. Conditionality With Uncertainty

So far we have discussed how a sovereign may refrain from choosing optimal trade policies in an effort to minimize debt repayment. Conditionality was shown to help address this incentive problem by resolving a commitment failure. In theory, however, efforts by a sovereign to evade debt repayment obligations, and efforts by creditors to monitor conditional loan rescheduling could be eliminated by forgiving any debt obligation that exceed R^c. Doing so would induce the sovereign to choose T^c. Debt forgiveness could thus be a way to increase debt repayment without having to monitor the performance of the sovereign. Why then is massive debt forgiveness so rarely observed?

In this section we explore one possible answer to this question, namely, that the future of the sovereign is uncertain. The intuition behind our approach is straightforward: if there is some probability that the sovereign is able to pay in the future, the creditor has no incentive to forgive the debt. This is true even though the current level of debt obligations could never be repaid should the sovereign's economic potential remain unchanged.

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[11] Fernandez and Glazer (1990) examine the polar question of collusion among debtor countries.

A Model of Sovereign Debt with Uncertainty

To keep things as simple as possible, we assume that at any point in time the sovereign has an exogenously determined probability p of jumping to a higher production possibility frontier $\tilde{g}(T)$, which lies everywhere strictly above $g(T)$. After the jump, the sovereign stays with $\tilde{g}(T)$ forever. The sovereign observes the state it is in before making policy decisions about T. The maximum credible loan repayment that can be expected from the sovereign in the high state is determined as in section 2. Let $\bar{D}$ stand for the present discounted value of the maximum loan repayment that be credibly recovered without conditionality from the sovereign in the high state:

$$\bar{D} = \frac{\beta h(\tilde{T}^d)}{1-\beta}$$

where $\tilde{T}^d$ is defined as before, but using $\tilde{g}(T)$ instead of $g(T)$. Once the level of nominal debt has reached $\bar{D}$, the expected discounted value of future debt repayments remains constant: any increase beyond $\bar{D}$ will never be repaid.

Now consider the expected discounted value of the nominal debt $\bar{D}$ when the sovereign is in the low state. Let $\hat{R}$ be the maximum payment that can be extracted from the sovereign in the low state, e.g., $\hat{R} = h(T^d)$. The value of the debt $\bar{V}$ is:

$$\begin{aligned} \bar{V} &= p\bar{D} + (1-p)[\hat{R} + \beta p\bar{D} + \beta(1-p)[\hat{R} + \beta pD + \cdots \\ &= \frac{p\bar{D} + (1-p)\hat{R}}{1 - \beta(1-p)} \end{aligned} \tag{13}$$

Proposition 7: $\bar{V}$ increases with p, β, $h(\tilde{T}^d)$ and $h(T^d)$.

Proof: Apply equation (13).□

Proposition 7 states that $\bar{V}$, the value of holding a nominal debt $\bar{D}$ in the low state, increases with the probability that the sovereign will transit to the high state, with the patience of the creditor, and with penalties that can be inflicted upon the sovereign in both states. Since $h(\tilde{T}^d)$ increases with $\tilde{g}(T)$, the value of the debt is also an increasing function of the size of the anticipated productivity gain.

Proposition 8: Let $\kappa \equiv \overline{V}/\overline{D}$ and let $k \equiv h(\tilde{T}^d)/h(T^d)$. Then $\kappa < 1$ and κ decreases with k and increases with p as long as (A3) $k > 1/\beta$.

Proof: In appendix.

Proposition 8 indicates that, in the low state, the intrinsic value of a nominal debt $\overline{D}$ is lower than its face value, i.e., that the nominal debt trades at a discount. The discount gets larger as the probability of the sovereign reaching the high state gets smaller or as the gap between repayment in the low state and repayment in the high state gets larger. Proposition 8 provides a rationale why a creditor may prefer to hold nominal claims which cannot not currently be serviced instead of forgiving the debt. It is the hope of higher debt service, were the sovereign to jump to the high state, that grants some value to nominal claims exceeding the current repayment potential of the sovereign. It is this hope that makes the creditor unwilling to forgive the debt.

We now want to characterize how nominal claims on the sovereign evolve in comparison with the intrinsic value of the debt. Let us assume (A4) that unpaid arrears are accumulated at the same interest rate at which the creditor discounts the future.[12] Consequently, we can assume without loss of generality that the debt is due every period. If current repayment $R_t < D_t(1-\beta)$, the stock of debt increases over time; otherwise it decreases. Given these assumptions, we can work out the law of motion of the nominal

[12] This assumption has the merit of allowing a closed form solution. If arrears were accumulating at a faster rate, the nominal debt would rise faster and reach $\overline{D}$ sooner, which would only reinforce some of the results that follow.

debt D_t. Once the law of motion of D_t is found, we can compute the law of motion of V_t using a simple arbitrage argument.

Proposition 9: Let T be the time at which $D_T = \bar{D}$ exactly. Then the stock of nominal debt and the value of the debt evolve according to:

$$D_{T-s} = \hat{R}\frac{1-\beta^s}{1-\beta} + \beta^s\bar{D}$$

$$V_{T-s} = \hat{R}\frac{1-\beta^s}{1-\beta} + \beta^s\bar{D}[1-(1-p)^s(1-\kappa)]$$

Proof: By backward induction.□

Proposition 9 indicates that the gap between D_t and V_t rises exponentially with the accumulation of arrears. The discount on the nominal debt thus grows as arrears accumulate. It also shows that the total value of the debt grows in spite of an increasing discount on the debt. As arrears continue to accumulate and D_t eventually gets above $\bar{D}$, however, V_t stops growing and the total value of the debt remains constant at $\bar{V}$. These results are illustrated in Figure 3. When the sovereign jumps to the good state, the value of the debt V_t jumps to $Min\{\bar{D}, D_t\}$ and the discount disappears.

The accumulation of arrears through repeated rescheduling of debt is thus rational from the creditor's point of view as long as there is a possibility, even if remote, that the nominal debt will ever be repaid. As long as $D_t \le \bar{D}$, debt forgiveness is not optimal for the creditor. Accumulation of debt beyond $\bar{D}$, however, is useless. It may even hurt the creditor if, as we have argued in the preceding section, the sovereign may evade its debt obligations by reducing its involvement in international trade. The creditor may thus more easily agree to debt forgiveness once D_t has reached a level that is deemed unreasonable. It is nevertheless not in the creditor's interest to accept a reduction of the debt so large that the sovereign is able to service it in the bad state. The creditor should only agree to forgive the portion of the debt that has accumulated beyond $\overline{D}$. This implies that a discount on the nominal debt persists over time, until the sovereign jumps to the good state. It also means that debt forgiveness is to be granted a little bit at a time: only arrears that accumulate beyond $\overline{D}$ can be the object of forgiveness.

The willingness of the creditor to forgive debt depends on the existence of a well defined ceiling on what the sovereign can ever be forced to repay. In our example this ceiling is $\overline{D}$. One could imagine more complex situations in which the sovereign can jump to a variety of intermediate states. Proposition 9 would be affected as the law of motion of D_t and V_t would become more complicated. Our conclusion regarding debt forgiveness, however, would not change: the creditor should only agree to forgive the portion of the nominal debt that has accumulated beyond what the sovereign could ever be forced to repay in the best possible state of the world, say, $\overline{D}$. This means that, once the nominal debt has reached $\overline{D}$, debt rescheduling will occur in all states except the highest possible. Although the rise of the nominal debt up to $\overline{D}$ is rational for the creditor, it reduces the welfare of the sovereign:

Proposition 10: The expected welfare of the sovereign is a decreasing function of D_t for all $D_t < \overline{D}$.

Proof: In appendix.

The Role of Conditionality

We are now ready to reexamine the role of conditionality when the future of the sovereign is uncertain. We assume that the state is known before the sovereign and creditor engage in negotiations about T^c and R^c. The sequence of negotiations within each period is thus the same as that portrayed in Figure 2, and the resulting equilibrium is as before. The only difference is that one gets a set of equilibrium $\{T^c, R^c\}$ for each state the sovereign can be in. This leads to the following proposition:

Proposition 11: Let $\hat{R}^c$ and $\bar{R}^c$ be debt repayments with conditionality in the bad and good states, respectively, and let $\bar{D}^c$ be the present discounted value of collecting $\bar{R}^c$ forever in the good state. Then $\bar{D}^c \geq \bar{D}$ and $\hat{R}^c \geq \hat{R}$. These inequalities are strict if $h' \neq 0$.

Proof: Apply propositions 5 and 6.□

Proposition 11 states that debt repayment goes up with conditionality. As a result, the ceiling on useful nominal debt increases as well. Combining propositions 10 and 11, conditionality increases the sovereign's *ex ante* welfare. An immediate and important corollary is that conditionality can, in certain circumstances, eliminate debt overhang, that is, prevent the accumulation of arrears beyond the sovereign's immediate ability or willingness to pay.

Corollary 1: In the presence of incentive problems, there exist a full measure set of D_t such that $D_{t+1} > D_t$ without conditionality and $D_{t+1} < D_t$ with conditionality.

By proposition 9, conditionality is more likely to be successful in eliminating debt overhang when applied early on. It cannot always be successful, however. If the nominal debt is such that $\hat{R}^c < D_t(1-\beta)$, then it will continue to grow in spite of conditionality. Unsuccessful conditionality still benefits the sovereign because it retards the growth of D_t, but much less than if it could prevent the accumulation of debt altogether. It can also become a tiresome process as the creditor and the IFIs repeatedly negotiate structural adjustment programs with the sovereign while the debt continues to accumulate. Conditionality can be disheartening when there is no end in sight.

Anticipated Conditionality and the Conditionality Trap

We have examined how conditionality can help resolve an existing debt crisis. We now investigate what happens when the intervention of IFIs to help set up conditionality is anticipated by creditors. We assume, as in Eaton, Gersovitz and Stiglitz (1986), that the maximum penalty creditors can credibly inflict on a debtor determines the maximum credit they are willing to give. We immediately get the following proposition:

Proposition 12: Anticipated conditionality: (1) raises the maximum amount of credit a sovereign can receive; (2) reduces the interest charged on loans that exceeds the sovereign's immediate willingness and ability to pay; (3) increases the sovereign's *ex ante* welfare.

Proof: In appendix.

Proposition 12 indicates that anticipated conditionality has several advantages. There are, however, other, less beneficial consequences of anticipated intervention of the IFIs to implement conditionality. They are summarized in the following proposition:

Proposition 13: When conditionality is anticipated, (1) it is more likely to be resorted to; (2) it is more likely to last over extended periods of time; (3) the debt is less likely to be forgiven.

Proof: In appendix.

Taken together, the three statements of proposition 13 constitute what we might call a conditionality trap: conditionality helps debtors *ex ante*, but it haunts them *ex post.* The situation is not without analogy to labor bonding or debt peonage: giving a creditor more leverage on its debtors enables them to receive more credit and thus improve their expected welfare. But it also means that, in this case, a number of debtors will end up as *de facto* serfs or slaves. That labor bonding is an economically efficient institution does not detract from the fact that it is morally repugnant. The situation about anticipated conditionality is not quite as dramatic, but it also implies a loss of sovereignty that some may find morally unacceptable, especially if, as proposition 13 suggests, it lasts for a long time.

Debt Relief by the IFIs

We have seen that conditionality need not be sufficient to prevent the accumulation of arrears. The IFIs have attempted to remedy this situation with various forms of concessionary lending, the details of which are beyond the scope of this paper (see Eaton, 1990; IMF, 1991a, 1991b, 1991c; Riess, 1991). The model developed here can also throw some light on the fate of IFI lending for debt relief.

Proposition 14:

(1) There exist a rate $1/\lambda$ such that $R^c > D_t(1-\lambda)$ for any strictly positive R^c and D_t.

(2) Assume that $R^c < D_t(1-\beta)$. Suppose the IFIs wish the stock of nominal debt D_t to grow at a rate $1/\lambda < 1/\beta$. To do so, they offer concessionary lending at rate $1/\alpha$. Then there exist a rate $1/\alpha$ such that $R^c > D_t(1-\lambda)$ for any strictly positive R^c and D_t.

(3) To achieve $1/\lambda$, the IFIs must keep on buying commercial debt.

Proof: In appendix.

Proposition 14 states that for any level of debt and any repayment capacity of the sovereign, there is a rate of interest for the accumulation of arrears such that the debt will be repaid. In consequence, any debt overhang can be eliminated by replacing commercial and bilateral debt accumulating at the rate $1/\beta$ with concessionary debt at a low enough interest rate and long enough horizon. The last part of the proposition states that, in order for this to be achieved, the IFIs must keep replacing other debt with their own.

Conclusions

By providing a partial solution to a commitment problem, conditionality helps the repayment of sovereign debt. In certain circumstances, it can eliminate debt overhang, especially when it is coupled with concessionary lending of sufficient magnitude. It is, however, unable to restore first best. When it is anticipated by lenders, conditionality may get IFIs and sovereign debtors into a trap where the debt overhang persists, debt rescheduling takes place periodically, and conditionality continues indefinitely. Although many would probably agree that short bouts of conditionality are a price worth paying for increased lending and welfare, long spells of IFI conditionality constitute a infringement of sovereignty that is harder to justify in principle.

The model presented here can be extended in various directions. It could form the basis for a formal treatment of the contractual details surrounding sovereign debt and conditionality. Our understanding of clauses regarding debt seniority, cross-default, grace period, or debt horizon, for instance, can be enhanced by building upon the insights gained here. It can also be used to illuminate the relationship between sovereign debt, structural adjustment, and development policy. In this paper conditionality was taken as synonymous of structural adjustment and trade liberalization. These forms of policy intervention organize economies around their static comparative advantage. They may be justified when conditionality is a short-term intervention quick to get a sovereign out of trouble. They are not if conditionality is to last for an extended period of time. Although trade liberalization may lay down some of the foundations for export-led growth, it fails to recognize the need for other forms of intervention if a sovereign is to industrialize or modernize its agriculture (The World Bank, 1989, 1993). In the long run, policies directed at raising growth, the parameter p in our model, would do better than trade liberalization alone.

The kind of long term policies and investment that are required for growth may, however, be deterred by the existence of a debt overhang. Indeed, when $D_t > V_t$, increasing p benefits the creditor as well as the sovereign, and part of the gains from growth have to be surrendered to the creditor. The disincentive effect of debt overhang on investment has been examined elsewhere (Sachs (1984); Krugman (1988); Claessens (1990); Claessens and Diwan (1990); Cohen (1990)). The framework developed here could be used to explore whether conditionality can lessen these disincentive effects.

Finally, our model could be extended to cover the possible role of default as a form of insurance (Udry 1990, Platteau and Abraham, 1987). Development is an inherently difficult and risky venture. Many try and few succeed. Because the reward for success is sweet, many continue to try. Yet the capital required to successfully develop is well beyond the savings capability of most poor countries. Candidates for development must borrow, knowing that they may fail. Who should shoulder the risk of development? Should unsuccessful development attempts be penalized not only by long lasting poverty but also by the loss of sovereignty? These are questions beyond the domain of economists and financiers alone. These are questions that must be answered.

Appendix

Proof of Proposition 1:

(1) $T' > 0$: by totally differentiating the first order condition for T we get:

$$T' = \frac{dT}{dR} = \frac{U_{NT}g' + U_{TT}}{SOC}$$

The second order condition is negative at the optimum. $T' > 0$ is (A1) is satisfied.

(2) $T' < 1$: multiplying the above through by the SOC we obtain (A2).□

Proof of Proposition 2:

Since λ is not a function of time, the right hand side of equation (4) increases (decreases) over time when β > (<) δ. The right hand side of equation (4) is the marginal utility cost of debt repayment R. It is an increasing function of R.□

Proof of Proposition 3:

Assuming that equation (8) is binding, the last period optimization problem boils down to:

$$Max_{\{R_M,\ T_M,\ T_M^d\}} \ \beta^M R_M$$

subject to

$$U(g(T_M^{d*}),\ T_M^{d*} - h(T_M^{d*})) \leq U(g(T_M),\ T_M - R_M)$$
$$T_M^{d*} = arg\ Max\ U(g(T_M^d,\ T_M^d - h(T_M^d))$$
$$R_M = h(T_M)$$

The first order condition for T_M is thus:

$$U_N g' + U_T(1 - h') = 0$$

which is equivalent to the first order condition for T_M^{d*}. Consequently, the optimal $T_M = T_M^{d*}$ and $R_M = h(T_M^{d*})$. Working backward to $M-1$, $M-2$, ..., the same result holds for every period.□

Proof of Proposition 5:

In the last period M the optimization problem boils down to (dropping the M subscript):

$$Max_{\{R^c,\, T^c,\, T^d\}} \quad \beta^M R^c$$

subject to

$$U(g(T^{d*}),\, T^{d*} - h(T^{d*})) \leq U(g(T^c),\, T^c - R^c) \qquad \text{(a)}$$

$$T^{d*} = arg\ Max\ U(g(T^d,\, T^d - h(T^d)) \qquad \text{(b)}$$

$$R^c \leq h(T^c) \qquad \text{(c)}$$

We must show that $R^d < R^c < h(T^c)$. Suppose first that $R^c = h(T^c)$. Then equation (c) is binding, the optimization problem is identical to that of proposition 3, and $R^c = R^d$. Now suppose that $R^c < h(T^c)$. If we can show that $R^c > R^d$, then the solution is higher when equation (c) is not binding, and the proof is completed.

Suppose the contrary, i.e., that $R^d = R^c < h(T^c)$. Then $R^c = h(T^d)$. Given that equation (c) is not binding, the first order condition with respect to T^c is $U_N g' + U_T = 0$. In contrast, the first order equation for T^d is $U_N g' + U_T(1 - h') = 0$. Thus $h' > 0 \rightarrow T^c > T^{d*}$ and $h' = 0 \rightarrow T^c = T^{d*}$. As a result, equation (a) is not binding whenever $h' \neq 0$, a contradiction with the assumption that R^c was optimal. This establishes proposition 5 in the last period. Working backward to $M-1$, $M-2$, ..., the same argument holds for every period and R^c is constant.□

Proof of Proposition 6:

(1) As shown in the proof of proposition 5, equation (11) is never binding at the optimum. The optimization problem with conditionality is thus a constrained version of the optimization problem with full commitment, and an unconstrained version of the optimization

problem without commitment. Application of Le Chatelier principle finalizes the proof or part (1). Part (2) holds by proposition 5.(2).□

Proof of Proposition 8:

From equation (13) we get:

$$\kappa = \frac{\beta kp + (1-p)(1-\beta)}{\beta k(1-\beta+\beta p)}$$

which is below 1 as long as $k > 1/\beta$. Totally differentiating with respect to p we get:

$$\frac{d\kappa}{dp} = \frac{(1-\beta)(\beta k-1)}{\beta k(1-\beta+\beta p)^2}$$

which is positive as long as $k > 1/\beta$. Similarly we get:

$$\frac{d\kappa}{dk} = \frac{-(1-\beta)(1-p)}{\beta k^2(1-\beta+\beta p)} < 0.\square$$

Proof of Proposition 10:

In the bad state, the welfare of the sovereign is not affected by D_t since repayment is, by assumption, capped by $h(T^d)$ which is constant and independent of D_t. Welfare in the good state, however, decreases with D_t as long as $D_t < \overline{D}$. When $D_t \geq \overline{D}$, the welfare of the sovereign remains constant and equal to its reservation utility. The expected welfare of the sovereign is thus as stated in the proposition.□

Proof of Proposition 12:

The maximum credit a sovereign can receive is $\overline{V}$, in exchange for a debt of $\overline{D}$. By propositions 7, $\overline{V}$ increases with $\overline{D}$. By proposition 11, $\overline{D}^c > \overline{D}$. This takes care of part (1).

When V_t is below the discounted future value of what the sovereign can credibly be forced to repay in the bad state, repayment is certain and the interest charged on the loan is equal to the creditor's opportunity cost of capital. For any amount borrowed V_t above that, repayment is not certain. The difference between V_t and D_t in proposition 9 is the risk premium that compensates the lender for repayment risk. Using the formulas provided in that proposition, it can easily be shown that the ratio between D_t and V_t decreases as a function of $\overline{D}$. This proves part (2). Part (3) follows from parts (1) and (2).□

Proof of Proposition 13:

Here is an heuristic proof of the proposition. Consider a population of impatient, sovereign debtors. By proposition 12, the anticipation of conditionality raises the maximum amount a member of that population can credibly be forced to repay and thus the maximum it can borrow to $\overline{D}^c$. It is therefore more likely that a certain proportion of the population of borrowers will either borrow up to $\overline{V}^c$ or accumulate arrears beyond $\overline{D}$. The repayment of any amount above $\overline{D}$, however, can only be achieved with the help of conditionality. Conditionality will thus have to be resorted to more often. This proves part (1).

When $\overline{D}^c > D_t > \overline{D}$, conditionality continues indefinitely. From part (1), the proportion of borrowers for which conditionality has to be used in the good state as well as the bad state is higher than when conditionality is not anticipated. This proves part (2). Since $\overline{D}^c > \overline{D}$, creditors refuse to forgive debt that is below not just $\overline{D}$ but also $\overline{D}^c$. This proves part (3).□

Proof of Proposition 14:

Parts (1) and (2): obvious.

Part (3): Let D be the total nominal debt and θ be the share of it in the hands of the IFIs.

We want:

$$D_{t+1} = \frac{D_t - R^c}{\lambda} = D_t - R^c\left(\frac{\theta_t}{\alpha} + \frac{1-\theta_t}{\beta}\right)$$

from which we get that:

$$\theta_t = \theta = \frac{\alpha}{\lambda}\frac{(\lambda-\beta)}{(\alpha-\beta)}$$

The share of nominal debt in the hands of the IFIs is constant, but it accumulates at a lower rate. As a result the IFIs receive a portion of R^c_{t+1} equal to $\frac{\theta\alpha}{(1-\theta)\beta + \theta\alpha}$. This portion is strictly smaller than θ since, by construction, $\alpha < \beta$. This means that the IFIs must continue buying commercial debt in order to maintain the constant share of total debt that is required for the realized interest rate on the debt to be $1/\lambda$.□

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