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Conditionality and Fragility in Long-Term Financial Contracts

by

Spiros Bougheas, Indraneel Dasgupta and Oliver Morrissey

Abstract

Lenders condition future loans on some index of past performance. Typically, banks condition future loans on repayments of earlier obligations while international organizations condition future loans on the implementation of some policy conditions. We build an agency model that accounts for these tendencies to offer an explanation for why both types of conditionality clause may coexist. The optimal conditionality clause depends on the likelihood that a borrower who has been denied funds from the original lender can access funds from other sources, what we call 'fragility'. For conditionality to work it is paramount that when lenders deny future loans borrowers do not have access to alternative sources of funds. When fragility is not a major issue conditional on investment contracts are optimal. In contrast, when fragility is a major concern then conditional on repayment contracts are optimal as they reduce the likelihood of those states where fragility becomes an issue.

Key Words: Long-term loans, fragility, conditionality

***JEL* Classification:** G21, F34

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Outline

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1. INTRODUCTION

An important feature of most credit markets is that relationships between lenders and borrowers are repeated so that each agent must maintain some minimum level of performance or commitment to sustain the relationship. For example, banks offer loan commitments (credit lines) to firms which as long as they make regular repayments (performance) are free to borrow any amount up to some predetermined limit. A similar financial contract governs the relationship between consumers and their credit card suppliers. Furthermore, international organizations, like the World Bank and the IMF, promise further financial assistance in the future as long as their clients exhibit some level of acceptable performance, typically requiring them to undertake some specific action(s).[1] What these examples have in common, apart from the repeated and sustained nature of the relationship between creditors and their clients is that future access to funds (the lenders commitment) is made conditional on some indicator of borrower performance. In the first two examples the condition relates to repayment of past borrowings whilst in the case of international organizations conditions typically relate to the implementation of some policy reform program.

The above examples suggest that private institutions that predominantly offer funds to consumers and firms, and in certain cases also to sovereign states, are more likely to offer contracts that are *conditional on repayment* whilst international organizations are more likely to offer contracts *conditional on investment* (where investment is interpreted broadly as any action requiring an implementation cost, pecuniary or otherwise). In this paper, we offer a theoretical explanation of this tendency. In the following section, we provide a brief review of two distinct literatures that examine separately the optimal design and properties of these two types of onditional financial contracts.[2] Our aim is to move one step back and try to identify factors that determine the optimal choice of 'conditionality'.[3]

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[1] Such conditional lending to sovereign states is intended to overcome adverse selection and moral hazard problems, and most research on contract design is aimed at analyzing the effectiveness of conditionality (e.g. Diwan and Rodrik (1992), Fafchamps (1996), Marchesi and Thomas (1999), Federico (2004))

[2] Bougheas, Dasgupta and Morrissey (2007) examine the choice of conditional on investment contracts, as against unconditional contracts, in charitable giving (where repayment is not a feature). They provide an explanation for why donors choose conditional giving, whereas the concern here is with the choice of alternative performance conditions (repayments versus investment).

[3] In the development literature the term 'conditionality' has been associated with the contracts that we, here, refer as 'conditional on investment'. Our use of the term is more encompassing as our aim is to explore why different types of lenders choose a different performance condition.

We develop a simple agency model with three types of borrowers, where types are private information. Each type is endowed with a stochastic technology that is available for two consecutive periods. The technology's stochastic return is independently but identically distributed across periods. Two of the three types of borrowers can improve the likelihood of success of their technologies by undertaking an additional type-specific investment, while the third cannot. However, lenders can observe only one type of investment, so the observation does not yield sufficient information to distinguish borrower types. The role of conditionality is to offer incentives to borrowers to use funds for investment rather than consumption. It does so by tying the availability of future funds to some action that the borrower must take; either repaying earlier loans (conditional on repayment contracts) or undertaking the observable investment (conditional on investment contracts). The choice between the two mechanisms depends on the following trade-off. Conditional on investment contracts ensure that, as long as the observable investment is made, future funds will be available independently of the earlier outcomes (project realized returns). However, the observable investment is appropriate for only one type of borrower. In contrast, conditional on repayment contracts ensure that any type will receive future funds, but repayment can only be made when the initial project performs well.

In order for conditionality to work it is paramount that a borrower who has accepted one of the conditional contracts but has been unable to satisfy its conditionality clause, and hence is denied a new loan, does not have access to an alternative source of funds. It is clear that if this is not the case then the incentive mechanism of the contract might break down, hence the contract is fragile. We use the term 'fragility' for the situation when there is a likelihood of obtaining a loan from another lender. Lenders than can 'eliminate' other lenders can therefore remove fragility.

First, we examine the case where having access to other sources of funds is not a concern. We find that there are three possible outcomes. There is a set of values for the parameters of the model such that it is not optimal to offer any conditional contracts. This is the case when the borrowers who cannot use the extra funds for improving their technology accept a conditional offer and use the funds for consumption. When conditional contracts are feasible it is always optimal to offer the conditional on investment contract. Among the set of parameter values such that

conditional contracts are feasible there is a subset where it is optimal to offer a menu of contracts, comprised of the two conditional contracts. It is obvious that the highest level of efficiency is achieved when it is feasible to offer the menu of contracts since it achieves a complete separation of types. We find that it is never optimal to offer only the conditional on repayment contract. The intuition behind the last result is that it is more difficult to separate the type of borrowers that do not have any good use of the extra funds using the repayment contract. This is because with repayment contracts there is a good chance that they will receive funds again but this is not the case with investment contracts.

We then allow for the possibility that those borrowers who have signed a conditional contract but were denied a new loan get access to funds from another source. Once more, we examine how the optimal contracts offered vary with changes in the parameters of the model. Not surprisingly, we find that if the probability that a firm which has been denied a new loan obtains funds from another creditor is sufficiently high then conditional contracts will not be offered. But, more importantly, we also find that conditional on investment contracts are more 'fragile' than conditional on repayment contracts; that is there is a range of probabilities were only contracts conditional on repayment will be offered. The intuition behind the result is as follows: for a borrower who uses extra funds for consumption there is still a good chance that they will meet the conditionality clause of the repayment contract, which in turn implies that the expected benefits of having access to other borrowers is low. In contrast, the same borrower will never meet the conditionality clause of the investment contract and thus the corresponding benefits are high.

We organize the rest of the paper as follows. In the next section we provide a brief review of some salient literature that examine the optimal design and properties of these two types of conditional financial contracts. In section 3 we develop the model and solve for the optimal mechanism under the supposition that fragility is not a concern. In section 4 we introduce fragility and analyze its consequences for mechanism design. We offer some final comments in the last section.

2. CONDITIONAL LENDING: RELATED LITERATURE

This paper is related to the literature on IMF conditionality that investigates the benefits of the Fund's practice of conditioning future funds on the implementation

of some economic reform. This literature is extensive and reviewed in Federico (2001), and generally relates to the design of conditionality to render it effective in supporting reform (thereby reducing moral hazard and adverse selection). Federico (2004) is representative of this literature, where the focus is on the time inconsistency of conditionality when donors are only able to make imperfect commitments (e.g. the threat to withdraw lending is not credible). As other examples, Drazen (2002) and Paloni and Zanardi (2006) consider how conditionality interacts with the political economy of policy reform in borrower countries to assess the effectiveness in inducing reform. The literature does not generally consider a specific choice between repayment and investment conditions. In two closely related papers to our work Sachs (1989) and Rodrik (1996) argue that the IMF has an advantage over private creditors in enforcing conditional on investment contracts for several reasons ranging from informational advantages and political neutrality to the ability to control other potential creditors. In this paper we provide a formal rationale for the last argument based on our 'fragility' concept.

A common rationale offered for IMF conditionality is that it provides incentives to borrowers for using the funds for productive investments (e.g. Diwan and Rodrik (1992), Fafchamps (1996) and Marchesi and Thomas (1999)). In this respect, our approach is more general because we allow the creditor a wider choice of mechanisms to address the same issue. For example, we find that when fragility is an issue, conditional on investment contracts are not necessarily optimal. Among the last group of papers, Marchesi and Thomas (1999) is the most relevant to our work. They also view conditionality on investment as a mechanism that screens high-productivity borrowers from low-productivity ones, however, they focus on debt-relief issues and do not consider alternative mechanisms. The agency approach to understanding the relationship between IMF and its client countries is also followed by Federico (2001) who examines three alternative explanations for the Fund's conditionality on investment clause on its loans; namely, as a safeguard of the Fund's resources, as a technology that allows to commit to invest rather than consume, and as a mechanism that mitigates excessive risk-taking.

The existence of alternative lenders imposes some limit on the extent of IMF conditionality, and may even encourage the IMF to tolerate higher levels of non-compliance than would otherwise be the case. Penalver (2004) notes that sovereign

countries have access to private capital markets and this can substitute for IMF borrowing and weaken conditionality (on investment) as our model predicts. On the other hand, countries receiving IMF support are also likely to receive more aid from donors because the conditionality is a positive signal of some commitment to policy reform (Bird and Rowlands (2007)). This implies stronger conditionality, and suggests possible sorting of recipients depending on whether the most viable alternative is private borrowing or aid.

Bolton and Scharfstein (1990) are the first to consider conditional on repayment contracts. The difference from our approach is that in their model project returns are not verifiable and thus one period lending is impossible. The conditional contract offers incentives to borrowers to make high payments at the end of the first period in order to receive a new loan in the second period. In our case, the returns are observable but the conditional contracts offer incentives to borrowers to use the extra funds for investment in order to increase the probability that their second period project will be financed. A similar type of mechanism is also considered in the large 'sovereign debt' literature which is reviewed in Eaton and Fernandez (1995).

Lastly, the model is also related to the growing literature on 'group lending' that analyzes the practices of NGOs such as the Grameen Bank in Bangladesh and Sewa in India which use funds from charitable transfers to subsidize lending to poor family groups.[4] The contracts that these organizations offer are a mix of the two types of contracts considered in this paper. In particular, future loans are conditioned on both repayment of earlier loans and on the participation of group members in time-consuming group activities. In addition to problems that inflict typical borrower-lender relationships, these mix contracts are also designed to solve problems that are directly related to group lending.[5] In contrast, in the present paper we focus exclusively on bilateral financial relationships.

3. THE MODEL

There are 3 periods $(t = 0,1,2)$. There is a single good that can be used both for consumption and investment purposes. A risk-neutral borrower needs funds to finance a risky project. At $t = 0$ the project requires a fixed investment of K units. At $t = 1$, if

[4] Ghatak and Guinnane (1999), Morduch (1999), and more recently Rai and Sjöström (2004) provide reviews.

successful, it will yield X units of output and 0 otherwise. The probability of success of the project, $p_i(E_j)$, is endogenously determined and it depends on the level and type $(j = A, B)$ of an additional investment, $E_J \in \{0, e\}$, and the type of the borrower, $(i = 0,1,2)$. More specifically,

$$p_0(E_i) = p_L \text{ for every } E_j,$$

$$p_1(E_j) = p_H \text{ for } E_A = e \text{ and } p_L \text{ otherwise, and} \quad (1)$$

$$p_2(E_j) = p_H \text{ for } E_B = e \text{ and } p_L \text{ otherwise.}$$

where $p_H > p_L$.[6] In words, only a type 1 or a type 2 borrower can improve the probability of success of the project and only by making the appropriate type-specific investment.

The technology is also available at $t = 1$, where an investment of K units will yield X units at $t = 2$ with the same probability distribution for each type. For either a type 1 or a type 2 borrower who has made the appropriate additional investment in period 0, the probability of success of the second project remains p_H. We also assume that the borrower uses the first period profits, if any, for consumption. Thus, to finance the second period project the borrower needs a new loan.

The borrower can raise funds in competitive financial markets. All potential lenders are risk-neutral and, for simplicity, we assume that the interest rate is equal to zero and there is no discounting. Let π_0, π_1, and π_2 $(\pi_0 + \pi_1 + \pi_2 = 1)$ denote the beliefs of lenders about the probability distribution of types 0, 1 and 2 respectively. A lender makes a loan offer and the borrower either accepts it or rejects it. If the borrower rejects the offer both parties make zero profits. For the moment, we consider one-period loans. In this case, the loan offer includes the size of the loan at $t = 0$ and the repayment conditional on the success of the project at $t = 1$. The last condition implies that the borrower is protected by limited liability. We impose the following condition on the project's payoffs:

***Condition* 1**: $p_H K - K - e > p_L X - K > 0$.

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[5] For example, joint liability rules aim to foster incentives for intra-group monitoring.

The additional investments that improve the probability of success of the projects of type 1 and type 2 borrowers are efficient. Therefore the optimal loan size to either a type 1 or a type 2 borrower is equal to $K + e$. It follows that the repayment will be set equal to $(K + e)/p_H$. The optimal loan size for type 0 borrowers is K and the repayment will be set equal to K/p_L. Under full information, the average return across types, Y_F, is given by:

$$Y_F = 2\pi_0(p_L X - K) + (\pi_1 + \pi_2)\{2(p_H X - K) - e\} \quad (2)$$

3.1. One-period Lending under Asymmetric Information

Now, suppose that types are private information and that type A investment is observable. While lenders can verify that a borrower has made a type A investment they cannot do so for the type B investment. We assume that the following condition is satisfied:

***Condition* 2**: $p_H X - K - e > p_L(X - (K + e)/p_H) + e$

The above condition implies that if borrower types were observable (so that type 0 borrowers can be excluded) both type 1 and type 2 borrowers would prefer to use the extra funds for investment rather than consumption. Thus, when we restrict our attention to one-period contracts the ability to observe the type A investment is inconsequential. Notice that there are two types of informational asymmetries in this model; namely, adverse selection because the borrower's type is not observable and moral hazard because type B investment is not observable. In contrast, we assume that payoffs are observable and contractible.

The above informational restrictions imply that if lenders offer a one-period contract it must be a contract that pools at least type 1 and 2 borrowers. We can prove the following result:

***Lemma* 1**: *A type* 0 *borrower will always pretend to be either a type* 1 *or a type* 2 *borrower.*

Proof: The payoff of a type 0 borrower who pretends to be either a type 1 or a type 2 borrower and uses the additional investment funds for consumption is:

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[6] In an earlier version of the paper we have allowed the probabilities of success of the projects of type 1 and type 2 borrowers who make the appropriate investments to differ. We found that setting them equal improves the presentation while none of the results are affected.

$p_L(X-(K+e)/p_H)+e$. The payoff when he truthfully reveals his type is: $p_L X - K$ .Since, $p_H > p_L$ the first expression is always larger. □

The above result implies that if there exists an equilibrium where lenders are willing to provide one-period loans of size $K+e$, it must be an equilibrium that pools all three types of borrowers. In such an equilibrium, lenders will be demanding a repayment equal to $(K+e)/p^*$, where $p^* = \pi_0 p_L + (1-\pi_0)p_H$. This repayment will be sufficient for lenders to break-even if type 1 and type 2 borrowers have the incentive to invest instead of consuming the additional funds. The payoff of either a type 1 or a type 2 borrower who uses the funds for the appropriate investment, is $p_H(X-(K+e)/p^*)$. The corresponding payoff when the additional funds are used for consumption is $p_L(X-(K+e)/p^*)+e$.

***Condition* 3**: $p_H(X-(K+e)/p^*) < p_L(X-(K=e)/p^*)+e$

If the above condition is satisfied and lenders provide the additional funds type 1 and type 2 borrowers will use them for consumption.[7] Therefore, the lenders will only offer loans of size *K* with repayment K/p_L. We can summarize the results of this section in the following proposition:

***Proposition* 1**: *If* $\frac{p_H - p_L}{p^* + p_H - p_L} < \frac{e}{p^* X - K} < 1$ *then one-period contracts cannot achieve the optimal level of investment because e is not contractible.*

Proof: Condition 3 implies the first inequality. The second inequality implies that adverse selection alone is not sufficient for under-investment. □

***Example* 1**: Let $p_H = 0.75$, $p_L = 0.60$, $\pi_0 = 0.50$, $K = 1$, $X = 4$. Then if $0.3092 < e < 1.7$ the double inequality stated in proposition 1 is satisfied.

In what follows, we are going to assume that the double inequality stated in Proposition 1 holds so that one-period contracts that allow for the extra investment are not feasible. Still, the underinvestment problem might be mitigated by introducing multi-period contracts.

[7] Notice that conditions 2 and 3 are consistent because $p_H > p^*$.

3.2. Two-period Contracts Conditional on Investment

In this section, we consider a lender that is able to make long-term commitments. Given that the technology is also available at $t = 1$ and that the type A investment is observable, the lender might be able to improve efficiency by designing a two-period contract where a second loan is made available at $t = 1$ under the condition that at $t = 0$ the borrower makes the type A investment. For the moment, we assume that a borrower who has accepted a two-period contract and has been denied second period credit can not get access to a one-period loan in the second period. Of course, lenders still have the incentive to finance the second period project. Put differently, the commitment not to finance the second period project is not time-consistent. Nevertheless, even if such a commitment might not be credible from private profit maximizing banks, it can be credible if it is made by a no-profit international financial institution. But even in that case, other lenders still have the incentive to grant loans in the second period. In this section, we assume that they are not willing to do so. This assumption can be justified if, for example, banks that provide loans in the first period have better information about the second period return distribution of their clients' projects. It can also be justified if the lender who made the initial conditional offer is, once again, an international financial institution that is powerful enough to influence private lenders.

Let $\Pi_i(0)$ denote the two-period payoff of type i borrowers who do not make the additional investment and $\Pi_i(e)$ the two-period payoff when they make the investment that corresponds to their type. Notice that all types have the option not to make the additional investment and use a sequence of one-period loans where in that case their payoff will be:

$$\Pi_i(0) = 2(p_L X - K) \tag{3}$$

We impose the following restriction on the above payoff:

***Condition* 4**: $\Pi_i(0) > p_H X - K - e$.

If the above condition and Condition 2 are satisfied then all borrowers will prefer to use a sequence of two period contracts rather than using the additional funds of a conditional contract for consumption. Notice that in the latter case they will not be able to invest at $t = 1$. We can prove the following results:

***Lemma* 2**: *If Conditions* 1 *and* 2 *hold then a type* 1 *borrower will accept a conditional two-period contract and use the funds for investment.*

Proof: Condition 1 implies that a type 1 borrower prefers to accept the conditional loan and make the type A investment to the sequence of one-period contracts. Condition 2 implies that a type 1 borrower also prefers the first alternative to accepting the two-period contract but using the funds for consumption. If they use the funds for consumption they will be giving up the second period profits because they will not be granted a second period loan. □

***Lemma* 3**: *Condition* 2 *implies that if a type* 2 *borrower accepts the conditional contract she will invest the funds in the type* B *investment.*

Proof: Condition 2 implies that a type 2 borrower who asks for additional funds will not use them for consumption. Furthermore, the borrower would never use these funds for a type A investment because it does not improve the probability of success of the project and consequently the funds are wasted. The only thing that the borrower gains by a type A investment is a loan in the following period but the same outcome can be achieved by opting for a sequence of one-period contracts. □

We are ready to prove the main result of this section:

***Proposition* 2**: *Suppose that Condition* 4 *is satisfied. Then the conditional contract will be accepted only by type* 1 *borrowers and the other types will use a sequence of one-period contracts.*

Proof: It follows immediately from Lemmas 2 and 3. □

***Remark* 1**: When Condition 4 is not satisfied there is an equilibrium where both type 1 and type 2 borrowers receive loans and each type makes the appropriate investment but only type 1 borrowers receive future loans. Without any loss of generality, we are going to restrict attention to the case where Condition 4 holds.

We can now compare the expected return under the conditional contract with the full-information average return. The expected return of the two-period conditional on investment contract Y_I, is given by:

$$Y_I = (\pi_0 + \pi_2)2(p_L X - K) + \pi_1(2(p_H X - K) - e) \qquad (4)$$

Subtracting the above expression from (2) we can estimate the effect of asymmetric information on expected returns as a result of under-investment.

$$Y_F - Y_I = \pi_2(2(p_H X - K) - e - 2(p_L X - K) \quad (5)$$

3.3. Two-period Contracts Conditional on Repayment

In this section, we consider a two-period contract, where a second period loan is made available under the condition that the repayment of the first-period loan is made. Again, we assume that other lenders are not willing to offer one-period contracts to those borrowers denied second-period credit from the initial lender.

The terms of the contract are the following: At $t = 0$ the lender offers a loan of size $K + e$. If the borrower repays $(k + e)/p_H$ at $t = 1$, then the lender provides another loan of size K with repayment conditional on success at $t = 2$, of K/p_H.[8]

A type k (k=1,2) borrower's total expected payoff, given that the additional funds are used for investment, $\Pi_k(e)$ is equal to:

$$\Pi_k(e) = 2(p_H X - K) - e \quad (6)$$

In contrast their corresponding expected payoff, when they use the funds for consumption, $\Pi_k(0)$, is equal to:

$$\Pi_k(0) = p_L(X - (K + e)/p_H) + e + (p_L)^2(X - K/p_H) \quad (7)$$

Notice that, under the supposition that the contract pools type 1 and type 2 borrowers, the appropriate probability for calculating the repayments is p_H. Expression (7) also corresponds to the total expected profits of a type 0 borrower who pretends to be either a type 1 borrower or a type 2 borrower. If any type of borrowers opts to finance their two projects by a sequence of one period loans from private banks then their corresponding payoff, $\Pi_i(0)$, is given by (3).

***Lemma* 4**: *Suppose that Condition* 2 *holds. Then,* $\Pi_k(e) > \Pi_k(0)$.

Proof: It follows immediately from the fact that $p_H > p_L$. □

Thus, if $\Pi_k(e) > \Pi_i(0)$ type 1 and 2 borrowers will prefer to seek funds from lenders offering the conditional contract and use the extra funds in the first period to improve

[8] Bolton and Scharfstein (1990) derive a similar type of conditional contract. The difference is that in their model project returns are not verifiable and thus one period lending is impossible. The conditional contract offers incentives to borrowers to make high payments at the end of the first period in order to receive a new loan in the second period. In our case, the returns are observable but the conditional

the quality of their projects. In addition, if $\Pi_i(0) > \Pi_k(0)$ type 0 borrowers will truthfully reveal their types by financing their projects through the private banking system with a sequence of one period loans. The following proposition summarises:

***Proposition* 3**: *If* $\Pi_i(0) > \Pi_k(0)$ *there exists a separating equilibrium where type* 1 *and* 2 *borrowers sign conditional contracts and type* 0 *borrowers receive one-period loans.*

***Example* 2**: Using the same parameter values as in example 1 we get: $\Pi_k(e) = 3.5 - e$, $\Pi_k(0) = 2.56 + 0.2e$ and $\Pi_i(0) = 2.8$. Then if $0.3092 < e < 0.7$ all the restrictions so far are satisfied.

Again, we can compare the expected return under the new contract with the full-information optimal average return. The expected return of the two-period contract that is conditional on repayment, Y_R, is given by:

$$Y_R = \pi_0 2(p_L X - K) + (1 - \pi_0)\{(1 + p_H)(p_H x - K) - e\} \tag{8}$$

Subtracting the above expression from (2) we can once more estimate the effect of asymmetric information on expected returns as a result of under-investment.

$$Y_F - Y_R = (1 - \pi_0)\{(1 - p_H)(p_H X - K) \tag{9}$$

3.4. The Optimal Choice of Contracts

We have examined two types of long-term contracts that dominate a sequence of short-term contracts. Both types of long-term contract require the borrower to meet some condition in order to receive future loans. This is necessary in order to separate type 1 and type 2 (productive) borrowers from unproductive type 0 borrowers. One of the long-term contracts conditions the provision of loans in future periods on the use of funds by the borrower. The other long-term contract conditions future loans on the ability of the borrower to make early repayments. What is the appropriate choice of contracts? We have the following trade-off between the two types of long-term contracts. When the contract is conditional on investment type 1 borrowers receive with certainty future loans but type 2 borrowers do not. This is because even if they have made the appropriate investment the latter is not observable. In contrast, when

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contract offer incentives to borrowers to use the extra funds for investment in order to increase the probability that their second period project will be financed.

the contract is conditional on repayment both types receive future loans but only if their early projects have been successful. Of course, there is a third possibility. Lenders can offer a menu of contracts that comprises of the two conditional contracts.

***Proposition* 4**: (*Optimal choice of contracts*) *Suppose that those borrowers who received conditional loans and were denied second-period loans cannot receive funds in the second period from other lenders. Then,*

a) *if* $\Pi_i(0) < p_L(X-(K+e)/p^*)+e$ *lenders will not offer any conditional loans,*

b) *if* $p_L(X-(K+e)/p^*)+e < \Pi_i(0) < \Pi_k(0)$ *lenders will only offer the contract conditional on investment, and*

c) *if* $\Pi_k(0) < \Pi_i(0)$ *lenders will offer the menu of contracts.*

Proof: The proposition follows from Propositions 2 and 3 and the inequality $\Pi_k(0) > p_L(X-(K+e)/p^*)+e$. □

It is clear that expected returns are maximized when the equilibrium with the menu of contracts is feasible since it achieves a complete separation of types. Denote by Y_M the expected returns when the menu of contracts is offered. Then,

$$Y_M = \pi_0 2(p_L X - K) + \pi_1(2(p_H x - K) - e) + \pi_2((1+p_H)(p_H X - K) - e) \quad (10)$$

Once more, by subtracting the above expression from (2) we can estimate the effect of asymmetric information on expected returns as a result of underinvestment.

$$Y_F - Y_M = \pi_2(1-p_H)(p_H X - K) \quad (11)$$

When lenders offer the menu of contracts underinvestment only results in the case where the first-period project of a type 2 borrower fails.

***Remark* 2 (Correlation of returns):** Up to this point, we have restricted our attention to the case where project returns across periods are independently distributed. However, it is straightforward to examine how the optimal contract choice would be affected when we allow the returns to be correlated. When we introduce a positive correlation (the more plausible case) of returns across periods the case for the repayment contract, *ceteris paribus*, is strengthened. The reason is that under the repayment contract the borrower receives a future loan only when the initial project

has been successful. In contrast, under the investment contract a type 1 borrower receives a future loan even if the original project fails.

4. FRAGILE CONDITIONALITY

In this section, we consider the possibility that those borrowers who received conditional loans but were denied second-period loans might now receive funds for their second period projects from other lenders. Let θ denote the probability of getting these loans. It is clear that this possibility affects the expected payoffs when borrowers receive funds initially.

We begin the analysis for the case when the loans are conditional on repayment. In this case, the new expected payoff for either a type 1 borrower or a type 2 borrower who uses the extra funds for investment, $\Pi_k^*(e)$, is equal to:

$$\Pi_k^*(e) = \Pi_k(e) + \theta(1-p_H)(p_H X - K) \tag{12}$$

For either a type 1 borrower or a type 2 borrower who uses the extra funds for consumption and for a type 0 borrower who pretends to be a type $k = (1,2)$ the corresponding new expected payoff, $\Pi_k^*(0)$, is:

$$\Pi_k^*(0) = \Pi_k(0) + \theta(1-p_L)p_L(X - K/p_H) \tag{13}$$

If $\Pi_k^*(0) > \Pi_i(0)$, type-0 borrowers will choose the conditional contract. Of course, in this case, under the existing arrangement, separation of types is not possible and there will be under-investment. The following proposition describes the conditions under which separation fails:

***Proposition* 5**: *If* $\theta > \dfrac{\Pi_i(0) - \Pi_k^*(0)}{(1-p_L)p_L(X - K/p_H)} \equiv \theta^*$ *then conditional on repayment contracts will not be offered.*

The proposition states that for separation to be feasible the probability of receiving a second period loan from other lenders, given that no funds were made available by the initial lender, cannot be very high.

***Example* 3**: Let $e = 0.5$ which satisfies all the above restrictions. Then $\Pi_k^*(e) = 3.0 + 0.5\theta$, $\Pi_k^*(0) = 2.66 + 0.56\theta$, $\Pi_i(0) = 2.8$ and $\theta^* = 0.25$.

Next, we consider the case where the loans are conditional on investment. The payoff of a borrower who uses the funds for consumption but receives a second period loan with probability θ is equal to $p_L(X-(K+e)/p_H)+e+\theta(p_L X-K)$. Once more we can calculate a critical value θ^{**} such that the above payoff is equal to the one that corresponds to a sequence of one-period contracts, $\Pi_i(0)$. Furthermore, comparing the above payoff to the corresponding one for the case where the loans are conditional on repayment, $\Pi_k^*(0)$, we get the following proposition:

***Proposition* 6**: *Loans conditional on investment are more fragile than loans conditional on repayment.*

Proof: It follows directly from $\theta^{**}<\theta^{*}$. □

4.1. The Optimal Choice of Contracts

As the following proposition demonstrates, fragility can affect the contracts offered by the international organization.

***Proposition* 7**: *(Optimal choice of contracts under fragility) Suppose that those borrowers who received conditional loans and were denied second-period loans, with probability θ, receive funds for their second period projects from new lenders. Then,*

a) if $p_L(X-(K+e)/p^{*})+e>\Pi_i(0)$ *conditional contracts are not feasible,*

b) if $\Pi_k(0)>\Pi_i(0)>p_L(X-(K+e)/p^{*})+e$ *and* $\theta^{**}<\theta$ *conditional contracts are not feasible,*

c) if $\Pi_k(0)>\Pi_i(0)>p_L(X-(K+e)/p^{*})+e$ *and* $\theta^{**}>\theta$ *only contracts conditional on investment will be offered,*

d) if $\Pi_k(0)<\Pi_i(0)$ *and* $\theta^{**}>\theta$ *both conditional contracts (menu of contracts) will be offered,*

e) if $\Pi_k(0)<\Pi_i(0)$ *and* $\theta^{*}>\theta>\theta^{**}$ *only contracts conditional on repayment are feasible, and*

f) if $\Pi_k(0)<\Pi_i(0)$ *and* $\theta>\theta^{*}$ *conditional contracts are not feasible.*

Proof: The proposition follows from propositions 4 and 6. □

When case (a) holds then conditional contracts cannot achieve any separation even in the absence of fragility. In case (b) only conditional on investment contracts are

feasible, however, these contracts are fragile and as a result no conditional contracts are offered. In case (c) once more only conditional contracts on investment are feasible but now they are not fragile. In case (d) both contracts are feasible and neither is fragile: as a result the menu of contracts is offered that achieves complete separation. In case (e) both contracts are feasible but the contract conditional on investment is fragile and thus only the contract conditional on repayment is offered. Finally, in case (f) even if both conditional contacts are feasible, no contract is offered because both are fragile.

5. CONCLUDING COMMENTS

It is common practice that lenders condition future loans on some performance measure that serves as an indicator of borrowers' creditworthiness. For international lending organizations the implementation of some policy program serves as such an indicator while private lenders rely on the ability of their clients to make repayments. In both cases, lenders need to ensure that their clients are using the loaned funds for their intended purpose. As has already been demonstrated in the literature both types of 'conditionality' can provide a solution to this incentive problem. But can we move one step further and identify the conditions under which each type of conditionality is optimal?

In this paper, we have shown that one possible explanation is what we have termed as 'fragility'. For conditionality to work, in the kind of environment that we have analyzed, it is paramount that when lenders deny future loans borrowers do not have access to alternative sources of funds. We have demonstrated that the optimal contract offered depends on the degree of fragility. When fragility is not a major issue conditional on investment contracts are optimal as they provide better incentives for using loaned funds appropriately. In contrast, when fragility is a major concern then conditional on repayment contracts are optimal as they reduce the likelihood of those states where fragility becomes an issue. Our results are consistent with Rodrik (1996) who argues that one of the advantages of international organizations over private lenders is their ability to control other lenders. We argue that for the opposite reason private lenders prefer to offer conditional on repayment contracts.

One important issue that we have ignored in order to keep our analysis tractable, and which has recently been addressed in Eichengreen, Kletzer and Mody

(2006), is the role of international organizations and banks as monitors (which they contrast to the lack of monitoring by bondholders).[9] As long as part of the purpose of monitoring by international organizations is to ensure that conditionality is protected by eliminating other potential lenders, our results are consistent with theirs. This is clear for international organizations (conditional on investment contracts) and bond markets (conditional on repayment contracts). The monitoring role usually attributed to banks is the supervision of the activities of firms when they are under distress (see e.g. Townsend (1979) and Diamond (1984)) and is not related to fragility and therefore the fact that banks offer conditional on repayment contracts is still consistent with their monitoring activities.

The introduction of 'fragility' into our agency model has allowed us to provide a rationale for why international organizations choose to offer conditional on investment contracts (because they have some possibility to exclude other lenders) while private creditors offer contracts conditional on repayment. Our model also suggests that even in the absence of fragility a better separation of borrowers might be achieved by offering a menu of contracts. To keep the analysis tractable we have treated 'fragility' as an exogenous parameter. A potentially interesting extension of our work would be to endogenize it. One possible way to do so is to follow the Sharpe (1990) customer relationships model where in the process of lending a creditor learns more than others about its own customers. Another possible extension, which is empirical, is to examine the extent to which international organizations can reduce fragility by discouraging other lenders. The empirical literature suggesting that the IMF has a catalytic effect, by providing a signal of creditworthiness that encourages other lenders to offer loans (e.g. Bird and Rowlands (2007)), is not necessarily inconsistent with our model as it is contingent on timing. To the extent that the IMF can reduce fragility it is optimal to offer conditional on investment contracts but once the actions have been implemented it may then be optimal for other lenders to enter.

[9] See also Marchesi and Sabani (2005) for the potential conflict arising from the IMF's dual role as a lender and as a monitor.

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