Debt "Hold Up" and International Lending

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Abstract

Are lending contracts between international financial institutions (IFIs) and sovereign borrowers optimal? To address this question this paper builds on two ideas. First, the prospect of future debt relief can make it profitable for an IFI to continue lending even if lending contracts are currently violated. Second, some policy makers may prefer not implement reform contracts, and this preference remains unobserved to the IFI. Hence, some governments may strategically implement contracts in order to accumulate debt. When the debt stock becomes sufficiently large, it can be used as an "hold up" instrument, enabling the government to implement its preferred policy, assured that lending will continue. To mitigate the risk of "hold up", the IFI may use lending contracts to screen such borrowers, leading to distorted reform contracts.

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I. INTRODUCTION

"Some twenty-five countries have been indebted to the Fund for more than thirty years out of the last fifty. Sixteen countries have been under Fund-supported programs for twelve years or more out of the last eighteen. Such prolonged use risks turning the Fund into a source of long term financing, in contradiction with the mandate set forth in its Articles of Agreement. Many of the countries have acute debt sustainability problems and most are now enrolled in the HIPC (Heavily Indebted Poor Country) initiative" –Independent Evaluation Office (IEO) of the International Monetary Fund (IMF) 2002

Lending by international financial institutions (IFIs) such as the IMF and the World Bank (WB) have been frequently linked to unsustainable debt burdens and little sustained policy reform (Easterly [2001 a, b] and Boone [1995, 1996]). Both the amount of resources involved, and the social costs from misallocating those resources across and within borrower countries are substantial. For example, as the excerpt above notes, in recognition of their repayment difficulties, about $US50 billion in debt forgiveness have been provided to many long term IFI borrowers thus far, and several more countries are expected to become eligible for similar relief in the coming years[2]. Despite the magnitude of resources involved, much remains to be understood about why IFI lending is often associated with acute debt unsustainability in many borrowing countries. Are IFI lending contracts optimal? How does the possibility of future debt relief affect the composition and enforcement of these contracts? And when do borrowers chose to abide by lending contracts?

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. To motivate the discussion, the argument emphasizes the case where the sovereign borrower is better informed about its preference for reform than the IFI, and this policy choice determines whether loans can be repaid. But unlike most private banking relationships, collateral requirements, co signers and the other contractual methods of mitigating repayment risk[3] are unavailable in contracts that involve sovereign borrowers[4] 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. Often underlying these arrangements is the implicit notion

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

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

[4] 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].

that under the heading of debt relief, "bad" loans will eventually be forgiven[5]. 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. However, while debt relief is potentially "cheaper", accessing the debt relief mechanism requires the IFI to continue lending until debt relief actually becomes available, thereby increasing the stock of overall debt. Instead, although disruptive, canceling lending when reforms first fail results in a lower stock of debt or arrears. Therefore, the decision to resolve repayment difficulties through debt relief versus an immediate cancellation of lending depends on when conditionality is first breeched: if the existing stock of debt is small enough, then lending is cancelled; otherwise, continued lending until debt relief becomes available is optimal.

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. An extractive borrower can implement 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 freely pursue it's own policy objectives, assured that the IFI will continue lending until debt relief is provided. Specifically, for some borrowers, realizing the contracted policy outcome or reform is costly, as extractive policies are more lucrative. Thus, 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 accumulate debt. However, if the debt relief option exists, then extractive borrowers can lucratively "hold up" an IFI, reforming until sufficient debt is accumulated; after which, the policy maker can implement extractive policies, while the IFI continues to lend.

"Hold up" is costly to an IFI, and mitigating the "hold up" risk potentially distorts the terms of IFI lending contracts. Instead of contracting upon the first best policy outcome—the reform most likely to succeed, and thus ensure repayment-- the IFI may require a more "ambitious" reform—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. For example, 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

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

is insufficiently informative about a borrower's type, then the IFI may be deterred from lending.

Therefore, while successful reform implementation is inherently uncertain and 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.

These arguments are developed within the simplest framework possible, and are related to a small but rapidly growing body of analytical work focused on studying the relationship between multilateral lenders and sovereign borrowers. A common theme in this literature is the idea that the welfare of the domestic poor enters directly in the utility function of IFIs (the interdependent utility function approach). Hence, multilateral institutions continue to lend to help protect the poor despite observing ill conceived government policies (Sevensen [2000], Federico [2001]). Another strand of literature attributes the failure of conditional aid to imperfect monitoring; the budgetary process can be quite complex, and resources are fungible. Together, these factors can again enable aid recipients to divert resources to their preferred use, minimizing the effectiveness of conditionality (Cordella and Dell'Arrica [2001]). Of course, while concern about poverty and imperfect monitoring undoubtedly account for key features of the relationship between sovereign borrowers and multilateral lenders the case study evidence suggests that repayment considerations and the stock of debt may also be of paramount concern[6].

II. 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[7] a particular policy outcome.

[6] In addition to the aforementioned IEO report, documenting 5 country cases, a study funded by the Dutch government (8 countries) conclude that repayment considerations play an important role in the relationship between lender and borrower.

[7]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].

Borrower sovereignty is assumed to limit the set of contractible policy outcomes[8]. 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 reach period the IFI decides whether to lend a fixed amount—normalized to 1--before observing the policy outcome. To provide a tractable motivation for policy makers to borrow from IFIs, I assume that lending arrangements are concessional[9] . 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[10]; 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:

$$\beta < \tau < 2\beta \tag{0.1}$$

Policy makers vary in their preference for reform. To capture this heterogeneity, extractive policy makers—type θ^E -- derive negative payoffs if reforms are succesful. 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

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

[9] Zettelmeyer and Joshi (2003) analyzes 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] .

[10] 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].

influence whether the policy is actually successful[11]. More precisely, both a PM's type, θ^j, 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 (D), 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[12]:

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

Thus, given the payoff functions, the policy preferences of the IFI and a policy maker of type θ^G are perfectly aligned. And it is less costly to cancel lending in period one rather than use the debt restructuring mechanism available in period *T*. However, the debt relief option is optimal if the contract is breeched in period two.

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

[12] Note that the IFI derives negative payoffs even if a more ambitious reform than the orginally contracted policy is observed. This assumption is made for simplicity, as it eliminates any singalling motive on the part of policy makers.

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 $\{x_i^{1*},1\}$, 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 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.

Fig. 1

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 is observable; the PM's type, θ^i , and his reform choice in 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:

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

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

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

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 . Throughout the analysis it is assumed that $2 + \dfrac{x_B\theta^G - 2\beta}{1 + p\left(x_B, \theta^G\right)} > T$, so that type θ^G always chooses x_B^{2*} rather than choosing 0 in period two in order to avoid repaying debt[13]. Given τ , the IFI's decision to lend in period 2 depends on it's assessment of the PM's type. And intuitively, the greater the cost of hold up, the less likely is the IFI to lend in period 2:

Proposition 1: *The IFI lends in period two if* $p_2\left(x_i^{1*}\right) \geq \overline{p_2}\left(\tau\right)$, *where* $\overline{p}_2{}'\left(\tau\right) > 0$.

[13] 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.

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 adhere to 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. If x_i^{1*} is not realized, then θ^E earns 1. Thus, θ^E's expected payoffs from choosing x_i^{1*} is :

$$p\left(x_i^{1*},\theta^E\right)\left[x_i^{1*}\theta^E+T\right]+\left[1-p\left(x_i^{1*},\theta^E\right)\right] \tag{0.7}$$

Since the disbursement is made before x_i^{1*} is realized, θ^E's payoff from choosing the status quo 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:

$$0>\theta^E>\frac{-T}{x_i^{1*}} \tag{0.8}$$

Since x_B is the first best, if $x_i^{1*}=x_B$, then type θ^G routinely chooses x_i^{1*}. However, if x_A is offered, then θ^G's expected payoffs from choosing x_A^1 in the first period is $V^{PM}\left(1,x_A^1,\theta^G\right)$. For type θ^G, x_A^1 is incentive compatible if it makes the policy maker no worse off than choosing x_B. Therefore, if offered, θ^G chooses the less efficient contract x_A^1 if it's probability of realization $p\left(x_A^{1*},\theta^G\right)$ is sufficiently large. A policy outcome x_i^{1*} induces pooling if it satisfies the incentive compatibility constraint of both types of policy makers:

Proposition 2: *If* $0>\theta^E>\frac{-T}{x_i^{1*}}$ *and* $p\left(x_i^{1*},\theta^G\right)>\overline{p}\left(x_i^{1*},\theta^G\right)$, *then* $\left\{x_i^{1*},1\right\}$ *induces pooling.*

Otherwise, if $\theta^E<\frac{-T}{x_i^{1*}}$ and $p\left(x_i^{1*},\theta^G\right)>\overline{p}\left(x_i^{1*},\theta^G\right)$, *then* $\left\{x_i^{1*},1\right\}$ *induces full screening, as type* θ^E *chooses 0, and* θ^G *chooses* $\left\{x_i^{1*},1\right\}$.

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. Since both contracts sort borrowers, but the first best contract, x_B^1 , provides higher expected payoffs, if the IFI does decide to lend in period one, it 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. Given this risk, the IFI may elect to ration credit; under this scenario, if the IFI is sufficiently prejudiced about the set of borrowers, then 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.

In this case, 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, both because the expected payoffs are higher than x_A^1, as well as, since $p\left(x_A^1,\theta^j\right) < p\left(x_B^1,\theta^j\right)$, repayment is more likely under x_B^1 than x_A^1**.** However, because of 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, and the cost of hold up τ play key roles in resolving this tradeoff. Specifically, a period one contract $\left\{x_i^1,1\right\}$ is feasible if it renders the IFI's expected payoffs positive in each period. That is, it ex-ante provides the IFI with positive expected payoffs in the period one lending phase, and 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 $\left\{x_i^1,1\right\}$, then it expects to observe x_i^1 with probability $\widetilde{p} = p_1 p\left(x_i^1,\theta^G\right) + \left(1-p_1\right) p\left(x_i^1,\theta^E\right)$; and if x_i^1 is observed, then the IFI receives $\left(x_i^1 - 1\right)$ at the end of period one . Therefore, period one static payoffs are positive if $\widetilde{p}\left[x_i^1 - 1 - \beta\right] - \left[1 - \widetilde{p}\right] \geq 0$. But in addition to satisfying the period one constraint, the ex post realization of a feasible contract $\left\{x_i^1,1\right\}$ 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[14]. Therefore, a contract is feasible whenever its successful realization in the first period produces positive second period payoffs:

Proposition 4: $\{x_i^1, 1\}$ *is feasible if* $p_1 > f^1(x_i^1, \tau)$, *where* $\frac{df^1(x_i^1, \tau)}{d\tau} > 0$.

And intuitively, as τ , the cost of using the debt relief mechanism increases, the threshold level of initial beliefs that render a contract feasible also rises. Suppose that $p_1 > \overline{p}(x_B, \tau)$, so that both x_A and x_B are feasible. Although the full information optimal contract $\{x_B, 1\}$ is feasible, if the cost of using the debt relief mechanism is large, then 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* $p_1 > f^2(x_A, x_B, \tau)$, *where* $f^2(x_A, x_B, \tau) > f^1(x_B, \tau)$

Figure 1 illustrates these ideas. Below the curve $f^1(x_A, \tau)$, there are no feasible contracts, as credit is rationed. Between $f^1(x_A, \tau)$ and $f^1(x_B, \tau)$ x_A is the only feasible contract, and the equilibrium first period contract becomes $\{x_A^1, 1\}$. In the region between $f^2(x_A, x_B, \tau)$ and $f^1(x_B, \tau)$ 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 $f^2(x_A, x_B, \tau)$ 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. While the contract x_A^1 remains a costly deviation from the first best, x_B^1, if x_A^1 is observed at the end of period one, then the borrower's type is fully revealed. 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, τ) 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.

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

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

III. Debt Releif 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[15]. In contrast, the IFI's management is fully aware of the shareholders' debt relief decision[16]. More precisely, from equation (0.1) z is an an indicator function that takes on the value of one if the debt relief technology is available and zero otherwise:

$$z = \begin{cases} 1 & \beta < \tau < 2\beta \\ \\ 0 & \tau > 2\beta \end{cases} \tag{0.9}$$

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

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[15] 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.

[16] 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.

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, N_1 becomes common knowledge in the second arrangement. 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[17]. 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:

$$\begin{aligned} q = P\left(N_2 = 0 \middle| N_1 = 0\right) &= \frac{P\left(N_1 = 0 \middle| N_2 = 0\right) P\left(N_2 = 0\right)}{P\left(N_1\right)} \\ &= \frac{P\left(N_1 = 0 \middle| z = 0\right) P\left(z = 0\right)}{P\left(N_1 = 0 \middle| z = 0\right) P\left(z = 0\right) + \alpha P\left(z = 1\right)} \\ &= \frac{P\left(z = 0\right)}{P\left(z = 0\right) + \alpha\left[1 - P\left(z = 0\right)\right]} \end{aligned} \tag{0.10}$$

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 of a successful hold up is sufficiently great: $q < \bar{q} = 1 + \frac{x_B \theta^E}{T - 1}$. 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, as the realization of $x_B^{1,2}$ reveals the borrower to be of type θ^G.

[17] Although the IFI's decision to provide debt relief is modeled as probabilistic, this randomization is easily interpreted as representing the policy maker's uncertainty and resulting conjecture about whether the IFI will provide debt relief when that option is available, rather than some deliberate randomization on the part of the IFI.

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

In contrast, suppose that x_A and x_B induce pooling when there is no uncertainty over the provision of debt relief, then from Proposition 5, x_B would have been offered only if $p > f^2(x_A, x_B, \tau) > \overline{p}$.

B. First Arrangement

In the second period of the first arrangement, if reform fails and the IFI provides debt relief, then it obtains $-\tau$, plus $\left[p\left(x_B, \theta^G\right)x_B(T-2)\right]$ if the policy maker is of type θ^G. Providing debt relief in the first arrangement eliminates any ambiguity about its availability to the subsequent borrower. In this case, payoffs in the second arrangement resemble the earlier case in section C.3 where x_A and x_B induce pooling . To summarize, let $V^{I^2}\left(x_i^{1,2}(p_1), p_1, \tau\right)$ denote the IFI's expected payoffs in the second arrangement, given that debt relief was provided in the first arrangement. Conversely, suppose denying debt relief in the first arrangement effectively deters PMs of type θ^E from attempting hold up in the second period, then the IFI earns:

$$-2\beta + \left[p\left(x_B, \theta^G\right)x_B(T-2)\right] + V^{I^2}\left(x_B^{1,2}, p, \tau\right) \tag{0.11}$$

Assume that the net cost of canceling lending if reform fails in the first arrangement, $2\beta - \tau$, is not too big. Then if $P(z=0) \geq \overline{q}$, then in the first arrangement it is common knowledge that the IFI will cancel 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, since prior uncertainty about the provision of debt relief, $P(z=0)$, deters extractive borrowers from hold up strategies. If however $P(z=0) < \overline{q}$, 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:

$$\alpha^* = \frac{P(z=0)\left(1-\overline{q}\right)}{\overline{q}\left(1-P(z=0)\right)} \tag{0.12}$$

Consequently, $P(z=0)/\overline{q}$ is the total probability that lending will be cancelled in the first arrangement if reform fails. And if $P(z=0) > \overline{q}^2$, 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 $\bar{q}^2 < P(z=0) < \bar{q}$, then type θ^E is deterred from hold up in the first arrangement, and the IFI offers the first best contract. If reform fails 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.*

IV. Discussion

This paper has argued that while debt relief can be an important mechanism for managing reform failure, it can distort lending contracts between multilateral lenders and sovereign borrowers, leading in some cases to the increased provision of debt relief, or the contracting of "excessively difficult" reforms. 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".

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

V. APPENDIX

Proposition 1: *The IFI lends in period two if* $p_2\left(x_i^{1*}\right) \geq \overline{p_2}(\tau)$, *where* $\overline{p}_2'(\tau) > 0$.

Proof: To derive the value of a lending arrangement in period two, note that 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:

$$V^I\left(2,p_2\left(x_i^{1*}\right),x_B^{2*}\right)=\max\left\{\begin{array}{l}p_2\left(x_i^{1*}\right)\left[p\left(x_B^{2*},\theta^G\right)\left[x_B^{2*}-1+2\beta\right]-\left(1-p\left(x_B^{2*},\theta^G\right)\right)\left[p\left(x_B,\theta^G\right)x_B(T-2)-\tau\right]\right]\\-\left(1-p_2\left(x_i^{1*}\right)\right)\tau,0\end{array}\right\} \tag{0.13}$$

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

$$p_2\left(x_i^{1*}\right)\left[p\left(x_B^{2*},\theta^G\right)\left[x_B^{2*}-1+2\beta\right]-\left(1-p\left(x_B^{2*},\theta^G\right)\right)\left[p\left(x_B,\theta^G\right)x_B(T-2)-\tau\right]\right]-\left(1-p_2\left(x_i^{1*}\right)\right)\tau\geq 0 \tag{0.14}$$

And condition (0.14) is satisfied if the PM's reputation at the beginning of period two is sufficiently large:

$$p_2\left(x_i^{2*}\right)\geq\overline{p_2}(\tau)=\frac{\tau}{\left[p\left(x_B^{2*},\theta^G\right)\left[x_B^{2*}-1+2\beta\right]-\left(1-p\left(x_B^{2*},\theta^G\right)\right)\left[p\left(x_B,\theta^G\right)x_B(T-2)\right]\right]+\tau\left(2-p\left(x_B^{2*},\theta^G\right)\right)} \tag{0.15}$$

where $\overline{p}_2'(\tau) = 1 + \left(2 - p\left(x_B^{2*}, \theta^G\right)\right)\left[\frac{\tau}{\left[p\left(x_1^{2*}, \theta^G\right)\left(x_1^{2*} - 1\right) - \left(1 - p\left(x_1^{2*}, \theta^G\right)\right) + \beta 2\right] + \tau}\right]^2 > 0$

Proposition 2: *If* $0 > \theta^E > \frac{-T}{x_i^{1*}}$ *and* $p\left(x_i^{1*}, \theta^G\right) > \overline{p}\left(x_i^{1*}, \theta^G\right)$*, then* $\left\{x_i^{1*}, b\right\}$ *induces pooling.* *Otherwise, if* $\theta^E < \frac{-T}{x_i^{1*}}$ and $p\left(x_i^{1*}, \theta^G\right) > \overline{p}\left(x_i^{1*}, \theta^G\right)$*, then* $\left\{x_i^{1*}, b\right\}$ *induces screening, as type* θ^E *implements 0, and* θ^G *chooses* $\left\{x_i^{1*}, b\right\}$.

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, $V\left(1, x_A^1, \theta^G\right)$ is:

$$V\left(1, x_A^1, \theta^G\right) = p\left(x_A^{1*}, \theta^G\right)\begin{bmatrix} x_A^{1*}\theta^G + 1 + p\left(x_B^{2*}, \theta^G\right)\left[x_B^{2*}\theta^G + (1 - \beta 2)\right] + \\ \left[1 - p\left(x_B^{2*}, \theta^G\right)\right]\left[1 + (T - 2)\left(1 + p\left(x_B\right)x_B\theta^G\right)\right] \end{bmatrix} + \left(1 - p\left(x_A^{1*}, \theta^G\right)\right) \tag{1.2}$$

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

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

Therefore, the contract $\left\{x_A^1, 1\right\}$ satisfies θ^G's incentive compatibility constraint (IC) if :

$$p\left(x_A^1,\theta^G\right) \geq \overline{p}\left(x_A^1,\theta^G\right) \equiv \frac{2p\left(x_B,\theta^G\right)\left[x_B\theta^G\right]+2}{\left[x_A^{1*}\theta^G + p\left(x_B^{2*},\theta^G\right)\left[x_B^{2*}\theta^G + \left(1-\beta 2\right)\right] + \left[1-p\left(x_B^{2*},\theta^G\right)\right]\left[1+\left(T-2\right)\left(1+p\left(x_B\right)x_B\theta^G\right)\right]\right]}$$

(1.4)

Conversely, if $\theta^E < \frac{-T}{x_i^{1*}}$, then $\left\{x_i^1,1\right\}$ does not satisfy θ^E's IC, and θ^E chooses 0. If $p\left(x_i^{1*},\theta^G\right) > \overline{p}\left(x_i^{1*},\theta^G\right)$, then θ^G's IC is satisfied, and θ^G chooses $\left\{x_i^1,1\right\}$. Hence, if $\theta^B < \frac{-T}{x_i^{1*}}$ and $p\left(x_i^{1*},\theta^G\right) > \overline{p}\left(x_i^{1*},\theta^G\right)$, then $\left\{x_i^1,1\right\}$ induces screening.

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:

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

(1.5)

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

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

or if p_1 is sufficiently large:

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

(1.6)

□

Proposition 4: $\left\{x_i^1,1\right\}$ *is feasible if $p_1 > f^1\left(x_i^1,\tau\right)$, where $\frac{df^1\left(x_i^1,\tau\right)}{d\tau} > 0$*

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

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

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

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

.

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

Proof: From Proposition 4,

$$f^1(x_B,\tau)>f^1(x_A,\tau) \tag{1.9}$$

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

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

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

$$\frac{\partial V^{I}\left(x_{i}^{1}, p_{1}, \tau\right)}{\partial p_{1}} > 0 \tag{1.11}$$

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

$$\frac{\partial V^{I}\left(x_{B}^{1}, p_{1}, \tau\right)}{\partial p_{1}} > \frac{\partial V^{I}\left(x_{A}^{1}, p_{1}, \tau\right)}{\partial p_{1}} > 0 \tag{1.12}$$

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

$$h\left(x_{A}^{1}, x_{B}^{1}, \tau, p_{1} = f^{1}\left(x_{B}^{1}, \tau\right)\right) = 0 - V^{I}\left(x_{A}^{1}, f^{1}\left(x_{B}^{1}, \tau\right), \tau\right) < 0 \tag{1.13}$$

but,

$$f\left(x_{A}^{1}, x_{B}^{1}, \tau, p_{1} = 1\right) = V^{I}\left(x_{B}^{1}, 1, \tau\right) - V^{I}\left(x_{A}^{1}, 1, \tau\right) > 0 \tag{1.14}$$

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 $f^{2}\left(x_{A}, x_{B}, \tau\right) \in \left[f^{1}\left(x_{B}^{1}, \tau\right), 1\right]$ such that

$$h\left(x_{A}^{1}, x_{B}^{1}, \tau, f^{2}\right) = 0 \tag{1.15}$$

and for all $p_{1} > f^{2}\left(x_{A}, x_{B}, \tau\right)$ $h\left(x_{A}^{1}, x_{B}^{1}, \tau, p_{1}\right) > 0$, while $h\left(x_{A}^{1}, x_{B}^{1}, \tau, p_{1}\right) \leq 0$ for $p_{1} \leq f^{2}\left(x_{A}, x_{B}, \tau\right)$.

Proposition 6: 1. $\left\{x_{B}^{1}, 1\right\}$ *is optimal only if* $p_{1} > f^{3}\left(x_{A}^{1}, x_{B}^{1}, \tau\right)$, where $f^{3}\left(x_{A}^{1}, x_{B}^{1}, \tau\right) > f^{2}\left(x_{A}^{1}, x_{B}^{1}, \tau\right)$.

2. $\left\{x_{A}^{1}, 1\right\}$ *is optimal in the interval* $\overline{p_{1}}\left(x_{A}\right) < p_{1} < f^{3}\left(x_{A}^{1}, x_{B}^{1}, \tau\right)$, *where* $f^{4}\left(x_{A}^{1}, \tau\right) < f^{1}\left(x_{A}^{1}, \tau\right)$.

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 $p_{1} > \overline{p_{1}}\left(x_{A}\right)$

From equation (1.8), $\overline{\overline{p}}\left(x_{A}^{1}, \tau\right) < \overline{p}\left(x_{A}^{1}, \tau\right)$ if and only if $\tau > \frown{\tau}$ where:

$$\overset{\frown}{\tau} = \frac{p\left(x_B^2,\theta^G\right)\left[x_B^2-1\right]-\left(1-p\left(x_B^2,\theta^G\right)\right)+2\beta}{p\left(x_A^1,\theta^G\right)\left[x_A^1+\beta+p\left(x_B^2,\theta^G\right)\left[x_B^2-1\right]-\left(1-p\left(x_B^2,\theta^G\right)\right)\right]+\beta-1} \tag{1.16}$$

To identify when $\{x_B^1,1\}$ is optimal, let $g\left(x_A^1,x_B^1,\tau,p_1\right)=V^I\left(x_B^1,p_1,\tau\right)-V^I\left(x_A^1,p_1\right)$, where

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

and $V^I\left(x_B^1,p_1,\tau\right)$ is given by equation (1.7). By an argument similar to Proposition 4, there exists a $f^3\left(x_A^1,x_B^1,\tau\right)$ 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 $\{x_A^1,1\}$ screens borrower types, $V^I\left(x_A^1,p_1\right)$ is at least as great as that available from the pooling case: $V^I\left(x_A^1,p_1\right)\geq V^I\left(x_A^1,p_1,\tau\right)$, so that $g\left(x_A^1,x_B^1,\tau,p_1\right)\leq h\left(x_A^1,x_B^1,\tau,p_1\right)$ for all p_1. Therefore, $g\left(x_A^1,x_B^1,\tau,f^3\right)=0\leq h\left(x_A^1,x_B^1,\tau,f^3\right)$ and $h\left(x_A^1,x_B^1,\tau,f^2\right)=0$, which, since $h(\cdot)$ is non decreasing implies that $f^3\left(x_A^1,x_B^1,\tau\right)\geq f^2\left(x_A^1,x_B^1,\tau\right)$.

Proposition 7: If $q\geq\overline{q}$ 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: $p\left(x_B,\theta^E\right)\left[\theta^E x_B^{1,2}+q+(1-q)T\right]+\left(1-p\left(x_B,\theta^E\right)\right)$. Given that type θ^E's reservation payoff is one, it does not choose $x_B^{1,2}$ if $q>\overline{q}=1+\dfrac{x_B\theta^E}{T-1}$. Thus, if $q>\overline{q}$, then a separating equilibrium exists, and from Proposition 3, x_B is both feasible and optimal if $p\geq\overline{p}$.

Proposition 8: *If* $P(z=0)>\overline{q}$, *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* $\overline{q}^2<P(z=0)<\overline{q}$, *then type* θ^E *is deterred from hold up in the first arrangement, and the IFI offers the first best contract. If reform fails in the first arrangement, the IFI cancels lending with probability* α^*. *Otherwise, if* $P(z=0)<\overline{q}^2$, *then debt relief uncertainty does not sort borrowers.*

Assume that $2\beta-\tau<V^{I^2}\left(x_B^{1,2},p,\tau\right)-V^{I^2}\left(x_i^{1,2}(p),p,\tau\right)$. If $P(z=0)>\overline{q}$, 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, type θ^E are screened in the first arrangement since they expect hold up to fail with probability one. As a result, the IFI can offer the first best contract in both arrangements. If $P(z=0) < \bar{q}$, 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 $P(z=0)/\bar{q}$. From type θ^E's incentive compatibility constraint, hold up is not tried if $P(z=0) > \bar{q}^2$. 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 are screened in the second arrangement. If instead reforms succeed in the first arrangement, and $P(z=0) < \bar{q}$, then type θ^E is not screened in the second arrangement.

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