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Conditional Lending Under Altruism

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Abstract

We analyze how the altruism of an international financial institution (IFI) towards its low-income member countries (LICs) alters the effectiveness of its loans. We study IFI loans to a credit-constrained LIC. The IFI's repayment policy is determined by the interplay of its concerns for the welfare of the loan recipient and its fiduciary responsibilities to creditor countries. If the IFI is unable to commit to repayment terms in advance, conditional loans are superior to unconditional loans. Thus, IFI altruism and the inability to commit are sufficient reasons to equip loans with conditions. Conditional loans produce an efficient allocation of resources, so altruism is not a fundamental reason that loans fail to increase welfare.

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I. INTRODUCTION

The financial assistance provided by the International Monetary Fund (IMF) and other international financial institutions (IFIs) to low-income countries (LICs) is aimed at helping these countries increase economic growth and reduce poverty. The assistance is conditional on recipient countries' pursuit of agreed macroeconomic and structural policies. Since at least the debt crisis of the 1980s, the conditionality associated with IFI loans to LICs has focused on increasing spending on health, education, and other human capital investments, which raise the economy's growth rate and reduce poverty.

As is well known, however, donors who care about the welfare of their recipients may face time inconsistency problems that could limit their ability to impose discipline on recipients. When altruistic donors cannot commit to a particular course of action in advance, recipients will underinvest or underinsure in the expectation that they will be "bailed out" by their benefactors. This Samaritan's dilemma (Buchanan, 1975; Lindbeck and Weibull, 1988) is relevant for bilateral and multilateral loans to LICs. These countries may be tempted to underinvest or underinsure if they expect international lenders to lower loan repayments in the event of exogenous natural shocks (droughts, floods) or other unfavorable developments. Because of their tendency to shy away from acting like "tough cops," IFIs have been likened to "sympathetic social workers" who cannot, or will not, impose harsh penalties (Mussa, 2002, pp. 68–69; Willett, 2003, p. 1).

In this paper we analyze the effectiveness of an altruistic IFI's loans to the government of a credit-constrained LIC. We consider a two-period model in which the IFI faces a tension between its altruistic goal of helping LICs fight poverty and its fiduciary responsibility to safeguard the financial resources entrusted to it by creditor countries. For simplicity, we initially take the size of the IFI's financial base as being exogenous. The IFI attaches utility to its end-of-horizon capital, reflecting its desire to help poor countries in the future or even return these resources to IFI creditors. Later, we endogenize the IFI's capital by considering the problem of altruistic creditor countries that set up the IFI and must choose the size of its initial endowment. In this model, in the absence of external finance, the LIC would be unable to finance efficient levels of consumption and investment, and growth would be subpar. But while IFI assistance relaxes the LIC's financing constraint, we assume that the IFI cannot commit in advance to demand full repayment on its loans. This sets the stage for the analysis of the altruist's time consistent conditionality.

Loans extended without conditions lead the poor country to underinvest. In this case, the poor country takes the loan quantity as given, but recognizes that the required repayment depends on second-period resources. This creates a disincentive to invest. However, loans conditioned on the country's choice of investment lead to efficient outcomes. Linking loan levels to investment strengthens the poor country's incentives to invest that offset the marginal cost of increased interest repayment. Thus, IFI altruism and the inability to commit are sufficient reasons to equip loans with conditions. Conditional loans produce an efficient allocation of resources, so altruism is not a fundamental reason that loans fail to increase welfare.

The rest of this paper is structured as follows. Section II discusses some related literature. Section III introduces the basic model and analyzes the impact of conditional and unconditional IFI loans. Section IV considers several extensions of the model, including the question of how much initial capital creditor countries will choose to make available to an IFI, self-interested LIC governments, and productivity shocks in LICs. Section V concludes.

II. Related Literature

There are several papers that examine aid and loans under the assumption that the donor *can commit* to the level of aid or to the loan repayment in advance (Adam and O'Connell (1999)), Cordella and Dell'Ariccia (2002), Drazen (2002), Mayer and Mourmouras (2002), and Pedersen (1996)). In these papers the need for conditionality is driven solely by differences in the objectives of the donor and the recipient. Conditions can serve to make the donor better-off while at least maintaining the welfare of all recipients.

Other papers are more closely related to ours in that they assume the donor *cannot commit* to all features of aid or loan policy in advance. This introduces the Samaritan's dilemma problem because the actions of the donor can be manipulated by the actions of the recipients. We discuss two of these papers in some detail.

Svensson (2000) focuses on conditional aid to countries to alleviate poverty. He argues that without commitment, conditional aid cannot prevent recipient governments from reducing their efforts to alleviate poverty in order to induce more aid from external donors. His solution is to introduce third parties in order to create a commitment technology for the altruistic external donor. One example is to use legal institutions in the recipient country to form a binding contract with a domestic firm to provide services to the poor in exchange for a given level of donor subsidy. Another is example is to delegate the authority to administer the aid to an organization that does not have the same altruistic concerns for recipients.

There are two problems with introducing third parties. First, it increases the cost of extending aid since the services of the third party must be compensated. Second, while third parties may be able to help donors commit, this is not necessarily desirable. It means that the donors will not be able to help those most in need, even if their need is created by an exogenous event that is entirely out of their control. Our solution does not depend on introducing third parties and does not prevent the donor from changing aid, ex post, depending on the recipient's need.

The paper by Bruce and Waldman (1991) is even more closely related to our work. These authors focus explicitly on the investment behavior of the recipient in a two-period model where aid can be extended in each of the periods. The recipient knows that second-period aid depends inversely on second-period income, creating a disincentive to investment. Their solution is to make first-period aid *in-kind*, in the form of investment goods rather than cash. In-kind transfers of insurance are also advocated by Coate (1995), who focuses on incentives to under-insure faced by poor citizens receiving private charity.

There are three problems with using in-kind transfers. First, as with introducing third parties, the cost of extending aid is increased relative to a financial transfer. Second, the recipient has the incentive, and in some applications, the ability to undo the in-kind transfers by reducing its own investment effort or by selling the investment goods. Third, it may not be possible to reach the efficient level of investment because the present value of aid desired by the donor may not be sufficiently high. Our solution is based on a purely financial transfer–a subsidized loan. Instead of imposing the investment level on the recipient, in our solution recipients optimally choose their investment. This eliminates the desire to undo the policy and ensures ownership. Finally, since the solution is based on a loan, the subsidy level can be significantly less than the increase in investment required to achieve efficiency.

III. Exogenous IFI Capital

A. The Model

Consider a credit-constrained LIC that is unable to finance high-yielding human capital investments in education, training, and health care. In the absence of collateral or assets that can be seized, private lenders from creditor countries are not willing to finance these investments. In this situation, an IFI possessing powers to penalize defaulting countries could remedy the market failure.

There are two periods. The first-period income available to a representative member of the LIC is given by y. The LIC government taxes current income, and receives transfers and loan disbursements from the IFI. Earnings in period two are given by $wh(x)$. The wage rate paid to a unit of human capital, w, is constant and reflects LIC total factor productivity and its state of institutions and technology. $h(x)$ is a strictly increasing and strictly concave human capital production function. The government taxes second-period earnings to repay the loan. For now, taxes are assumed to be lump-sum.

We begin by viewing the IFI as a "social planner" with control over a full set of policy instruments. The IFI disburses loans (l) to the LIC in period one and lump-sum transfers (T_1,T_2) in periods one and two, respectively. The IFI's altruism may cause it to charge the LIC an interest rate μr that is lower than the world interest rate r, where $-1/r \le \mu \le 1$ is an IFI policy variable.

The LIC government chooses investment levels (and the corresponding taxes) to maximize the utility function of its representative household

$$U = u_1(c_1) + \beta u_2(c_2) \tag{2.1}$$

In equation (2.1) $c_1 = y - x + l + T_1$, $c_2 = wh(x) - (1+\mu r)l + T_2$, u is a strictly increasing and strictly concave function, and $1 > \beta > 0$ is the LIC's subjective time discount factor.

The IFI has been set up to provide assistance to countries in need. It is endowed with a certain amount of capital in period 1, B_1, provided to it by creditor countries. For simplicity, in this section this endowment is exogenously given. The IFI makes loans to either LICs or middle-income countries. The IFI is altruistic toward LICs, but not other countries, where it always demands full repayment of loans at the going world interest rate. The IFI also cares about maintaining its ability to provide loans in the future, which is proxied by the end-of-period capital stock, B_2. The IFI's preferences are given by

$$V\left(B_2\right)+\gamma U \tag{2.2}$$

In equation (2.2), $B_2=\left(B_1-l-T_1\right)\left(1+r\right)+l\left(1+r\mu\right)-T_2$, V is a strictly concave function, and $\gamma>0$ is the strength of the IFI's altruism toward the LIC.

B. First-Best Redistribution

We first characterize first-best allocations assuming that the IFI has the powers of a world social planner possessing a full set of policy tools. These tools include setting investment levels and making lump-sum transfers to (or levying lump-sum taxes on) the LIC. The remainder of the paper is devoted to describing allocations that are possible when the IFI possesses a more limited set of policy instruments.

With a complete set of instruments, the IFI's problem is to choose a nonnegative value of x^* and (T_1^*, T_2^*) to maximize

$$V\left(\left(B_1-T_1\right)\left(1+r\right)-T_2\right)+\gamma\left[u_1\left(y-x+T_1\right)+\beta u_2\left(wh(x)+T_2\right)\right] \tag{2.3}$$

Assuming $x^*>0$, the necessary and sufficient conditions for maximization can be written as

$$V'=\gamma\beta u_2' \tag{2.4a}$$

$$u_1'=\beta(1+r)u_2' \tag{2.4b}$$

$$u_1{}'=\beta u_2{}'wh' \tag{2.4c}$$

The first order conditions (2.4a–2.4c) implicitly determine first-best investment x^* and transfers (T_1^*, T_2^*). The resulting consumption allocation combines productive and intertemporal efficiency with optimal redistribution across the IFI and the poor country. The first determines the optimal redistribution. The second condition implies that the allocation of resources in the LIC is intertemporally optimal. The marginal rate of substitution in the LIC, $u_1'/\beta u_2'$, is equated to the world's opportunity cost of current funds, $1+r$. Combining the last two conditions implies that $1+r=wh'$. This condition guarantees productive efficiency in the LIC, i.e. equality of the marginal returns to human capital in the LIC with the world interest rate. The following example illustrates the first-best allocation for a simple economy.

Example 1. Let $V(\cdot)=u_1(\cdot)=u_2(\cdot)=\ln(\cdot)$. If the first-best involves positive human capital investment in the LIC, it will be given by $x^*=h'^{-1}\left(\frac{1+r}{w}\right)$. Letting $h^* = h(x^*)$, the first-best transfer and LIC consumption are:

$$T_1^*=\frac{\gamma}{1+\gamma+\gamma\beta}\left[B_1+\frac{wh^*}{1+r}\right]-\frac{1+\gamma\beta}{1+\gamma+\gamma\beta}\left[y-x^*\right]$$

$$\frac{T_2^*}{1+r}=\frac{\gamma\beta}{1+\gamma+\gamma\beta}\left[B_1+y-x^*\right]-\frac{1+\gamma}{1+\gamma+\gamma\beta}\frac{wh^*}{1+r}$$

$$c_1^*=\frac{\gamma}{1+\gamma+\gamma\beta}\left[B_1+y-x^*+\frac{wh^*}{1+r}\right]$$

$$\frac{c_2^*}{1+r}=\frac{\gamma\beta}{1+\gamma+\gamma\beta}\left[B_1+y-x^*+\frac{wh^*}{1+r}\right]$$

The LIC's optimal consumption allocations are proportional to the present value of consolidated resources. The IFI implements these allocations by appropriately tailoring its transfers over time. IFI altruism is operative if the net present value (NPV) of transfers,

$$T_1^*+\frac{T_2^*}{1+r}=\frac{1}{1+\gamma+\gamma\beta}\left[\gamma(1+\beta)B_1-\left(y-x^*+\frac{wh^*}{1+r}\right)\right],$$

is positive. Clearly, operative IFI altruism requires the parameter γ to exceed a threshold $\bar{\gamma}\equiv\frac{1}{B_1(1+\beta)}\left[y-x^*+\frac{wh^*}{1+r}\right]>0$. Operative altruism implies either positive transfers in both periods or positive transfers in period one followed by negative transfers in period two.

C. Loans Under Commitment

In this section we assume that the IFI no longer has the tax or transfer powers but can extend loans to the LIC at market rates and can commit to requiring full loan repayment. Without lump-sum transfers or the ability to provide interest subsidies, the IFI has no tools to redistribute resources and will fail to realize the first-best. The question remains whether the resulting allocation of resources is Pareto Optimal.

When the IFI can commit to require full repayment, unconditional loans lead to a Pareto Optimum, as can be seen by considering the unconditional loan game. This game unfolds in a single-period in two stages. In the first stage, the IFI chooses the loan amount. In the second stage, the LIC chooses investment given the loan presented by the IFI in the first stage. The game is solved working backwards. In the second stage, the LIC selects x for an arbitrarily given loan amount (and for T_1=T_2=0 and $\mu = 1$), to maximize (2.1). The implicit solution for the investment schedule as a function of the IFI loan is

$$u_1'\left(y - \tilde{x}(l) + l\right) \equiv \beta h'\left(\tilde{x}(l)\right) u_2'\left(h\left(\tilde{x}(l)\right) - (1+r)l\right) \tag{2.5}$$

Next, the IFI's first-stage problem is to choose l to maximize (2.2) subject to (2.5). This leads us to the following result. The proofs of all propositions are in the Annex I.

Proposition 2.1: *Under commitment, an unconditional loan policy generates an efficient allocation in the poor country.*

In this setting, there is no conflict of interest between the IFI and the recipient. The common objective of the IFI and of the LIC government is to maximize the utility of the representative household. In addition, commitment rules out any strategic behavior (there is no Samaritan's dilemma). Given that the IFI is charging the world interest rate for funds, the representative household's utility is maximized when the IFI loans an amount that gives rise to the efficient level of investment. One can also easily show that the form of the loan policy does not matter under commitment; efficiency is obtained either with unconditional or conditional loans. But while the resulting allocations are efficient, they are not fully optimal because the IFI *wants* to redistribute resources to the poor country (i.e., they want to satisfy (2.4a)). The question is whether IFIs can allow themselves to be altruistic, causing less than full loan repayment, without destroying the efficient outcomes obtained under commitment.

D. Loans Without Commitment

Without commitment, the IFI is free to choose μ in the second period. For its loan policies to be time-consistent, it must properly account for this fact when choosing the loan amount in the first period. This creates a dynamic game that is solved by backward induction. The IFI, and the LIC, must first anticipate the IFI's optimal second-period choice of μ for all possible choices of first-period loan amounts and investment levels. In the first period the IFI and the LIC choose optimal loan and investments levels, given the optimal repayment policy in the second period. The timing of choices in the first period depends on whether IFI loans are conditional or unconditional.

The IFI's optimal second-period repayment policy can be determined independently of its first-period loan policy since μ is chosen to maximize (2.2) for given x and l. The repayment policy is implicitly defined by

$$V'\left(B(1+r) - r\left(1 - \tilde{\mu}(x,l)l\right)\right) \equiv \gamma u_2'\left(h(x) - \left(1 + \tilde{\mu}(x,l)r\right)l\right). \tag{2.6}$$

Now, we turn to the first period, and examine the unconditional and conditional loan policies.

Unconditional Loans

In the first stage of the game, the IFI chooses the loan amount. In the second stage, the LIC chooses investment given the loan presented by the IFI in the first stage. The game is solved working backwards. In the second stage, the LIC selects x, given l and (2.6), to maximize (2.1). This generates

$$u_1'\left(y - \tilde{x}(x) + l\right) \equiv \beta\left[h'(\tilde{x}(l)) - rl\frac{\partial\mu}{\partial x}\right]u_2'\left(h(\tilde{x}(l)) - \left(1 + \tilde{\mu}(x,l)r\right)l\right) \tag{2.7}$$

Comparative statics on (2.6) yields

$$0 < rl\frac{\partial\mu}{\partial x} < h' \tag{2.8}$$

Equation (2.8) says that choosing a higher investment level raises the interest payment that the IFI will demand in the second period (since investment raises income in the LIC, making the IFI feel less altruistic). The indirect effect on interest repayment reduces the marginal benefit of investment, but does not eliminate it completely. This is the Samaritan's dilemma: IFI altruism lowers the marginal benefit of investment.

In the first stage, the IFI chooses it loan amount given (2.6) and (2.7). This produces the following result.

Proposition 2.2: *Without commitment, intertemporal consumption allocations in the LIC are efficient, but the level of investment and wealth is inefficiently low*

The IFI continues to view the opportunity cost of loans to the LIC, and to first period consumption, as $1 + r$. For every dollar lent, and every dollar of first period consumption gained, there must be a loss in second period consumption of $1 + r$. The optimal repayment policy simply determines how this loss in consumption is distributed across the LIC and the IFI. Thus, the IFI chooses its loan policy in order to generate an intertemporal consumption allocation that reflects the full opportunity cost of consumption in the first period.

If the poor country were left to borrow as much as it wishes at the subsidized interest rate, then it would borrow and consume too much in the first period. It is important that loans be rationed by the IFI to prevent this (note that in all cases the IFI will choose the loan amount, not the poor country). In the subsidized case, rationing is an important part of the optimal loan policy, whether the loan is unconditional or conditional.

While consumption is allocated efficiently, the level of investment and wealth is too low in the LIC because the IFI altruism, and the discretion to alter μ, lowers the return to investment in the poor country.

Conditional Loans

We view conditional loans as an entire loan schedule, presented to the poor country, indicating how much the IFI is willing to loan at each investment level. Thus, the loan quantity is *conditioned* on the investment level chosen and the poor country has full knowledge of this.

In the first stage, the IFI determines its loan schedule by choosing l, given x and (2.6), to maximize (2.2). The loan schedule is implicitly defined by

$$u_1'\left(y - x + \tilde{l}(x)\right) \equiv \beta(1+r)u_2'\left(h(x) - (1 + \tilde{\mu}\left(x, \tilde{l}(x)\right)r)\tilde{l}(x)\right) \tag{2.9}$$

For the same reasons as in the unconditional case, loans are chosen so as to generate an efficient intertemporal allocation of consumption.

In the second stage, the LIC takes the entire loan policy, defined by (2.6) and (2.9), as given and chooses x to maximize (2.1). This generates the following important result.

Proposition 2.3: *Without commitment, conditional loans lead to a fully efficient outcome (conditions (2.4a)–(2.4c) are satisfied).*

If the IFI sets its conditional loan policy optimally, as given by (2.6) and (2.9), the net marginal benefit to the LIC of increasing x is positive whenever the return to investment exceeds 1+r. While the LIC does not receive the *entire* difference between the return to a unit investment and 1+r, since some of the gain is reduced by increases in μ, it does receive a *portion* of it. Thus, the LIC must set investment levels so that the rate of return to investment is equated to r, if their wealth is to be maximized.

The fact that the recipient optimally chooses the investment level eliminates the need to monitor their behavior. It is in their best interest to carry out the investment, and in this sense they fully “own” the policy. In fact, one can show that recipients would choose efficient investment levels even if they had full discretion to determine their loan and investment levels *independently*. However, this would lead to “too much” borrowing in order to finance inefficient levels of current period consumption. The recipients would equate the marginal value of first period consumption to the subsidized, rather than the market, interest rate. Conditional loans retain the rationing feature needed to achieve an efficient allocation of consumption, while at the same time, generating efficient investment levels.

In short, conditional loans lead to an efficient outcome, where unconditional loan do not, because the LIC accounts for the fact that higher levels of investment will induce greater (rationed) loans from the IFI. Unless the LIC clearly recognizes this advantage, the full benefits of investing are not accounted for and investment is set too low.

A second interpretation of the result can be based on Becker's (1974) famous "Rotten Kid Theorem." Becker argues that even if a child cares nothing about other family members, he will act so as to maximize family income. However, this is only true if the child understands that his actions will affect the level of altruistic transfers received from parents. In order for a poor country, that cares nothing about the donor, to maximize consolidated resources, they too must fully understand the connection between their behavior and the altruistic transfer received from the donor. When loans and interest payments are both made conditional on recipient's actions, then the necessary connection between behavior and transfers is made.

Example 2. In Example 1, let $h(x) = x^{\alpha}$, $0 < \alpha < 1$. The IFI's second-period choice of μ is

$$\tilde{\mu} = \frac{wh - \gamma\beta B_1(1+r) - (1-\gamma\beta r)l}{rl(1+\gamma\beta)}.$$

The IFI will require partial interest repayment, $0 < \tilde{\mu} < 1$, if the NPV of the LIC's second-period income is in the range

$$\gamma\beta B_1 - \frac{1-\gamma\beta r}{1+r}l < \frac{wh}{1+r} < \gamma\beta B_1 + l.$$

Second-period LIC consumption and IFI capital are proportional to consolidated world resources $wh/(1+r) + (B_1 - l)$:

$$\frac{c_2}{1+r} = \frac{\gamma\beta}{1+\gamma\beta}\left\{\frac{wh}{1+r} + (B_1 - l)\right\}$$
$$\frac{B_2}{1+r} = \frac{1}{1+\gamma\beta}\left\{\frac{wh}{1+r} + (B_1 - l)\right\}.$$

To derive the IFI's optimal time-consistent loan policy, maximize the IFI's objective function while taking into account its second-period choice of $\tilde{\mu}$. This yields the following.

$$\tilde{l}(x) = \frac{1}{1+\gamma\beta+\gamma}\left\{\gamma\left[\frac{wh}{1+r} + B_1\right] - (1+\gamma\beta)(y-x)\right\}.$$

The first-stage LIC consumption allocation and IFI capital under the conditional loan are:

$$c_1 = \frac{\gamma}{1+\gamma\beta+\gamma}\left\{B_1 + y - x + \frac{wh}{1+r}\right\}$$
$$\frac{c_2}{1+r} = \frac{\gamma\beta}{1+\gamma\beta+\gamma}\left\{B_1 + \frac{wh}{1+r} + y - x\right\}$$
$$\frac{B_2}{1+r} = \frac{1}{1+\gamma\beta+\gamma}\left\{B_1 + \frac{wh}{1+r} + y - x\right\}.$$

In the *second stage*, the LIC chooses x taking $\tilde{\mu}$ and $\tilde{l}(x)$ as given to maximize its utility:

$$\max_x \left\{ \ln\left[\frac{\gamma}{1+\gamma\beta+\gamma} \left\{ B_1 + \frac{wh}{1+r} + y - x \right\} \right] + \beta \ln\left[\frac{\gamma\beta(1+r)}{1+\gamma\beta+\gamma} \left\{ B_1 + \frac{wh}{1+r} + y - x \right\} \right] \right\}$$

Ignoring constant terms, this is equivalent to $\max_x \left\{ (1+\beta)\ln\left[B_1 + \frac{wh}{1+r} + y - x \right] \right\}$.

Maximizing the last expression is equivalent to maximization of the NPV of consolidated resources. It follows that conditional loans lead to productive efficiency, or $wh'(x) = 1+r$. Hence, conditional loans support the first-best (see Example 1). It should be noted that quite large interest rate subsidies may be required to support the first-best.

Under an unconditional loan policy, the IFI's second-period repayment policy is unchanged, $\tilde{\mu} = \tilde{\mu}(x,l)$. In the second stage of the game, the LIC chooses investment $x = \tilde{x}(l)$ while taking into account the impact of its choice on the loan's repayment terms. LIC investment and consumption and IFI capital satisfy

$$w(1+\beta\alpha)\alpha x^{\alpha} - w\beta\alpha(l+y)x^{\alpha-1} + (B_1 - l)(1+r) = 0$$

$$c_1 = \frac{wx^{\alpha} + (B_1 - l)(1+r)}{\beta w\alpha x^{\alpha-1}}$$

$$\frac{c_2}{1+r} = \frac{\gamma\beta}{1+\gamma\beta}\left\{ \frac{wx^{\alpha}}{1+r} + (B_1 - l) \right\}$$

$$\frac{B_2}{1+r} = \frac{1}{1+\gamma\beta}\left\{ \frac{wx^{\alpha}}{1+r} + (B_1 - l) \right\}.$$

In the first stage, the IFI selects l to maximize its utility while taking as given the country's investment function $x = \tilde{x}(l)$.

This equilibrium is not Pareto Optimal. There is underinvestment relative to the first-best, as demonstrated in the numerical computations of Table 1.

Table 1. Optimal, Time-Consistent Loan Policies 1/

Productivity	Autarky	Perfect Markets	Unconditional Loans			Conditional Loans		
w	r^1	l	μ_u	l_u	x_u	μ_c	l_c	x_c
10	8.66	3.67	1.00	...	...	0.97	3.70	2.78
9	7.79	2.88	1.00	...	...	0.88	3.00	2.25
8	6.93	2.17	0.84	1.59	1.48	0.74	2.37	1.78
7	6.06	1.54	0.57	1.43	1.25	0.55	1.81	1.36
6	5.20	1.00	0.24	1.24	0.99	0.25	1.33	1.00
5	4.33	0.54	-0.22	1.00	0.68	-0.25	0.93	0.69
4	3.46	0.17	-1.14	0.66	0.34	-1.16	0.59	0.44
3	2.60	-0.13	-3.57	0.33	0.12	-3.13	0.33	0.25
2	1.73	-0.33	-11.02	0.12	0.04	-8.75	0.15	0.11
1	0.87	-0.46	-51.50	0.03	0.01	-39.13	0.04	0.03

Source: Authors' calculations.
1/ Based on the economy of Example 2, with B_1=2, r=2, $\alpha = 0.5$, $y = \beta = \gamma = 1$. A period is a generation (30 years). r=2 corresponds to an annual real interest rate of 3.73 percent.

IV. Extensions

This section develops several extensions to the model, including the implications of endogenizing the IFI's capital, uncertainty about future economic prospects and selfish governments. To simplify the analysis, we assume common utility functions in each period, $u_1 = u_2 = u$.

A. Endogenous IFI Capital

The magnitude of the IFIs' financial assistance depends critically on their capital base, which is determined by the creditor governments' subscriptions of convertible currencies. Thus far, we have assumed that the IFI's initial capital B_1 is exogenously given. In this section we endogenize the IFI's endowment by viewing the IFI as an organization that represents altruistic lenders from around the world.

We assume the lenders are identical. The representative lender cares about his lifetime consumption and about the welfare of LIC citizens. The lender makes loans to either LICs (l) or to middle- and high-income countries (b). The IFI is altruistic toward LICs, but not other countries, where it always demands full repayment of loans at the going world interest rate. Since the populations of citizens in the LIC and creditor countries are exogenous, we assume, for notational convenience only, that they are equal. The representative lender can then be thought as indirectly making loans to the representative citizen of the LIC. The lender's preferences are given by

$$u(\bar{c}_1)+\beta u(\bar{c}_2)+\gamma U \tag{3.1}$$

where $\bar{c}_1 = y_1 - b - l$, $\bar{c}_2 = y_2 + (1+r)b + (1+\mu r)l$, y_i are exogenous income levels, and $\gamma > 0$ gauges the strength of the IFI's altruism toward the LIC.

As before, the first-best allocation is the one achieved by assuming that the IFI is a benevolent social planner that chooses x, T_1, T_2 and b to maximize

$$u(y_1 - T_1 - b) + \beta u(y_2 + b(1+r) - T_2) + \gamma[u(y - x + T_1) + \beta u(wh(x) + T_2)].$$

The necessary and sufficient conditions for maximization are

$$u'(\bar{c}_2) = \gamma u'(c_2) \text{ and } u'(\bar{c}_1) = \gamma u'(c_1) \tag{3.2a}$$

$$u'(c_1) = (1+r)\beta u'(c_2) \text{ and } u'(\bar{c}_1) = (1+r)\beta u'(\bar{c}_2) \tag{3.2b}$$

$$1 + r = wh'. \tag{3.2c}$$

The interpretations of these conditions are as in equations (2.4a–2.4c).

In the absence of foreign assistance or the ability to borrow, the LIC country's government chooses x and l to maximize $u(y - x + l) + \beta u(wh - (1+r)l)$, subject to $l \le 0$. The resulting autarkic allocation, with a binding constraint on l, is characterized by

$$u'(c_1) = \beta wh' u'(c_2) > \beta(1+r)u'(c_2) \tag{3.3}$$

Equation (4.3) implies that investment is inefficiently low ($wh' > 1 + r$). In addition, the marginal value of current consumption, in terms of forgone future consumption, exceeds the world's opportunity cost of funds. This inefficiency creates the possibility that an IFI loan could improve the situation, but can it achieve the first-best without a full set of policy tools?

B. Loans Without Commitment

We proceed working backwards. In period two, the IFI chooses μ optimally, taking as given first-period loan amounts and investment levels. The IFI's repayment policy is defined by maximizing (3.1) with respect to μ, given x, l, b:

$$u'\left(y_2 + (1+\tilde{\mu}(x,l,b)r)l + (1+r)b\right) \equiv \gamma u'\left(wh(x) - (1+\tilde{\mu}(x,l,b)r)l\right) \tag{3.4}$$

In period 1, the IFI and the LIC choose optimal loan and investments levels, given the optimal period-2 repayment policy. The timing of choices in period 1 again depends on whether the IFI is following a conditional or an unconditional loan policy.

Unconditional Loans

In the second stage, the LIC chooses *x*, given *l* and (3.4), to maximize (2.1). This generates

$$u'\left(y-\tilde{x}(l)+l\right)\equiv\beta\left[wh'\left(\tilde{x}(l)\right)-rl\tfrac{\partial\mu}{\partial x}\right]u'\left(wh\left(\tilde{x}(l)\right)-(1+r)l\right) \tag{3.5}$$

Comparative statics on (3.4) yield $0<rl\dfrac{\partial\mu}{\partial x}<wh'$. As in section II.D, higher LIC investment raises the interest rate required by the IFI in the second period, resulting in a Samaritan's dilemma.

In the first stage, the IFI chooses *l* and *b* amount given (3.4) and (3.5). Combining the first order conditions for *l* and *b* with (3.5) gives us:

$$1+r+\frac{\partial\mu}{\partial x}rl=wh'>1+r \tag{3.6}$$

Proposition 3.1: *Without commitment, unconditional loans lead to efficient intertemporal consumption allocations in the LIC, but investment and wealth are inefficiently low.*

While consumption is allocated efficiently, the level of investment and wealth is too low in the poor country because the IFI's altruism, along with the discretion to alter μ, lowers the return to investment in the poor country. The LIC knows the higher is its second period income, the greater is the loan repayment that the IFI will require. This creates a disincentive to invest.

Conditional Loans

In the first stage, the IFI determines its loan schedule by choosing *l* and *b*, given *x* and (3.4), to maximize (3.1). Combining the first order conditions for this problem with (3.4) once again generates (3.2a) and (3.2b). The loan schedule is implicitly defined by (3.4) and

$$u'\left(y-x+\tilde{l}(x)\right)\equiv\beta(1+r)u'\left(wh(x)-(1+\tilde{\mu}\left(x,\tilde{l}(x),\tilde{b}(x)\right)r)\tilde{l}(x)\right) \tag{3.7a}$$

$$u'\left(y_1-\tilde{l}(x)-\tilde{b}(x)\right)\equiv\beta(1+r)u'\left(y_2+\left(1+\mu\left(x,\tilde{l}(x),\tilde{b}(x)\right)r\right)\tilde{l}(x)+(1+r)\tilde{b}(x)\right) \tag{3.7b}$$

In the second stage, the LIC takes the entire loan policy, defined by (3.4) and (3.7), as given and chooses x to maximize (2.1). This generates:

Proposition 3.2: *Without commitment, conditional loans led to a fully efficient outcome (conditions (3.2a–3.2c) are satisfied).*

As in Proposition 2.3, conditionality provides the LIC with the right investment incentives. Conditional loans lead to an efficient outcome because the LIC recognizes that higher investment will induce greater loans from the IFI, which offsets the higher repayment.

Example 4. Consider again the case $u(\cdot)=\ln(\cdot)$. The solution for μ in the second period is $\mu=\dfrac{wh-(1+\gamma)l-\gamma(y_2+b(1+r))}{rl(1+\gamma)}$. Second-period consumption for the IFI and the LIC are

$$\bar{c}_2=\left[\frac{1}{1+\gamma}\right](wh+y_2+b(1+r)) \qquad c_2=\left[\frac{\gamma}{1+\gamma}\right](wh+y_2+b(1+r))$$

The optimal choice of μ is such that the combined second-period resources of the IFI and the poor country are divided in constant shares.

In the first period the IFI first chooses l and b to get

$$l=\left[\frac{\gamma}{(1+\gamma)(1+\beta)}\right]\left(y_1+\frac{wh+y_2}{1+r}\right)-\left[\frac{1+\beta(1+\gamma)}{(1+\gamma)(1+\beta)}\right](y-x)$$

$$b=\left[\frac{\beta}{1+\beta}\right](y_1+y-x)-\left[\frac{1}{1+\beta}\right]\left(\frac{wh+y_2}{1+r}\right)$$

In the optimal loan policy, the first- and second-period consumption in the LIC are constant shares of consolidated lifetime resources,

$$c_1=\left[\frac{\gamma}{(1+\gamma)(1+\beta)}\right]\left(\frac{1}{1+r}\right)[(1+r)(y_1+y-x)+wh+y_2]$$

$$c_2=\left[\frac{\gamma\beta}{(1+\gamma)(1+\beta)}\right][(1+r)(y_1+y-x)+wh+y_2]$$

Thus, maximizing consolidated lifetime resources is equivalent to maximizing utility in the poor country. This causes investment levels to be chosen efficiently.

C. Uncertainty

We have suggested that IFIs behave as if they are unwilling or unable to commit to a given interest subsidy in advance. However, under our assumptions, it is unclear why this would be the case. In practice, IFIs probably do not commit to how much they will require in loan repayment from LICs because of uncertainty. At the time the loan is made no one knows the precise conditions that will prevail in the poor country during the second period. The better the economic conditions in the second period, the smaller is the portion of the loan repayment that the IFI would be willing to forgive.

In this section we introduce uncertainty by assuming that the rental rate on human capital, *w*, is a random variable. To assess the performance of conditional loans in an uncertain environment, we must begin by reconsidering the first-best allocations and those obtained under autarky.

First-Best
Suppose, as before, that the IFI has the power to directly choose b, T_1, T_2, and x. The second period transfer, T_2, is not chosen until after the uncertainty is resolved. It is chosen to maximize $u(\bar{c}_2) + \gamma u(c_2)$. Conditional on the optimal choice of T_2, the first period problem is to choose b, T_1, and x to maximize

$$u(\bar{c}_1) + \gamma u(c_1) + \beta E\{u(\bar{c}_2) + \gamma u(c_2)\}, \tag{3.8}$$

where E is the expectation operator taken with respect to the random variable w. The solution is characterized by

$$u'(\bar{c}_2) = \gamma u'(c_2) \text{ and } u'(\bar{c}_1) = \gamma u'(c_1) \tag{3.9a}$$

$$u'(c_1) = (1+r)\beta E\{u'(c_2)\} \text{ and } u'(\bar{c}_1) = (1+r)\beta E\{u'(\bar{c}_2)\} \tag{3.9b}$$

$$(1+r)E\{u'(c_2)\} = E\{wh'u'(c_2)\} \equiv E\{wh'\}E\{u'(c_2)\} + COV\{wh'u'(c_2)\} \tag{3.9c}$$

The conditions for redistribution are unaltered (since they are not affected by uncertainty). In (3.9b), the value of forgone first period consumption now must be equated to the expected value of the gain in second period consumption. The final condition establishes that investments in human capital pay a "risk premium" because of the negative correlation between the return on human capital and the marginal value of second period consumption.

Autarky
Assuming the LIC has no access to private credit markets or altruistic transfers, it chooses x and l to maximize $u(y - x + l) + \beta E\{u(wh - (1+r)l)\}$, subject to $l \le 0$. The resulting allocation, with a binding constraint on l, is characterized by

$$u'(c_1) = \beta E\{wh'u'(c_2)\} > \beta(1+r)E\{u'(c_2)\} \tag{3.10}$$

Conditional Loans

In this setting, the optimal second-period choice of μ will vary with the random variable *w*. Absent commitment, an optimal contingent plan for μ is chosen as a function of *w*, *b*, *l*, and *x*. Given this plan, first period choices are made as under perfect certainty; an optimal conditional loan policy is chosen and then the poor country chooses investment levels. As under perfect certainty, the IFI's optimal loan and repayment policies feature a mix of rationing and subsidy. The IFI's conditional loan schedule causes the LIC to value forgone current consumption at the lenders' opportunity cost of funds, which gives the LIC incentives to select an efficient choice of investment.

Proposition 3.3*: When the returns to investment in the poor country are uncertain, commitment to a particular interest subsidy is not time-consistent. Without commitment, conditional loans are able to generate the first best allocation a characterized by (3.9a-3.9c).*

D. Government Consumption

Thus far we have assumed that the poor country's benevolent government uses lump-sum taxes for the sole purpose of financing investment projects that increase the welfare of its citizens. Now we show the results extend to the case where the poor country's government uses income tax revenues to finance its own consumption as well as finance investment projects. With a selfish government, taxes are set independently of investment choices. This adds another layer of complexity to the problem, but does not alter it fundamentally.

Suppose the government now sets income tax rates τ_1 and τ_2 to collect revenue in the two periods. The government uses some of these revenues for its own selfish purposes. Let the government's objective function take the form

$$(1-\rho)\left[u(\tau_1 y - x + l) + \beta E\{u(\tau_2 wh - (1+\mu r)l)\}\right] + \rho\left[u((1-\tau_1)y) + \beta E\{u(\tau_2 wh)\}\right], \qquad (3.11)$$

where $0 < \rho < 1$. The government may be quite selfish (have a ρ close to 0), but not completely so.

The analysis of conditional loans with a selfish government follows in the same fashion as with benevolent governments, except now tax rates have to be determined along with investment choices. Without commitment we again have a two-period game, but the government's choice of taxes adds a stage to the games in each period.

In the second period, the first stage has the government choosing τ_2 to maximize (3.11), for given values of all other variables. The second stage has the IFI choosing μ to maximize (3.8), taking into account how this will affect the government's tax policy.

In the first period, there is now a three-stage game. All choices in this period take into account their effects on the second-period behavior of the government and the IFI. The first stage has the government choosing τ_1 to maximize (3.11). For conditional loans, the second stage has the IFI choosing its loan schedule for given values of the poor country's investment and accounting for how the quantity of loans impacts tax policy in both periods. Finally, in the third stage, the poor country chooses its investment level accounting for how all other behaviors are altered. The solution to this dynamic game gives the extension of Proposition 5 to the case of a selfish government.

Proposition 3.4: *If a selfish government has at least some concern for its citizens, i.e., chooses policies to maximize (3.11), then conditional loans lead to a fully efficient allocation of resources*.

More selfish governments set higher taxes to increase the fraction of the country's resources consumed in the public sector. However, whatever this fraction, there are always gains from investment to be shared by all. Expanding the country's resources is in the best interest of the government, its citizens (since they will share at least some of the expansion), and the IFI (since they care about the citizens and about receiving repayment). Just as in the case with a perfectly benevolent government, conditional loans provide the incentive for the government to recognize this and invest at efficient levels.

V. Concluding Remarks

IFI loan programs help liquidity-constrained LICs raise human capital investments. If IFIs could commit in advance to demanding full loan repayment from their low-income borrowers, unconditional loans would produce efficient outcomes. This paper examined the implications of IFI altruism for the effectiveness of such loan programs when IFIs cannot commit to require full repayment. When IFIs cannot commit in advance to demanding any agreed repayment from poor countries, unconditional loans are inefficient. The LIC would set investment too low in the attempt to gain loan repayment forgiveness in the future. We have demonstrated that IFIs can design time-consistent conditional loan programs that overcome this moral hazard. In our model, conditionality preserves pareto optimality and achieves first-best redistribution even in the presence of complications related to uncertain LIC investments and selfish recipient governments.

Our solution to the Samaritan’s dilemma is for the altruistic donor to present recipients with a loan schedule where both the loan amount and its interest rate are conditional on investment. The optimal loan schedule creates incentives for the recipient to choose investment efficiently while at the same time receiving an interest subsidy, and thus a transfer, that varies with investment and future income realizations. The optimal interest rate subsidy balances the tension between the IFIs’ altruistic concerns for LICs and its fiduciary responsibilities to IFI creditors. The solution does not require commitment on the part of the donor and does not trigger renegotiation to write principal down at the time of repayment—a recurrent practice with loans to LICs.

Conditional loans to some LICs have not always been associated with solid results in the past (see Dollar and Svensson, 2000; IMF, 2002a; and Ivanova, Mayer, Mourmouras, and Anayiotos, 2003). Some countries have not been able to grow out of their poverty despite long-standing IFI engagement. Our analysis suggests that IFI altruism does not need to be a fundamental source of this failure. If IFI altruism is properly reflected in the financial terms and conditionality of IFI loans, full efficiency can be achieved, encompassing pareto optimality and first-best redistribution.

Reconciling the prediction that conditional loans will help poor countries achieve first-best allocations with the mixed results of conditional loans on the ground is a challenge. One possibility, not examined in this paper, is that IFIs and their LIC borrowers face incentives to systematically overstate LIC repayment prospects, leading to boom-bust cycles in which IFI lending is followed by LIC debt distress and ex post debt relief. Empirical evidence does suggest that IFI projections of LIC economic growth and export earnings are consistently overoptimistic, leading to understatement of future LIC debt and debt-servicing burdens. Partly in response to this problem, the IMF has recently revamped its framework for assessing debt sustainability (IMF, 2002b). A second issue concerns the effectiveness of conditionality in the presence of domestic policy failures and IFI commitment problems. The present paper provided a welfare case for conditionality based on the IFIs' inability to commit in a model that abstracted from policy inefficiencies in recipient countries. In a companion paper (Mourmouras and Rangazas, 2004) we examine a model of special interest groups that features inefficient fiscal redistribution. In this environment, the effectiveness of conditional loans in mitigating domestic policy inefficiencies is circumscribed by the IFI's commitment problem.

ANNEX: PROOFS

A. Exogenous IFI Capital

Proposition 2.1: Under commitment, maximizing (2.2) is equivalent to maximizing (2.1). Using the envelope theorem, choosing l to maximize (2.1) subject to (2.5) gives (2.4b). Combining this with (2.5) gives (2.4c).

Proposition 2.2: In choosing l to maximize (2.2) subject to (2.6) and (2.7), note that the choices of μ and x also maximize (2.2). This means the envelope theorem applies, and the indirect effect of l on μ and x can be ignored. The first order condition for l is then $-\beta V'(\cdot)(1-\mu)r + \gamma u_1'(\cdot) - \gamma\beta u_2'(\cdot)(1+\mu r) = 0$. Using (2.7), the first order condition reduces to (2.4b), implying that consumption allocations are efficient. Combining (2.4b) and (2.7) gives $h' = 1 + r + rl\frac{\partial\mu}{\partial x} > 1 + r$, so investments are inefficiently low.

Proposition 2.3: First note that (2.6) and (2.9) implicitly define μ and l as functions of x, i.e., $l = \tilde{l}(x)$ and $\mu = \hat{\mu}(x) \equiv \tilde{\mu}(x, \tilde{l}(x))$. Choosing x to maximize (2.1) subject to (2.6) and (2.9) gives $u_1'(\cdot)\left(\frac{dl}{dx} - 1\right) + \beta u_2'(\cdot)\left(h' - (1+\mu r)\frac{dl}{dx} - rl\frac{d\mu}{dx}\right) = 0$. Using (2.9), this condition can be rewritten as $h' - (1+r) + \left((1-\mu)r\frac{dl}{dx} - rl\frac{d\mu}{dx}\right) = 0$. Doing comparative statics on (2.6) and (2.9) reveals that $(1-\mu)r\frac{dl}{dx} - rl\frac{d\mu}{dx} = A\left((1+r) - h'\right)$, where $0 < A \equiv \frac{\gamma u_2'' u_1'' rl}{\gamma u_2'' u_1'' rl + V'' rl\left(u_1'' + 2\beta u_2''(1+r)\right)} < 1$. Thus, the net marginal benefit of investment is strictly increasing in the expression $h' - (1+r)$. This implies that poor country utility is not maximized unless $h' = 1 + r$.

B. Endogenous IFI Capital

Proposition 3.1: In choosing l and b to maximize (3.1) subject to (3.4) and (3.5), note that the choices of μ and x also maximize (3.1). This means the envelope theorem applies once again and the indirect effect of l and b on μ and x can be ignored. The first order condition for the choice of l and b generate expressions consistent with (3.2a) and (3.2b). Combining expressions of the form in (3.2a) and (3.2b) with (3.5), gives (3.6).

Proposition 3.2: Choosing x to maximize (2.1) subject to (3.4) and (3.7) gives $u'(c_1)\left(\frac{dl}{dx} - 1\right) + \beta u'(c_2)\left(wh' - (1+\mu r)\frac{dl}{dx} - rl\frac{d\mu}{dx}\right) = 0$. Using (3.7a), this condition can be rewritten as $wh' - (1+r) + \left((1-\mu)r\frac{dl}{dx} - rl\frac{d\mu}{dx}\right) = 0$. Doing comparative statics on (3.4) and

(3.7) reveals that $(1-\mu)r\frac{dl}{dx} - rl\frac{d\mu}{dx} = 0$. This implies that poor country utility is not maximized unless $1+r = wh'$.

Proposition 3.3: Begin in period 2 and choose μ to maximize $u(\bar{c}_2) + \gamma u(c_2)$. The optimal choice is characterized, as under perfect certainty, by $u'(\bar{c}_2) = \gamma u'(c_2)$; so the second period part of (3.8a) is satisfied for all *w*. This condition also tells us that $\bar{c}_2 = \phi c_2$, where $\phi \equiv u'^{-1}(\gamma)$ (the lenders and the poor country share the risk of investment proportionally).

Moving to the first stage of the first period game, the IFI chooses *b* and *l* to maximize $u(\bar{c}_1) + \gamma u(c_1) + \beta E\{u(\bar{c}_2) + \gamma u(c_2)\}$, taking the contingent repayment policy, implicitly defined above, and the level of *x* as given. The first order conditions to this problem generate $u'(\bar{c}_1) = \gamma u'(c_1)$, $u'(\bar{c}_1) = \beta(1+r)E\{u'(\bar{c}_2)\}$, and $u'(c_1) = \beta(1+r)E\{u'(c_2)\}$. These conditions satisfy (3.9a) and (3.9b). They also imply that we can write poor country consumption as $c_1 = \left[\frac{1}{1+\phi}\right](y_1 + y - x - b)$ and $c_2 = \left[\frac{1}{1+\phi}\right](wh + y_2 + b(1+r))$ (altruistic loan and repayment policies cause the combined resources of the two parties to be shared).

In the second stage, the poor country's government takes the IFI policies as given, which determine the consumption allocations above as a function of *x* and *b*(*x*), and choose *x* to maximize the expected lifetime utility of its representative household. Using (3.9b), the first order condition to this problem generates (3.9c).

***Proposition 3.4*:** Begin in period 2. The government first chooses τ_2 to maximize (3.11), yielding $(1-\rho)u'(\hat{c}_2) = \rho u'(c_2)$, where $\hat{c}_2$ denotes government consumption. This condition implies $\hat{c}_2 = \frac{\Omega}{1+\Omega}(wh - (1+\mu r)l)$ and $c_2 = \frac{1}{1+\Omega}(wh - (1+\mu r)l)$, where $\Omega \equiv u'^{-1}\left(\frac{\rho}{(1-\rho)}\right)$. Next, we can skip to the first stage of the period 1 game (since the choice of period 1 tax is independent of any period 2 variables) and follow the same steps to get $c_1 = \frac{1}{1+\Omega}(y - x + l)$. Thus, the problem takes the same form as in the benevolent case, except that now the representative household only consumes a fraction of the resources available in each period. The remaining solution of the game, and completion of the proof, reduces to the same steps taken in the proof to Proposition 3.3.

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