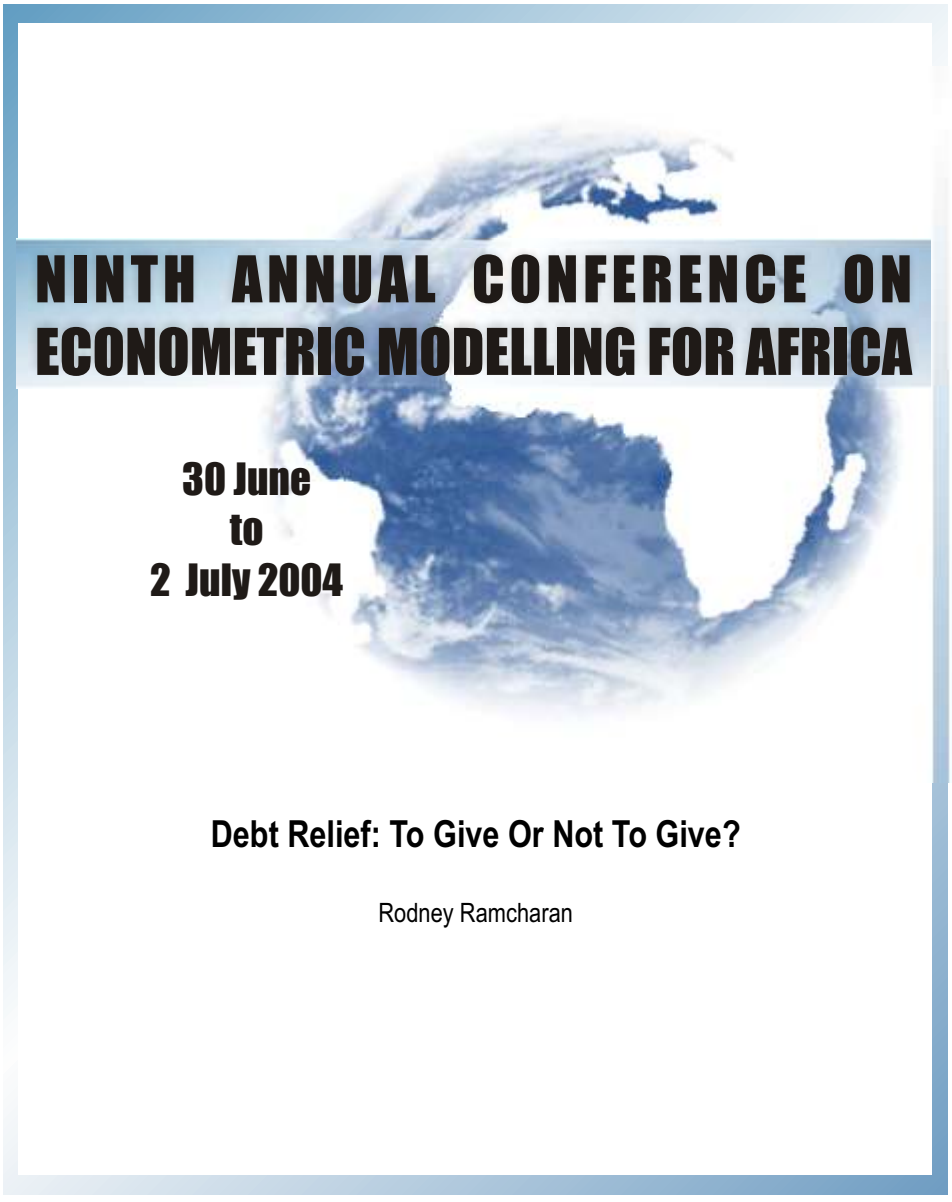

NINTH ANNUAL CONFERENCE ON ECONOMETRIC MODELLING FOR AFRICA

30 June
to
2 July 2004

Debt Relief: To Give Or Not To Give?

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Abstract

The last decade witnessed a heavily publicized and remarkably successful campaign to "end Third World" debt. Yet despite the highly public debate and the large amount of resources involved, many fundamental questions remain about how debt relief might affect the relationship between International Financial Institutions (IFIs) and sovereign borrowers. Specifically, how does setting a precedent for debt relief affect the future terms through which IFIs supply credit? Will it affect contract enforcement? Can this precedent influence the willingness of borrowers to comply with the terms of IFI lending contracts? In addressing these questions, this paper shows that the possibility of future debt relief can introduce several distortions into the IFI-borrower relationship, including inefficient contracts, credit rationing, and the misallocation of lending resources to "extractive" borrowers.

JEL Classification Numbers: F33,F34, F35
Keywords: Economic Reform, IMF Lending
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[1] I am grateful to Tito Cordella, Gernot Doppelhofer, Simon Johnson, Aart Kray, Rajesh Singh, Guido Tabellini, Carlos Vegh and participants at Northwestern and the 2002 Australasian Econometric Society Meetings for useful comments. The usual disclaimer applies.

I. INTRODUCTION

"Because poverty is so great and the need so urgent, neither you nor I want the richest countries to benefit any more from the debts of these poorest countries. So I can say to you – and to all the 41 HIPC countries on behalf of the British Government – I will renounce our right to receive any benefit from the historic debt owed by all the 41 most indebted countries". Gordon Brown, Chancellor of the Exchequer, United Kingdom[2]

With the support of the Pope, several rock stars, and various non governmental organizations the last decade witnessed a heavily publicized and remarkably successful campaign to "end Third World" debt. Employing variations on the debt overhang argument--debt repayments crowd out useful public expenditures--as well as moral suasion, the debt relief campaign culminated in the Heavily Indebted Poor Country Initiative (HIPC). Administered by international financial institutions (IFIs) such as the International Monetary Fund (IMF) and the World Bank (WB), nearly $US51 billion in debt service relief have been provided to 27 countries thus far[3]. Yet despite the highly public debate and the large amount of resources involved, many fundamental questions remain about how debt relief might affect the relationship between IFIs and borrower countries.

Many HIPC countries accumulated much of their original debt while involved in various IFI lending arrangements, and in many cases IFIs remain either the principal source of credit or the principal means of accessing credit from other sources [Marchesi (2003). For example, during the 1990s IFI debt accounts for over 33 percent of total HIPC debt[4]. Thus, how will the current round of debt relief influence the subsequent credit relationship between IFIs and borrowers? Specifically, how does setting a precedent for debt relief affect the future terms through which IFIs supply credit? Will it affect contract enforcement? Can this precedent influence the willingness of borrowers to comply with the terms of IFI lending contracts? More generally, is the current approach to debt relief efficient?

In addressing these questions, this paper builds on the idea that like most banking relationships, asymmetric information plays a key role in the interaction between IFIs and sovereign borrowers. The borrower's policy choice determines whether loans can be repaid. But as Table 1 indicates, compared with other nations, policy makers in HIPC eligible countries operate in political environments with weak control over corruption, little accountability, and inconsistent application of the rule of law. In such environments, policy

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[2] http://www.hm-treasury.gov.uk/topics/topics_debt/topics_debt_index.cfm

[3] See for example the IMF fact sheet on debt relief: http://www.imf.org/external/np/exr/facts/hipc.htm.

[4] In contrast, for non HIPC borrowers from the IMF during 1990-2001, the average share of total debt owned to IFIs was about 18 percent.

makers are relatively free to pursue their own preferred policy—rather than the policies that maximize repayment. And obviously, policy makers are better informed about their policy preferences than external agents like IFIs.

However, unlike most private banking relationships, collateral requirements, co signers and the other contractual methods of mitigating repayment risk[5] are unavailable in contracts that involve sovereign borrowers[6] and IFIs. Instead, these contracts are usually characterized by an initial disbursement of funds from the IFI in return for a borrower promise to realize some contracted policy outcome or "reform"—ex-post conditionality. Because the precedent of debt relief introduces the notion that "bad" loans can eventually be forgiven[7], this paper shows that the possibility of future debt relief can introduce several distortions into the IFI-borrower relationship, including inefficient conditionality, credit rationing, and the misallocation of lending resources to "extractive" borrowers.

Debt relief can enable both the IFI and the borrower to resolve repayment difficulties at a possibly lower cost compared with a disruptive immediate end to lending. But accessing the debt relief mechanism requires the IFI to continue lending until debt relief actually becomes available, thereby increasing the stock of overall debt. And by providing the IFI with an incentive to suspend the enforcement of contracts and continue lending, the prospect of debt relief can become a source of time inconsistency, increasing the potential for adverse selection, and the need for debt relief itself.

In particular, an extractive borrower can "hold up" an IFI, implementing reforms until the debt stock is big enough, so that debt relief becomes the IFI's preferred option for managing repayment difficulties. Once this threshold is reached, the borrower can now either negotiate its own preferred policies or not implement the contracted policy, assured that the IFI will continue lending until debt relief is provided. In contrast, without the prospect of debt relief, since the IFI would cancel lending if reforms failed, an extractive borrower would implement extractive polices immediately after the loan is made rather than inefficiently accumulating debt.

"Hold up" is costly to an IFI, and mitigating the "hold up" risk can distort the terms of IFI lending contracts. Instead of contracting upon the first best policy outcome—the reform most likely to succeed and lead to repayment-- the IFI may require a more

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[5] (Besanko and Tharkor [1994], Bester[1985] and a recent survey by (Frexias and Rochet [1998])

[6] Much of the literature on sovereign borrowers has focused on the determinants of country access to capital and on the incentives to repay *private* creditors. For example, see Eaton and Fernandez [1995], and more recent work by Tirole [2003], and Chamon [2001].

[7] The cost of debt forgiveness is usually shared between the IFIs and bilateral creditors. For example, in the current HIPC initiative, slightly more than half of the financing comes from bilateral creditors, with the IFIs accounting for the rest. See the IMF HIPC Fact Sheet.

"ambitious" policy—one with a smaller chance of success--but provides more information about the borrower's type if it is successful. That is, optimal lending contracts now reflect a tradeoff between the need to learn about the borrower in order to avoid "hold up" versus the need to contract upon policies that provide the highest expected payoffs. Moreover, because sovereignty imposes limits on the set of contractible policy outcomes, credit rationing can be an equilibrium response to the hold up risk: an external lender cannot contract upon the dismissal of the Prime Minister. Thus, if the risk of hold up is severe enough, and a successful outcome from the set of contractible policies is insufficiently informative about a borrower's type, then the IFI may be deterred from lending.

Therefore, while debt relief provides a possibly lower cost mechanism of dealing with the consequences of reform failure, it is not without substantial costs. Introducing ambiguity over the provision of debt relief, and transparency in current contracts, so that future borrowers can observe actions in current contracts, can reduce the incidence of distortionary contracts. In this case, instead of resorting to inefficient contracts as a means of sorting borrowers, uncertainty over the provision of debt relief can itself serve as an effective screening mechanism, allowing the IFI to offer the first best contract. And because current actions are observable to future borrowers, the IFI has an incentive to maintain that ambiguity, not providing debt relief if reforms fail.

This paper is related to the earlier literature on debt relief and debt overhang [Krugman (1988), Bulow and Rogoff (1988, 1989), as well as to the current debt relief debate [Sachs (2002), Easterly (2001) and surveyed by Dijkstra (2003). A notable difference however is the focus on the relationship between multilateral lenders and their sovereign borrowers. In this regard, the analysis is also related to the small but growing literature studying these relationships. However, rather than emphasizing the role of asymmetric information between borrower and lender, a common theme in that literature is the idea that the welfare of the domestic poor enters directly in the utility function of IFIs (the interdependent utility function approach [Sevensen (2000), Federico (2001)]. The paper is structured as follows: Section 2 of the paper briefly reviews some key aspects of IFI lending contracts, and presents some stylized facts about the enforcement of these contracts; Section 3 develops the simplest model possible to illustrate the main argument, while Section 4 extends the model to consider the impact of uncertainty over the provision debt relief; Section 5 concludes.

II. IMF LENDING CONTRACTS: SOME STYLIZED FACTS ON CONTRACT ENFORCEMENT

IMF lending contracts provide funds to countries experiencing balance of payments problems. The financial assistance provided by the IMF is intended to help countries rebuild their international reserves, stabilize their currencies, and continue paying for imports without having to impose trade restrictions or capital controls. Like commercial banking

relationships, IMF loans are usually provided under an arrangement[8] that stipulates the conditions or performance criteria the borrower must meet in order to gain access to the loan. These performance criteria usually consist of quarterly or biannual targets on economic aggregates such as the government balance, the accumulation of net international reserves, and the growth of domestic credit. All arrangements must be approved by the Executive Board and the loan performance criteria (PC) are presented to the Executive Board in a "letter of intent". Loans are then released in phased installments as the program as the performance criteria are met.

However, using discretion the IMF may still disburse loans even if a particular performance criteria (PC) is not met. Formally, this process is known as an ex-post waiving of the contract requirement, and the incidence of waivers is a useful indicator of contract enforcement. Using simple non parametric regressions, this section describes the relationships between the incidence of waivers for the three most prominent performance criteria in IMF contracts and measures of relative "balance sheet" exposure. The first measure considers the IMF's balance sheet exposure to a borrower, or the borrower's potential leverage in the lending relationship, defined as the borrower's debt to the IMF divided by total IMF outstanding credit[9], observed the year prior to the contract. The second variable can be interpreted as the IMF's leverage in the credit relationship: debt to the IMF divided by the country's total outstanding external debt, again observed the year prior to the contract.

Figure 2 describes the relationship between the incidence waivers for contracts with fiscal deficit performance criteria—a value of 1 if a waiver was granted in the contract or program year, and 0 otherwise—and the measure of the IMF's balance sheet exposure to a borrower; the data is taken from 440 contracts during 1990-2001; and the smoothed curve is

[8] These arrangements vary in intent. Low income countries can borrow at a concessional interest rate through the Poverty Reduction and Growth facility (PRGF). Stand by Arrangements (SBA) are designed to address short term balance payments problems and is the most widely used facility of the IMF. The length of an SBA is typically 12-18 months, and repayment is expected within 2-4 years. The Extended Fund Facility (EFF) is geared towards more protracted balance of payments problems with roots in the structure of the economy. EFF arrangements are thus longer (3 years), and repayment is expected within 4-7 years. Supplemental Reserve Facilities (SRF) are designed for very short term financing on a large scale, for example as a result of a sudden loss of market confidence leading to massive capital outflows. Borrowers are expected to repay loans within 2-21/2 years, and all loans carry a substantial surcharge of 3-5 percentage points above market rates.

[9] Note that this exposure measure is adjusted for the fact that on the IMF's balance sheet, the various types of lending contracts or arrangements are funded from different resource accounts. In particular, while the general resource account is used to fund general type lending arrangements (SBAs, EFFs etc) the PRGF Trust Fund—a separate account--only finances the PRGF facility.

expressed as the log of the odds ratio. The curve suggests that a non linear relationship. The odds of receiving a waiver fluctuates when exposure is small, but steadily rises beyond the 0.04 threshold, only leveling off at the 0.15 threshold and is thereafter little changed over the remaining interval. Figure 3 documents a similar relationship between the probability of observing a waiver for the domestic credit performance criteria and the balance sheet exposure measure. Beyond the 0.05 threshold, borrowers with a bigger role on the IMF balance sheet are more likely to receive a waiver when the domestic credit PC is missed. The relationship between the probability of observing a waiver for the foreign reserve target and IMF exposure (Figure 5) is also quite similar. But in this case the threshold above which increasing exposure corresponds to a greater incidence of waivers is 0.01.

Figures 4-6 depict the relationship between the incidence of waivers for the three key PCs and a borrower's exposure to the IMF the year prior. The results are striking. In the case of the fiscal deficit (Figure 4), the relative of probability of a waiver fluctuates but gradually declines, with the rate of decline deepening after the 0.3 threshold. The odds of observing waivers for the domestic credit PC also rapidly declines after the 0.3 threshold. Likewise, in the case of waivers for the reserves PC, there is some fluctuation in the log of the odds ratio for low exposure, but it too rapidly declines as a country's relative indebtedness to the IMF rises—after the 0.2 threshold in this case.

While other factors including political considerations are at work, taken together Figures 1-6 suggest that the contracting relationship between IFIs and borrowers are more complex than just an attempt to redress economic imbalances. Relative indebtedness and "balance sheet" exposure—measures that probably reflect negotiating leverage—do appear to be related to contract enforcement and lending decisions. The next section analyzes how debt, and the anticipation of debt relief might influence the terms and enforcement of lending contracts between IFIs and their sovereign borrowers.

III. MODEL

A. Setup

A lending contract consists of a loan disbursement from the IFI to the policy maker (PM), and a promise from the policy maker (PM) to choose[10] a particular policy outcome. Borrower sovereignty is assumed to limit the set of contractible policy outcomes[11]. Let x_A and x_B denote the two possible contractible policy outcomes, where $x_A > x_B > 1$. A lending arrangement is initially scheduled to last two periods, and in each period the IFI decides whether to lend a fixed amount—normalized to 1--before observing the policy outcome. To

[10]The analysis could also be recast in terms of contracting upon the PM's effort level. And at the cost of additional complexity, contracts could also specify both choice and effort; see for example Diamond [1998].

[11] See for example the requirement that conditionality be consistent with "national ownership" (IMF[2002]).

provide a tractable motivation for policy makers to borrow from IFIs, I assume that lending arrangements are concessional[12] . A fraction β of cumulative borrowing is repayable at the end of the second period if the contracted policy outcomes, x_i^* were successfully observed in each period of the arrangement[13]; for simplicity both the interest and discount rates are set to zero.

There are two technologies available to deal with reform failures. If the contracted policy x_i^* is not observed at the end of period t and the IFI cancels lending, then it incurs cost βt . Otherwise, if x_i^* is not observed the IFI can delay cancellation until a debt restructuring mechanism becomes available on a future date T . The IFI pays a fixed cost τ to use this mechanism and since it is only available on date T , the IFI must continue lending until then. To focus on how the possibility of debt relief can influence the IFI's reaction to a reform failure, I assume that:

$$\beta < \tau < 2\beta \qquad (0.1)$$

That is, lending is cancelled if reforms fail in the first period. However, if reforms fail in the second period, then lending continues until debt relief is provided on date T

Policy makers vary in their preference for reform. To capture this heterogeneity, extractive policy makers—type θ^E -- derive negative payoffs if reforms are successful. For example, reforms may limit the scope for extractive behavior. In contrast, PMs of type θ^G earn positive payoffs whenever reforms are successful. In addition to determining the payoffs, the parameter θ^j also influences whether the chosen policy is realized. Specifically, although a policy x_i is chosen, its realization or successful implementation is uncertain. Underlying this approach is the idea that perceptions about a policy maker's type—his preference for extraction--can impact the behavior of agents. Thus, even if a policy maker were to publicly choose a particular policy, beliefs about the policy maker's commitment can influence whether the policy is actually successful[14]. More precisely, both a PM's type, θ^j ,

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[12] See Zettelmeyer and Joshi (2003) for an analysis of the concessional element of IMF lending. Other reasons that countries may seek IFI lending include signaling to other creditors (Marchesi et.al[1999] and Morris and Shin [2002]) , as well as a difference in time preference between the IFI and the policy maker Bulow and Rogoff [1989b] .

[13] By making repayment contingent on whether the contracted policies are realized, the analysis abstracts away from some of the issues related to repayment incentives. Classic references include Eaton and Gersowitz [1981] and Bulow and Rogoff [1989a].

[14] Similar arguments are often used to explain features of monetary policy, and disinflation and economic reform programs. For example, compared with a "good" policy maker, a PM with a reputation for rent extraction or profligate spending may have less success at achieving low inflation despite an announced anti-inflation policy. See surveys by

(continued)

and the magnitude of the intended reform determine the probability of successful implementation. Let $p\left(x_i,\theta^j\right)$ denote the probability that a policy maker of type θ^j successfully realizes policy outcome x_i. And as a benchmark case, policy x_B is assumed to yield higher expected payoffs for θ^G:

$$p\left(x_B,\theta^G\right)x_B > p\left(x_A,\theta^G\right)x_A \tag{0.2}$$

Payoff functions are linear, and the policy maker (PM)'s payoffs are determined by the IFI's net disbursement $\left(D\right)$, the policy outcome, x_i, and the PM's policy preferences or its "type": θ^G or θ^E :

$$U^{PM}\left(x_i,D,\theta^j\right)=x_i\theta^j+D \tag{0.3}$$

where $\theta^G>0$ and $\theta^E<0$: only the PM of type $\theta^E<0$ prefers no change in policy: $x_i=0$. In the case of the IFI, payoffs are positive only if there is both lending, and the realization of the contracted policy outcome, x_i^*; payoffs are negative if it lends and x_i^* is not observed[15]:

$$U^I\left(x_i,1\right)=\begin{cases}x_i^*-D & if\ x_i=x_i^*\\ -D & if\ x_i\neq x_i^*\end{cases} \tag{0.4}$$

Thus, given the payoff functions, the policy preferences of the IFI and a policy maker of type θ^G are perfectly aligned.

B. Timing

Figure 1 summarizes the timing of the model. The IFI is the agenda setter. In period one, it decides whether to lend to the policy maker, and what conditionality or policy outcome: x_A or x_B to contract. Let x_i^{1*} denote the contracted policy in period one. If the IFI decides to lend $\left\{x_i^{1*},1\right\}$, then it disburses 1 to the policy maker (PM). After the disbursement, the PM chooses x_i^{1*}, a different policy, or leaves the policy stance unchanged: $x_i^1=0$. If x_i^{1*} is

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Drazen[1999] and Persson and Tabellini [2001]. On the other hand, as Masson and Drazen [1992] observes, it may take a policy maker with a known inflation bias to credibly fight inflation.

[15] Note that IFI payoffs are negative if a different, perhaps more ambitious reform than the originally contracted policy is realized. This assumption is made for simplicity, as it eliminates any signaling motive on the part of borrowers. See Rodrik [1996] for a argument with some of these signaling features.

not observed, then the IFI cancels the lending arrangement. If x_i^{1*} is observed, then the IFI chooses whether to lend in period two, $\{x_i^{2*},1\}$. If the IFI disburses in period two, the policy maker again selects its policy stance; if x_i^{2*} is successful, then θ^G repays 2β. Otherwise, if x_i^{2*} is not realized, then the IFI continues to lend until period T, when debt relief is provided.

Without uncertainty about a policy maker's policy preferences, θ^j, lending decisions are efficient across time and borrowers, as $\{x_B{}^*,1\}$ is the equilibrium contract between the IFI and type θ^G in both periods and there is no lending to θ^E. But the IFI is often only partially informed about θ^j, and the presence of debt relief can distort lending arrangements. The next section analyzes these issues.

Table. 2

Period one

- IFI decides whether to lend: $\{x_i^{1*},1\}$
- Disbursement is made
- PM chooses x_i^1
- x_i^1 is realized
- If $x_i^1 \neq x_i^{1*}$, program is cancelled
- Otherwise, IFI lends in period two $\{x_i^{2*},1\}$

Period two

- IFI disburses
- PM chooses x_i^2
- x_i^2 is realized
- PM chooses whether to repay or hold up IFI

C. Period 2 Equilibrium

Only the reform outcome, x_i, is observable; the PM's type, θ^i, and his reform choice are unobserved. At the beginning of period two, let p^2 denote the IFI's probability assessment that the policy maker is of type θ^G. By assumption, p^2 is common information, and the IFI updates its initial period one assessment of the PM's type, p_1, using Bayes' rule:

$$
\begin{aligned}
p^2 &= prob\left(\theta = \theta^G \left| x^1 = x_i^{1*}\right.\right) \\
&= prob\left(\theta = \theta^G \text{ and } x^1 = x_i^{1*}\right) / prob\left(x^1 = x_i^{1*}\right) \\
&= \frac{prob\left(x^1 = x_i^{1*} \left| \theta = \theta^G \right.\right) prob\left(\theta = \theta^G\right)}{prob\left(x^1 = x_i^{1*} \left| \theta = \theta^G \right.\right) prob\left(\theta = \theta^G\right) + prob\left(x^1 = x_i^{1*} \left| \theta = \theta^E \right.\right) prob\left(\theta = \theta^E\right)} \\
&= \frac{p_1 p\left(x_i^1, \theta^G\right)}{p_1 p\left(x_i^1, \theta^G\right) + \left(1 - p_1\right) p\left(x_i^1, \theta^E\right)}
\end{aligned}
\tag{0.5}
$$

Condition (0.6) notes that observing x_A --the "bigger" of the two possible reforms provides more information about a borrower's type:

$$
\frac{p\left(x_A, \theta^E\right)}{p\left(x_A, \theta^G\right)} < \frac{p\left(x_B, \theta^E\right)}{p\left(x_B, \theta^G\right)} < 1 \tag{0.6}
$$

In period 2 an IFI cannot credibly commit not to continue lending if implementation fails, and there is no gain from strategic conditionality. As a result, if the IFI does lend in period 2, then it offers $\left\{x_B^{2*}, 1\right\}$ --the first best contract and type θ^E implements the hold up strategy— $x_i^t = 0$ until period T. As a result, the IFI's decision to lend in period 2 depends on it's assessment of the PM's type:

Proposition 1: *The IFI lends in period two if* $p_2\left(x_i^{1*}\right) \geq \overline{p_2}$.

From Proposition 1, the first period contracted outcome x_i^{1*} determines whether the IFI lends in period two. Otherwise, if PMs knew that the realization of x_i^{1*} was irrelevant for period two lending, then there would be no incentive to comply with the lending contract; and in the first period PMs of both types would choose their preferred policy outcome. This uninteresting case is ignored by assuming that the IFI offers x_i^{1*} only if it's successful realization provides enough information about the borrower so that lending is optimal in period two.

D. Period One Equilibrium

C.1 Policy Maker's Incentives

This section identifies when a contracted policy outcome is incentive compatible. Suppose x_i^{1*} is the contracted first period policy outcome. If type θ^E chooses x_i^{1*}, then with probability $p\left(x_i^{1*}, \theta^E\right)$ the PM gets $x_i^{1*}\theta^E + 1$ in period one, plus the hold up payoff $T - 1$ beginning in period two; otherwise, if x_i^{1*} is not realized, then θ^E earns 1. Moreover,

since the disbursement is made before x_i^{1*} is realized, θ^E 's reservation payoff from choosing $x = 0$ is 1. Thus, x_i^{1*} is incentive compatible for type θ^E if the disutility from the realization of x_i^{1*} is not too big relative to payoffs from hold up:

$$0 > \theta^E > \frac{-T}{x_i^{1*}} \tag{0.7}$$

A similar intuition determines the incentive compatible contracts for θ^G. The contract x_B is θ^G's first best; thus if $x_i^{1*} = x_B$, then it is routinely chosen. In contrast, since x_A is riskier and yields lower expected value than $x_i^{1*} = x_B$, θ^G chooses x_A^1 if it's relative probability of successful realization is sufficiently large. Moreover, a policy outcome x_i^{1*} induces pooling if it satisfies the incentive compatibility constraint of both types of policy makers:

Proposition 2: *If* $\theta^E < \frac{-T}{x_A^{1*}}$ *and* $\frac{p\left(x_A^1, \theta^G\right)}{p\left(x_B^1, \theta^G\right)} \geq \frac{\left[x_B^1 \theta^G + C\right]}{\left[x_B^1 \theta^G + C\right]}$, *then* $\left\{x_A^1, 1\right\}$ *induces screening, as* θ^G *chooses* $\left\{x_A^1, 1\right\}$, *while a PM of type* θ^E *reveals himself in the first period . Similarly,* $\left\{x_B^1, 1\right\}$ *is a screening contract if* $\theta^E < \frac{-T}{x_B^{1*}}$.

C.2. Both x_A^1 *and* x_B^1 *induce screening in period one.*

In this the simplest case, both x_B^1 and x_A^1 screen extractive borrowers, so that if x_i^1 is realized, then the IFI enters period two fully aware that the PM of type θ^G --and there is no risk of hold up. Thus, if the IFI does decide to lend in period, then since both contracts sort borrowers equally well and x_B^1 provides higher expected payoffs, the IFI offers $\left\{x_B^{1*}, 1\right\}$ -- the second best contract is never observed. Although the hold up risk is fully eliminated in this case, extractive borrowers can still exploit the ex-post nature of conditionality: accepting a lending contract, earning the immediate payoff, 1, but privately choosing not to implement the contracted outcome. Motivated by this risk, if the IFI is sufficiently prejudiced about the set of borrower, it may elect to ration credit. Under this scenario, even policy makers willing to choose x_B --type θ^G would be denied IFI contracts:

Proposition 3: *If* $p_1 \geq \overline{p_1}$, *then* x_B *is both feasible and optimal. If* $p_1 < \overline{p_1}$, *then there is no lending.*

C. 3. Both x_B^1 and x_A^1 induce pooling behavior in period one.

The available set of contractible policies do not fully screen borrowers, as sovereignty constraints are fully binding. Consequently, the IFI faces a key tradeoff. Offering x_B^1 generates higher payoffs in the first period, however from condition (0.6), observing x_B^1 provides less information about the borrower's type at the beginning of period two than x_A^1. The IFI's initial beliefs about the set of borrowers, p_1 plays a key role in resolving this tradeoff. Specifically, a period one contract $\{x_i^1, 1\}$ is feasible if it renders the IFI's expected payoffs positive in each period. That is, a feasible contract ex-ante provides the IFI with positive expected payoffs in the period one lending phase; moreover, the ex-post realization of x_i^1 --at the end of period one—ensures that the IFI's period two expected payoff is positive.

More concretely, if the IFI offers $\{x_i^1, 1\}$, then it expects to observe x_i^1 with probability $\tilde{p} = p_1 p(x_i^1, \theta^G) + (1 - p_1) p(x_i^1, \theta^E)$; and if x_i^1 is observed, then the IFI receives $(x_i^1 - 1)$ at the end of period one . Therefore, period one static payoffs are positive if $\tilde{p}[x_i^1 - 1 - \beta] - [1 - \tilde{p}] \geq 0$. But in addition to satisfying the period one constraint, the ex post realization of a feasible contract $\{x_i^1, 1\}$ must also provide the IFI with positive expected payoffs in period two. To exposit simply the main intuition, I assume that whenever period two payoffs are positive, then so are period one payoffs[16]:

Proposition 4: *$\{x_i^1, 1\}$ is feasible if $p_1 > f^1(x_i^1)$.*

However, although a contract may be feasible, it need not be optimal. Suppose that $p_1 > f^1(x_B)$, so that both x_A and x_B are feasible. Although the full information optimal contract $\{x_B, 1\}$ is feasible, the IFI may still offer $\{x_A^1, 1\}$. In this case, the gain in information if x_A is realized offsets the cost of deviating from the optimal contract. Thus, the first best contract $\{x_B^1, 1\}$ is offered only when the borrower's reputation for reform is big enough:

Proposition 5: *$\{x_B, 1\}$ is optimal only if $p_1 > f^2(x_A, x_B)$, where $f^2(x_A, x_B) > f^1(x_B)$*

Figure 7 illustrates these ideas. Below the $f^1(x_A)$, there are no feasible contracts and credit is rationed. Between $f^1(x_A)$ and $f^1(x_B)$, x_A is the only feasible contract, and the

[16] Relaxing this assumption does not substantially alter the main results; see Appendix.

equilibrium first period contract becomes $\{x_A^1, 1\}$. In the region between $f^2(x_A, x_B)$ and $f^1(x_B)$ both contracts are feasible, but $\{x_A^1, 1\}$ remains the optimal contract. Only when uncertainty about the borrower's type becomes sufficiently small, above the $f^2(x_A, x_B)$ line, does the first best contract $\{x_B^1, 1\}$ become optimal.

C. 4. x_A induces screening; x_B induces pooling.

The IFI faces a more extreme tradeoff than in the previous section. The policy x_A^1 remains a costly deviation from the first best, x_B^1. But if x_A^1 is observed at the end of period one, then the borrower's type is fully revealed, eliminating the risk of "hold up". Therefore, since x_A^1 provides a relatively more powerful signal of the borrower's type, it is both feasible and optimal over a wider range of p_1 than the previous case. Thus, compared with the previous cases, although the incidence of credit rationing is decreased, the first best contract is less likely to be offered.

Proposition 6: 1. $\{x_B^1, 1\}$ *is optimal only if* $p_1 > f^3(x_A^1, x_B^1)$, *where* $f^3(x_A^1, x_B^1) > f^2(x_A^1, x_B^1)$. 2. $\{x_A^1, 1\}$ *is optimal in the interval* $\overline{p}_1(x_A) < p_1 < f^3(x_A^1, x_B^1)$, *where* $\overline{p_1}(x_A) < f^1(x_A^1, \tau)$.

IV. DEBT RELIEF AMBIGUITY

The analysis has outlined how the prospect of debt relief can create incentives for "hold up", leading to inefficient lending contracts. How robust is this argument? And what policy conclusions might be inferred? To address these questions, this section modifies the information structure along two important dimensions. Instead of assuming that policy makers know with certainty that debt relief will be available on date T, the argument considers the case where policy makers are uncertain about the provision of debt relief. The argument is also extended by considering how both the IFI's and the policy maker's behavior are affected when their actions are observable to subsequent borrowers. That is, there is ambiguity over the provision of future debt relief, but transparency in current contracts.

To capture intuitively the notion of ambiguity over the availability of debt relief, assume that domestic policy makers are uncertain about whether the IFI's major shareholders have endowed the IFI's management with the debt relief option if reform fails[17]. In contrast,

[17] In the governance structure of international financial institutions, management reports to an executive board, appointed by shareholders. The executive board is responsible for the institutions' policies.

the IFI's management is fully aware of the shareholders' debt relief decision[18]. More precisely, let z denote an indicator function that takes on the value of one if the debt relief technology is available and zero otherwise:

$$z = \begin{cases} 1 & \beta < \tau < 2\beta \\ 0 & \tau > 2\beta \end{cases} \tag{0.8}$$

and $P(z=1)$ denotes the PM's assessment that the debt relief option is available to the IFI.

To analyze the impact of repeated contract transparency in the simplest possible manner, I assume that the IFI sequentially engages in two lending arrangements with two different borrowers, each independently drawn from the same distribution of types, where p denotes the prior probability that PM is of type θ^G. Let N_1 take on the value of one if reform failed and debt relief was provided in the first arrangement. Because of transparency, the event N_1 becomes common knowledge in the second arrangement. And given that the debt relief option was available $(z=1)$, let α denote the conditional probability that the IFI cancels lending in the first arrangement if reform fails[19]. Using Bayes rule, the probability that hold up will be unsuccessful in period two, $N_2 = 0$, given that the IFI did not provide debt relief in the first arrangement after reform failed, $N_1 = 0$, is :

$$\begin{aligned} q = P(N_2 = 0 | N_1 = 0) &= \frac{P(N_1 = 0 | N_2 = 0) P(N_2 = 0)}{P(N_1)} \\ &= \frac{P(N_1 = 0 | z = 0) P(z = 0)}{P(N_1 = 0 | z = 0) P(z = 0) + \alpha P(z = 1)} \\ &= \frac{P(z = 0)}{P(z = 0) + \alpha [1 - P(z = 0)]} \end{aligned} \tag{0.9}$$

[18] Of course, the management of the IFI may also be partially informed about the shareholder's debt relief decision for some time. However, management is likely to have more information about this decision than domestic policy makers.

[19] Although the IFI's decision to provide debt relief is modeled as probabilistic, this randomization is easily interpreted as representing a policy maker's conjecture about whether the IFI will provide debt relief when that option is available and the institution faces subsequent borrowers. See Reny and Robson [2002]

where in the second arrangement the IFI always provides debt relief if second period reform fails.

A. Second Arrangement

Working backwards, suppose the IFI offers the first best contract in the first period of the second arrangement: $\left\{x_B^{1,2},1\right\}$. An extractive borrower chooses $\left\{x_B^{1,2},1\right\}$ in order to implement the hold up strategy if the probability it being unsuccessful is sufficiently small : $q<\bar{q}=1+\frac{x_B\theta^E}{T-1}$. If $q\geq\bar{q}$, then choosing $\left\{x_B^{1,2},1\right\}$ is not incentive compatible for a PM of type θ^E. In this case, because an extractive borrower will not attempt hold up, the IFI need not use conditionality as a sorting mechanism. Instead, if it does decide to enter into a second arrangement, it can offer the first best contract, since the realization of $x_B^{1,2}$ would reveal the borrower to be of type θ^G.

Proposition 7: If $q\geq\bar{q}$ and $p\geq\overline{p}$, *then* x_B *is both feasible and optimal in the second arrangement*

Compared with the earlier case where there was no uncertainty over the provision of debt relief, from Proposition 5 x_B would have been offered only if $p>f^2\left(x_A,x_B\right)>\bar{p}$. Thus, debt relief uncertainty can decrease the incidence of credit rationing, making the IFI more willing to lend even with rising uncertainty about the borrower's preferences.

B. First Arrangement

The decision to provide debt relief in the first arrangement depends on the existing level of ambiguity, as well as on the cost of canceling lending: $2\beta-\tau$. Intuitively, by providing debt relief in the first arrangement, the IFI eliminates ambiguity in its dealings with the subsequent borrower, and payoffs in the second arrangement would resemble the earlier analysis in section C.3 where x_A and x_B induce pooling. Alternatively, suppose denying debt relief in the first arrangement effectively deters PMs of type θ^E from attempting hold up in the second lending arrangement, then there is full screening in the second arrangement and the IFI can offer the first best contract.

More precisely, assume that the net cost of canceling lending if reform fails in the first arrangement, $2\beta-\tau$, is not too big. In this case, if the initial ambiguity over debt relief is sufficiently big: $P\left(z=0\right)\geq\bar{q}$, then in the first arrangement it is common knowledge that the IFI finds it optimal to preserve that ambiguity, canceling lending with certainty whenever reform fails. As a result, if the IFI chooses to lend, it offers the first best contract in each period of both arrangements, confident that prior uncertainty about the provision of debt relief, $P\left(z=0\right)$, will deter extractive borrowers from hold up strategies. If

however $P(z=0) < \bar{q}$, then in the first arrangement the conditional probability that the IFI will cancel lending if reform fails, given that the debt relief option is available is:

$$\alpha^* = \frac{P(z=0)(1-\bar{q})}{\bar{q}(1-P(z=0))} \tag{0.10}$$

Consequently, $P(z=0)/\bar{q}$ is the total probability that lending will be cancelled in the first arrangement if reform fails. And if $P(z=0) > \bar{q}^2$, then type θ^E will not pursue the hold up strategy in the first arrangement, and the IFI, if it chooses to lend, will offer the first best contract.

Proposition 8: *If $P(z=0) > \bar{q}$, then the IFI is expected to cancel lending whenever reforms fail. Therefore, if the IFI chooses to lend, the first best contract is always offered. If $\bar{q}^2 < P(z=0)$, then type θ^E is deterred from hold up in the first arrangement: observing x_B fully reveals the borrower to be of type θ^G, and the IFI offers the first best contract. If reform happens to fail in the first arrangement, the IFI cancels lending with probability α^*. Otherwise, if $P(z=0) < \bar{q}^2$, then debt relief uncertainty does not sort borrowers.*

V. DISCUSSION

Motivated by the evidence suggesting a more complex relationship between multilateral lenders and sovereign borrowers, this paper has argued that while debt relief can be an important mechanism for managing reform failure, it can distort lending contracts, leading in some cases to the misallocation of loans to extractive borrowers, or the contracting of "excessively difficult" reforms. Indeed, consistent with the evidence presented in Figures 1-6, the argument predicts that beyond particular debt thresholds, the incidence of waivers would increase. Uncertainty over the provision of debt relief, coupled with "transparent" lending arrangements can mitigate some of these distortions. Intuitively, sufficient doubt about whether debt relief is available can deter "extractive" borrowers from hold up strategies, while "transparent" lending arrangements can induce an IFI to preserve that doubt whenever reforms fail.

Some key simplifications underlie these arguments. Most notably, to easily motivate the "hold up" strategy, the argument assumed that an IFI interacts with a single domestic policy maker who expects to remain in power throughout the lending relationship. Yet, governments or policy makers often change. A richer formulation of the policy making process might reveal how expectations about a policy maker's political durability might influence lending contracts, and perhaps how such contracts might affect the political process. That said, while further research may shed additional insights, and no doubt qualify when "hold up" strategies are optimal, it seems unlikely to reverse the basic intuition behind

these strategies. For example, if a policy maker expects to be short lived, "hold up" can still be optimal depending on its ease. Accumulating a small amount of debt may make debt relief optimal for the IFI, allowing the short lived extractive policy maker sufficient time to "recoup" its reform costs. In turn, this may make it easier for subsequent policy makers to engage in "hold up", since the existing debt stock may have already grown.

Perhaps a more fundamental avenue for future research is the need to clarify how repayment difficulties affect the payoffs of various groups within an IFI. Although IFI shareholders ultimately determine whether debt relief is provided if reforms fail, they delegate the negotiation, monitoring and design of lending contracts to an institutional staff. And it is unclear from the analysis whether "hold up" occurs at the staff or shareholder level. More precisely, suppose that "career concerns" or other similar considerations make it unpalatable for current staff—the delegated monitor-- to report repayment difficulties to shareholders—the principal; instead, because of regular rotation across lending assignments or other factors passing the reporting of repayment difficulties to future staff may yield higher payoffs. In this case, focusing on the design of internal governance may be key to mitigating "hold up" risk

VI. APPENDIX

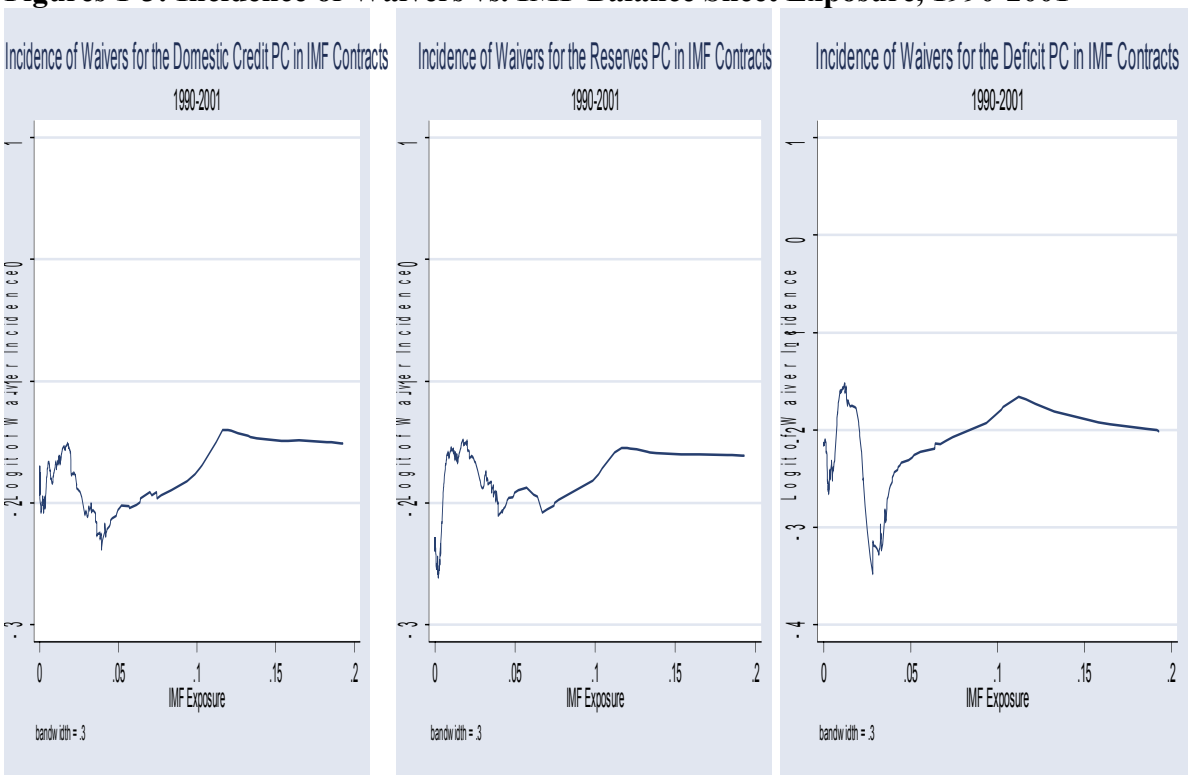
A. Tables and Graphs

Table 1. Governance Indicators, Average 1996-2002

	Voice and Accountability	Rule of Law	Control of Corruption
HIPC	-0.65	0.22	0.20
Non-HIPC	0.18	-0.80	-0.71

Source: World Bank. The three governance indicators are measured in units ranging from about -2.5 to 2.5, with higher values corresponding to better governance outcomes

Figures 1-3: Incidence of Waivers vs. IMF Balance Sheet Exposure, 1990-2001



Figures 4-6: Incidence of Waivers vs. Borrower Relative Indebtedness to the IMF, 1990-2001

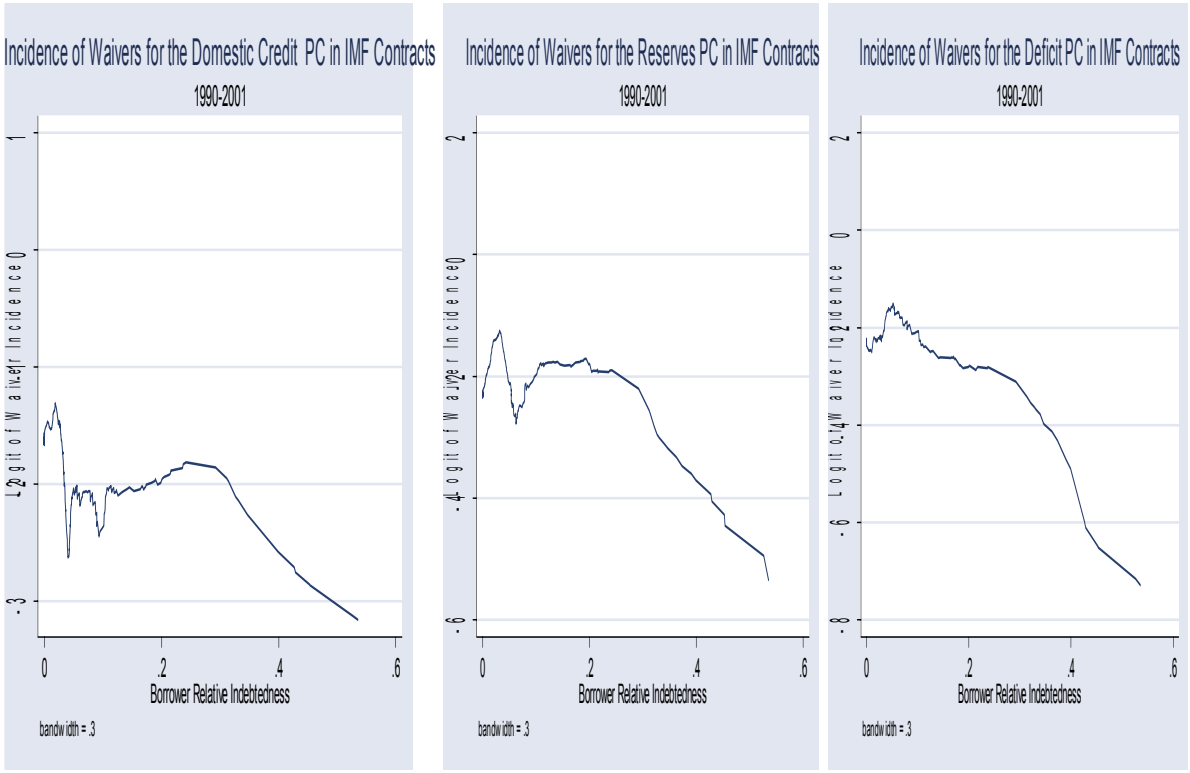
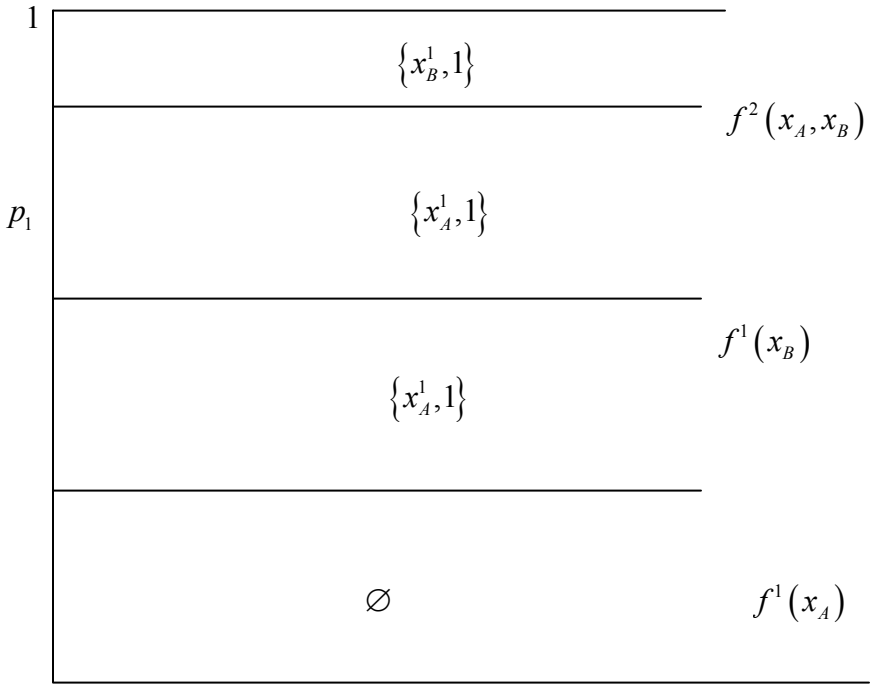


Figure 7. Equilibrium Contracts



B. Mathematical Details

Proposition 1: *The IFI lends in period two if* $p_2\left(x_i^{1*}\right) \geq \overline{p_2}$.

Proof: Before deriving Proposition 1, I assume that θ^G always chooses x_B^{2*} in period two rather than choosing 0 in order to avoid repaying debt: $\theta^G - 2\beta - (T-2)\,p\left(x_1, \theta^G\right)\theta^G > 0$ [20]. Using this simplification, with probability $p_2\left(x_i^{1*}\right)$ the IFI lends to a PM of type θ^G, resulting in expected payoffs $p\left(x_B^{2*}, \theta^G\right)\left[x_B^{2*} - 1 + 2\beta\right]$ if x_B^{2*} successful; with probability $1 - p\left(x_B^{2*}, \theta^G\right)$ x_B^{2*} is not realized and the IFI continues to lend until period T with payoffs $\left[p\left(x_B, \theta^G\right)x_B - 1\right](T-2)$. However, since debt relief transforms the accumulated debt stock to τ, the expected payoffs from prolonged lending to type θ^G is $p\left(x_B, \theta^G\right)x_B(T-2) - \tau$. Alternatively, with probability $\left(1 - p_2\left(x_i^{1*}\right)\right)$, the IFI lends to type θ^E and is held up, at a cost $-\tau$. Therefore, given the PM's reputation in period two, the IFI's value from a lending arrangement in period 2 is:

$$V^I\left(2, p_2\left(x_i^{1*}\right), x_B^{2*}\right) = \max\left\{\begin{matrix} p_2\left(x_i^{1*}\right)\left[p\left(x_B^{2*}, \theta^G\right)\left[x_B^{2*} - 1 + 2\beta\right] - \left(1 - p\left(x_B^{2*}, \theta^G\right)\right)\left[p\left(x_B, \theta^G\right)x_B(T-2) - \tau\right]\right] \\ -\left(1 - p_2\left(x_i^{1*}\right)\right)\tau, 0 \end{matrix}\right\} \quad (0.11)$$

The IFI lends in period two if and only if the value of a period two lending arrangement is non negative:

$$p_2\left(x_i^{1*}\right)\left[p\left(x_B^{2*}, \theta^G\right)\left[x_B^{2*} - 1 + 2\beta\right] - \left(1 - p\left(x_B^{2*}, \theta^G\right)\right)\left[p\left(x_B, \theta^G\right)x_B(T-2) - \tau\right]\right] - \left(1 - p_2\left(x_i^{1*}\right)\right)\tau \geq 0 \quad (0.12)$$

And condition (0.12) is satisfied if the PM's reputation at the beginning of period two is sufficiently large:

$$p_2\left(x_i^{2*}\right) \geq \overline{p_2} = \frac{\tau}{\left[p\left(x_B^{2*}, \theta^G\right)\left[x_B^{2*} - 1 + 2\beta\right] - \left(1 - p\left(x_B^{2*}, \theta^G\right)\right)\left[p\left(x_B, \theta^G\right)x_B(T-2)\right]\right] + \tau\left(2 - p\left(x_B^{2*}, \theta^G\right)\right)} \quad (0.13)$$

[20] Without this assumption, since both types of policy makers would not reform in the second period, the IFI would never lend in the second period.

Proposition 2: *If* $\theta^E < \frac{-T}{x_A^{1*}}$ *and* $\frac{p\left(x_A^1,\theta^G\right)}{p\left(x_B^1,\theta^G\right)} \geq \frac{\left[x_B^1\theta^G + C\right]}{\left[x_B^1\theta^G + C\right]}$, *then* $\left\{x_A^1,1\right\}$ *induces screening, as* θ^G *chooses* $\left\{x_A^1,1\right\}$, *while a PM of type* θ^E *reveals himself in the first period . Similarly,* $\left\{x_B^1,1\right\}$ *is a screening contract if* $\theta^E < \frac{-T}{x_B^{1*}}$.

Proof: Suppose $\left\{x_i^1,1\right\}$ is offered. Type θ^E 's expected payoffs from choosing x_i^1 is:

$$p\left(x_i^1,\theta^E\right)\left[x_i^1\theta^E + T\right] + \left[1 - p\left(x_i^1,\theta^E\right)\right] \tag{1.1}$$

Choosing $x^1 = 0$ gives θ^E a reservation payoff of 1. Thus, x_i^1 satisfies θ^E 's incentive compatibility constraint (IC) if $0 > \theta^E > \frac{-T}{x_i^1}$. In the case of type θ^G, since x_B is the first best, it is always incentive compatible for type to choose x_B if it is offered. If x_A is offered, then type θ^G expected payoffs from choosing x_A is:

$$p\left(x_A^{1*},\theta^G\right)\left[x_A^{1*}\theta^G + 1 + C\right] + \left(1 - p\left(x_A^{1*},\theta^G\right)\right) \tag{1.2}$$

where C is the continuation payoffs in period two

$$C = p\left(x_B^{2*},\theta^G\right)\left[x_B^{2*}\theta^G + (1-\beta 2)\right] + \left[1 - p\left(x_B^{2*},\theta^G\right)\right]\left[1 + (T-2)\left(p\left(x_B\right)x_B\theta^G\right)\right]$$

θ^G 's reservation payoff from choosing x_B instead is:

$$p\left(x_B^1,\theta^G\right)\left[x_B^1\theta^G + 1 + \left[p\left(x_B^2,\theta^G\right)\left(x_B^2\theta^G + 1 - 2\beta\right) + C\right]\right] + 1 - p\left(x_B^1,\theta^G\right) \tag{1.3}$$

Therefore, the contract $\left\{x_A^1,1\right\}$ satisfies θ^G 's incentive compatibility constraint (IC) if the relative riskiness of $p\left(x_A^1,\theta^G\right)$ is not too big:

$$\frac{p\left(x_A^1,\theta^G\right)}{p\left(x_B^1,\theta^G\right)} \geq \frac{\left[x_B^1\theta^G + C\right]}{\left[x_B^1\theta^G + C\right]} \tag{1.4}$$

Hence, if $\theta^E < \frac{-T}{x_A^{1*}}$ and $\frac{p\left(x_A^1,\theta^G\right)}{p\left(x_B^1,\theta^G\right)} \geq \frac{\left[x_B^1\theta^G + C\right]}{\left[x_B^1\theta^G + C\right]}$, then $\left\{x_A^1,1\right\}$ induces screening, as θ^G chooses $\left\{x_A^1,1\right\}$, while a PM of type θ^E reveals himself in the first period . Similarly, $\left\{x_B^1,1\right\}$ is a screening contract if $\theta^E < \frac{-T}{x_B^{1*}}$.

Proposition 3: *If* $p_1 \geq \overline{p_1}$ *, then* x_B *is both feasible and optimal. If* $p_1 < \overline{p_1}$ *, then there is no lending.*

Proof: If x_B induces screening in period one, then the IFI's period one payoffs are:

$$V^I\left(1,p_1,x_B^1\right) = \max\begin{Bmatrix} p_1\left[p\left(x_B^1,\theta^G\right)\left[x_B^1 - 1 + p\left(x_B^2,\theta^G\right)\left[x_B^2 - 1 + 2\beta\right] + \left(1 - p\left(x_B^2,\theta^G\right)\right)\left(p\left(x_B,\theta^G\right)x_B(T-2) - \tau\right)\right] - \left(1 - p\left(x_B^1,\theta^G\right)\right)\right] \\ -(1-p_1),0 \end{Bmatrix} \tag{1.5}$$

and the IFI enters into a lending arrangement if expected payoffs are non-negative

$$p_1\left[p\left(x_B^1,\theta^G\right)\left[x_B^1 - 1 + p\left(x_B^2,\theta^G\right)\left[x_B^2 - 1 + 2\beta\right] + \left(1 - p\left(x_B^2,\theta^G\right)\right)\left(p\left(x_B,\theta^G\right)x_B(T-2) - \tau\right)\right] - \left(1 - p\left(x_B^1,\theta^G\right)\right)\right]$$
$$-(1-p_1) \geq 0$$

or if p_1 is sufficiently large:

$$p_1 \geq \overline{p_1} = \frac{1}{\left[p\left(x_B^1,\theta^G\right)\left[x_B^1 - 1 + p\left(x_B^2,\theta^G\right)\left[x_B^2 - 1 + 2\beta\right] + \left(1 - p\left(x_B^2,\theta^G\right)\right)\left(p\left(x_B,\theta^G\right)x_B(T-2) - \tau\right)\right] - \left(1 - p\left(x_B^1,\theta^G\right)\right)\right]} \tag{1.6}$$

□

Proposition 4: $\left\{x_i^1,1\right\}$ *is feasible if* $p_1 > f^1\left(x_i^1\right)$.

Suppose that $\left\{x_i^1,1\right\}$ induces pooling in period one. The IFI expects to observe implementation in period one with probability $p_1 p\left(x_i^1,\theta^G\right) + (1-p_1)\,p\left(x_i^1,\theta^E\right)$; if x_i^1 is observed, then the IFI receives $\left(x_i^1 - 1\right)$ in the current period and $V^I\left(p_2\left(x_i^1\right),\tau\right)$ in period 2. x_i^1 is not realized with probability $1 - p_1 p\left(x_i^1,\theta^G\right) - (1-p_1)\,p\left(x_i^1,\theta^E\right)$ and the lending arrangement

is cancelled at the end of period one, with the IFI earning -1; the IFI's value from a lending arrangement in period one is:

$$V^I\left(x_i^1, p_1\right) = \max\left\{\begin{array}{l}\left[p_1 p\left(x_i^1, \theta^G\right) + \left(1-p_1\right) p\left(x_i^1, \theta^E\right)\right]\left[\left(x_i^1 - 1\right) + V^I\left(p_2\left(x_i^1\right), \tau\right)\right] - \\ \left[1 - p_1 p\left(x_i^1, \theta^G\right) - \left(1-p_1\right) p\left(x_i^1, \theta^E\right)\right], 0\end{array}\right\} \tag{1.7}$$

The contract $\left\{x_i^1, 1\right\}$ is feasible if the IFI's participation constraint in both periods are satisfied: $V^I\left(x_i^1, p_1, \tau\right) > 0$ and $V^I\left(x_B^2, p_2\left(x_i^1\right), \tau\right) > 0$. Since it is assumed that positive second payoffs are both a necessary and sufficient condition for contract feasibility, using Bayes' Rule and Proposition 1, $\left\{x_i^1, 1\right\}$ is feasible if:

$$p_1 > f^1\left(x_i^1\right) = \frac{\overline{p}_2 p\left(x_i^1, \theta^E\right)}{p\left(x_i^1, \theta^G\right) + \overline{p_2}\left[p\left(x_i^1, \theta^E\right) - p\left(x_i^1, \theta^G\right)\right]} \tag{1.8}$$

.

Proposition 5: $\left\{x_1, 1\right\}$ *is optimal only if* $p_1 > f^2\left(x_A, x_B\right)$, *where* $f^2\left(x_A, x_B\right) > f^1\left(x_B\right)$

Proof: From Proposition 4,

$$f^1\left(x_B\right) > f^1\left(x_A\right) \tag{1.9}$$

Let $h\left(x_A^1, x_B^1, p_1\right)$ denote the difference in payoffs available to the IFI from offering $\left\{x_B^1, 1\right\}$ compared to $\left\{x_A^1, 1\right\}$ *:*

$$h\left(x_A^1, x_B^1, p_1\right) = V^I\left(x_B^1, p_1\right) - V^I\left(x_A^1, p_1\right) \tag{1.10}$$

The value of lending in period one increases with the borrower's initial reputation:

$$\frac{\partial V^I\left(x_i^1, p_1\right)}{\partial p_1} > 0 \tag{1.11}$$

but the "marginal" impact is higher when the first best contract is offered:

$$\frac{\partial V^I\left(x_B^1, p_1\right)}{\partial p_1} > \frac{\partial V^I\left(x_A^1, p_1\right)}{\partial p_1} > 0 \tag{1.12}$$

therefore, $h\left(x_A^1, x_B^1, p_1\right)$ is monotonically increasing with p_1. From the definition of $f^1\left(x_B^1\right)$, the IFI is indifferent between offering $\left\{x_B^1, 1\right\}$ and not lending in period one:

$$h\left(x_A^1, x_B^1, p_1 = f^1\left(x_B^1\right)\right) = 0 - V^I\left(x_A^1, f^1\left(x_B^1\right)\right) < 0 \tag{1.13}$$

but,

$$f\left(x_A^1, x_B^1, p_1 = 1\right) = V^I\left(x_B^1, 1\right) - V^I\left(x_A^1, 1\right) > 0 \tag{1.14}$$

Therefore, by the intermediate value theorem and the monotonicity of $h\left(x_A^1, x_B^1, \tau, p_1\right)$, there exists a unique $f^2\left(x_A, x_B\right) \in \left[f^1\left(x_B^1\right), 1\right]$ such that

$$h\left(x_A^1, x_B^1, f^2\right) = 0 \tag{1.15}$$

and for all $p_1 > f^2\left(x_A, x_B\right)$ $h\left(x_A^1, x_B^1, p_1\right) > 0$, while $h\left(x_A^1, x_B^1, p_1\right) \le 0$ for $p_1 \le f^2\left(x_A, x_B\right)$.

Proposition 6: 1. $\left\{x_B^1, 1\right\}$ *is optimal only if* $p_1 > f^3\left(x_A^1, x_B^1\right)$, *where* $f^3\left(x_A^1, x_B^1\right) > f^2\left(x_A^1, x_B^1\right)$. 2. $\left\{x_A^1, 1\right\}$ *is optimal in the interval* $\overline{p_1}\left(x_A\right) < p_1 < f^3\left(x_A^1, x_B^1\right)$, *where* $\overline{p_1}\left(x_A\right) < f^1\left(x_A^1, \tau\right)$.

Proof: Since contract $\left\{x_A^1, 1\right\}$ induces screening, an argument similar to Proposition 3 can be used to show that $\left\{x_A^1, 1\right\}$ produces positive payoffs if $p_1 > \overline{p_1}\left(x_A\right)$. To identify when $\left\{x_B^1, 1\right\}$ is optimal, let $g\left(x_A^1, x_B^1, \tau, p_1\right) = V^I\left(x_B^1, p_1\right) - V^I\left(x_A^1, p_1\right)$, where

$$V^I\left(x_A^1, p_1\right) = \max \begin{cases} p_1\left[p\left(x_A^1, \theta^G\right)\left[x_A^1 - 1 + p\left(x_B^2, \theta^G\right)\left[x_B^2 - 1 + 2\beta\right] + \left(1 - p\left(x_B^2, \theta^G\right)\right)\left(p\left(x_B, \theta^G\right) x_B\left(T-2\right) - \tau\right)\right.\right. \\ -\left(1 - p_1\right), 0 \end{cases}$$

and $V^I\left(x_B^1, p_1\right)$ is given by equation (1.7). By an argument similar to Proposition 5, there exists a $f^3\left(x_A^1, x_B^1\right)$ such that $g\left(x_A^1, x_B^1, \tau, f^3\left(x_A^1, x_B^1, \tau\right)\right) = 0$. Moreover, since $\left\{x_A^1, 1\right\}$ screens borrower types, $V^I\left(x_A^1, p_1\right)$ is at least as great as that available from the pooling case, so that $g\left(x_A^1, x_B^1, p_1\right) \le h\left(x_A^1, x_B^1, p_1\right)$ for all p_1. Therefore, $g\left(x_A^1, x_B^1, f^3\right) = 0 \le h\left(x_A^1, x_B^1, f^3\right)$ and $h\left(x_A^1, x_B^1, f^2\right) = 0$, which, since $h(\cdot)$ is non decreasing, implies that $f^3\left(x_A^1, x_B^1\right) \ge f^2\left(x_A^1, x_B^1\right)$.

Proposition 7: If $q \geq \bar{q}$ and $p \geq \overline{p}$, *then* x_B *is both feasible and optimal in the second arrangement*

If $\left(x_B^{1,2},1\right)$ is offered in the first period of the second arrangement, then a type θ^E's expected payoffs from choosing $x_B^{1,2}$ is: $p\left(x_B,\theta^E\right)\left[\theta^E x_B^{1,2}+q+\left(1-q\right)T\right]+\left(1-p\left(x_B,\theta^E\right)\right)$. Given that type θ^E's reservation payoff is one, it does not choose $x_B^{1,2}$ if $q>\bar{q}=1+\frac{x_B\theta^E}{T-1}$. Thus, if $q>\bar{q}$, then a separating equilibrium exists, and from Proposition 3, x_B is both feasible and optimal if $p \geq \overline{p}$.

Proposition 8: *If* $P\left(z=0\right)>\bar{q}$*, then the IFI is expected to cancel lending whenever reforms fail. Therefore, if the IFI chooses to lend, the first best contract is always offered. If* $\bar{q}^2<P\left(z=0\right)$*, then type* θ^E *is deterred from hold up in the first arrangement: observing* x_B *fully reveals the borrower to be of type* θ^G*, and the IFI offers the first best contract. If reform happens to fail in the first arrangement, the IFI cancels lending with probability* α^**. Otherwise, if* $P\left(z=0\right)<\bar{q}^2$*, then debt relief uncertainty does not sort borrowers.*

Let $V^{I^2}\left(x_B^{1,2},p\right)$ and $V^{I^2}\left(x_i^{1,2}\left(p\right),p\right)$ denote respectively the IFI's payoffs in the second arrangement when an extractive borrower is fully deterred and not deterred from the hold up strategy. Assume that $2\beta-\tau<V^{I^2}\left(x_B^{1,2},p\right)-V^{I^2}\left(x_i^{1,2}\left(p\right),p\right)$. If $P\left(z=0\right)>\bar{q}$, then from Bayes rule, canceling lending with probability one if reform fails in the first arrangement ensures that $q \geq \bar{q}$, so that the hold up strategy is not played in the second arrangement. Thus, since it is common knowledge that hold up fails, type θ^E is screened in the first arrangement. As a result, the IFI can offer the first best contract in both arrangements. If $P\left(z=0\right)<\bar{q}$, then the IFI is expected to cancel lending in the first arrangement if reform fails with probability α^*; and the total probability that hold up will fail in the first arrangement is $P\left(z=0\right)/\bar{q}$. From type θ^E's incentive compatibility constraint, hold up is not tried if $P\left(z=0\right)>\bar{q}^2$. In this case, the IFI can offer the first best contract in the first arrangement. If reform fails and the IFI does not provide debt relief—with probability α^*--then $q \geq \bar{q}$, and type θ^E is screened in the second arrangement. If instead reforms succeed in the first arrangement, and $P\left(z=0\right)<\bar{q}$, then type θ^E is not screened in the second arrangement.

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