Basic Analytics of Multilateral Lending and Surveillance*

Rune Jansen Hagen†

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Abstract

I analyse whether multilateral lending may be justified in a world of global capital markets if multilaterals have an informational advantage over lenders in the market for sovereign debt. I show that the adverse selection problem in this market may be solved through cheap-talk provided the multilateral agency does not care too much about borrower country welfare. However, when lending is unconstrained the private information of the multilateral will be revealed whatever the relative weighting of welfare and lenders' profits. In contrast, restricted multilateral lending may worsen the problem compared to a situation where the agency plays a purely informational role.

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1 Introduction

International capital markets have grown rapidly over the last 50 years and many developing countries now have access to foreign for-profits funds in one form or another. Loans from private banks, which was the major component of commercial flows to developing countries before the debt crisis of the 1980s, are now supplemented by portfolio flows and foreign direct investment,

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†Department of Economics, Norwegian School of Economics and Business Administration, Helleveien 30, 5045 Bergen, Norway. E-mail: rune.hagen@nhh.no.

at least in some middle-income countries.[1] The changing character of international financial markets has created a debate over the raison d'être of multilateral institutions such as the IMF and the World Bank. Given that the resources at their disposal are now dwarfed by the size of capital markets, do they still have a role to play in international lending? Or should they instead focus on other tasks, such as distributing aid?

The recurrent financial crises over the last few decades demonstrate that despite their phenomenal rate of development capital markets still fail, sometimes spectacularly so. However, as economists customarily point out nowadays the existence of market failure is not a sufficient condition for intervention since public agencies are not infallible either. One must therefore demonstrate that public institutions can reasonably be expected to outperform private ones. In the current context, Rodrik (1996) outlines two reasons why agencies such as the World Bank and the IMF might improve the functioning of markets. The first reason is that they might have a comparative advantage with respect to the collection and dissemination of information about the investment environment in borrowing countries. The second reason is that they could have a comparative advantage with respect to the application of conditionality to the policies of the governments of these countries. However, he also points out that neither of these is by themselves arguments for lending by multilateral institutions.

In the next section, I discuss whether one can make a case for multilateral lending based on one or both of these suggested advantages. I argue that the collective good aspect of information about borrowing countries make for a stronger case. In the remainder of the paper, I formally analyse the conditions in which lending by a multilateral agency contributes to alleviating the adverse selection problem in the market for sovereign debt when it has an informational advantage relative to private lenders. This is done by contrasting equilibrium outcomes of a game where there is such lending with those in which the multilateral simply makes statements about the borrower ("certification").

I find that multilateral lending is not a necessary condition for information revelation. However, unconstrained lending solves the adverse selection problem even in conditions where certification does not. Then again, if multilateral loan size is restricted more information might be transmitted through certification. Hence, while there is a case to be made for multilateral lending care would have to be taken in devising financial arrangements in order not to compromise the potential for information transmission.

[1] The poorest countries, in particular those in Africa, are still almost completely dependent upon public concessional flows.

2 Should there Be Multilateral Lending?

The original rationale for the World Bank was to provide financing for post-war reconstruction and economic development, circumstances in which it was believed that financial markets would fail to provide the needed capital. The instrument was initially project loans in which the World Bank essentially operated as a financial intermediary borrowing from capital markets and lending to member governments. Later, with the establishment of the International Development Association, it began to provide aid to developing countries. The IMF was to oversee the functioning of the Bretton Woods system of exchange rates, supplying short-term funds to allow members to overcome temporary balance-of-payments problems. The money was provided by the members themselves, making the Fund a sort of credit union. However, asymmetries soon emerged, with the larger and richer members starting to lend to the IMF and ceasing to borrow from it. After the break-down of the Bretton Woods system, developing countries became the IMF's clientele. This created a need for facilities with a longer-term horizon than the conventional stand-by stabilisation programmes. Hence, over time the operations of these two institutions have converged in many respects, with both now providing longer-term loans for structural adjustment to developing and transition economies as well as subsidised credit.[2] While much of what follows pertain to the World Bank (specifically, the IBRD) as well as the IMF, for simplicity as well as specificity I will in the formal analysis mostly refer to the latter. The question posed is thus: Should there be IMF lending?[3]

In answering this question, it is important to bear in mind the nature of the market failure in question. Focusing on sovereign debt, that is, international lending to governments, the basic problem is a lack of institutions: there are no international courts that may enforce contracts with sovereigns.[4] Therefore, there is an ex post incentive for sovereigns to renege on their debt service obligations, making lenders restrict the volume of credit ex ante to levels at which the borrower government finds it optimal to repay their due when the time comes. Loans will be given if penalties can be levied in the event of default, but there will be credit-rationing that reduces investment levels in the borrowing country below those that would be obtainable with adequate third-party enforcement. One way around the moral hazard problem would be for

[2] The literature on the history of the Bretton Woods institutions is voluminous; for recent accounts, see Bordo and James (2000), Gavin and Rodrik (1995), and Krueger (1997).

[3] Rodrik's (1996) question is actually Why is there multilateral lending? However, the reasons why there is multilateral lending in a world of global capital markets may be very different from the normative question of whether such lending is desirable. To investigate the positive issue of why, one would probably have to take into account bureaucratic and political factors in addition to the economic ones that are in focus here.

[4] A good discussion of this issue can be found in Roubini and Setser (2004).

the sovereign to pledge assets as collateral by depositing them outside of its jurisdiction. Since finding suitable assets is likely to be difficult, it has been suggested that conditionality may serve as a substitute for collateral. If default penalties are proportional to output the borrower will strengthen its willingness to honour any obligation incurred by committing to policies that increase future output. Of course, if such actions were in the interest of the sovereign it would undertake them. If they could be verified by lenders, they would be willing to lend more. Both premises are often questionable.

The second argument for multilateral lending presented by Rodrik (1996) is that multilateral agencies may serve as a commitment device since their borrowers are members of these organisations, making their policy demands more acceptable politically than would the demands of private lenders or their governments. This might be true, even though IMF programmes in particular have often been politically controversial,[5] and multilateral lending might be important in making conditionality palatable to borrowers and credible to lenders. Moreover, multilateral agencies are better poised to monitor the actions undertaken by borrowers because they have privileged access to information about their members. Yet the basic enforcement problem limits the impact conditionality can have, as does agency problems within the multilateral financial institutions. Indeed, IMF (and World Bank) conditionality has a rather poor record, with compliance always being well below 100%.[6] Hence, while multilateral conditionality might be self-enforcing to a greater extent than private or bilateral conditionality it seems a rather weak argument for multilateral lending.

I therefore concentrate on the first issue, whether the collective good aspect of country-wide information about economic conditions and policies can justify lending by multilateral agencies. It seems indisputable that such information, in contrast to knowledge about specific investment projects, is a collective good in the sense that all potential investors benefit from it. Any one investor has no incentive to share knowledge gained about the general characteristics of the country in question with other investors. Hence, such knowledge will be underprovided or, if each potential investor should find it profitable to gather the information on their own, provided at too high a cost. Multilateral agencies could undertake the task of uncovering the information and making it publicly known. By "certifying" the policies of member countries they could

[5]Sachs (1989: 267), for instance, claims that "the epithet that a program is 'fundo monetarista' is about as damning as possible in much of the Latin American political lexicon." Even though this has probably changed somewhat in later years, few governments wish to be seen as surrendering national sovereignity.

[6]Notable studies on conditionality (in relation to both aid and multilateral lending from the World Bank as well as the IMF) include Mosley, Harrigan, and Toye (1991), Killick (1995, 1998), the World Bank (1998), and Easterly (2005).

improve the allocation of investment in the world economy, both directly and indirectly by guiding private lenders towards the more credit-worthy borrowers. That is, while they cannot get at the moral hazard problem of sovereign lending through information provision they might alleviate the adverse selection problem in which poor risks reduce the credit volume and worsen the terms available to good risks.

This is of course a major part of what the multilateral agencies do today. Indeed, some argue that it is the very reason for the existence of the IMF (Guitián 1992: 12): "There is a well-defined common thread that binds together all the activities of the IMF: the promotion and safeguarding of an international code of conduct. [...] The IMF is primarily a surveillance institution, and its other activities derive their legitimacy from the surveillance mandate laid out in the Articles of Agreement."[7] Surveillance of member is carried out on a regular basis, usually yearly, in what is known as Article IV consultations. In the process, the IMF gathers an enormous amount of information about the economy of each member as well as the policies of the government. Similar processes take place in the context of negotiations of financial arrangements with members. In addition, the IMF continually analyses the state of the economies of members. Hence, it is reasonable to assume that the IMF has an informational advantage relative to private investors and lenders, particularly since it gets privileged access to information from its members.[8]

Rodrik (1996) notes that monitoring by the multilaterals is usually intensified when lending is an issue. He argues that this might be due to governments being reluctant to disclose sensitive information unless it is exchanged for funds or, more importantly, that the quality of information-gathering might suffer if the multilaterals do not risk their own money, in which case they might be unduly influenced by political pressure from major shareholders or borrowing country governments. If so, private agents will be less inclined to take their statements seriously. It is, however, not entirely clear that this view is correct. The major shareholders of the IMF and the World Bank are home to the most important international investors and lenders, so it is not obvious that they have an interest in misleading them. Moreover, while officials of the

[7] Naturally, not all observers take such a strong position. While noting that surveillance activities account for 42% of the IMF's budget, Bordo and James (2000: 9) claim that "The IMF is primarily a financial institution."

[8] It is true that the institution publishes some of the economic data in series like International Financial Statistics and Government Finance Statistics. However, there is obviously a lag between collection and publication and other, "softer" types of information are not made public. It is also true that there are private companies conducting risk analyses and selling them to private investors and other interested parties. However, this does not change the fact that once these analyses have been produced it would be socially beneficial to make them public, since the social marginal cost of publishing them are essentially zero. Moreover, such actors do not have the kind of access to governments that a multilateral institution has. Thus, the accuracy of the analyses must in general be expected to be lower. For more on these issues, see Bird (1995), Krueger (1997), and Rodrik (1996).

multilaterals might be reluctant to criticise the member governments that are technically their principals this should not prevent them from praising member governments that are, in their opinion, pursuing sound policies. Most importantly, the argument may be stood on its head: the fact that a multilateral agency has a financial interest in a country may lead to decisions that obscure its private information. For example, when the IMF lends to a country indebted to it during a crisis it is not clear whether this should be interpreted as a signal of faith in the government or pious hope that matters will improve in the future so that the IMF will get its money back. Therefore, in the remainder of this paper I analyse the impact a multilateral agency with a purely informational role might have on the market for sovereign debt and contrast the resulting equilibria with those that emerge when its operational instrument is lending.

The existing literature on third-party involvement in sovereign debt markets tends to deal with issues only tangentially related to those analysed here or adopt quite different analytical frameworks. The approaches of Diwan and Rodrik (1992) and Marchesi and Thomas (1999) are perhaps closest in spirit to the one presented here, but there are still major differences.[9] Firstly, in both papers conditionality is assumed to work.[10] Secondly, in these models the multilateral institution do not have an informational advantage relative to lenders.[11] Thus, they might be said to take the first potential advantage of multilaterals for granted while ignoring the second.

[9]Other models of sovereign debt markets with third-party involvement have been developed by Bhattacharya and Detragiache (1994), Bulow and Rogoff (1988), Fafchamps (1996), Klimenko (2002), and Wells (1993). Bulow and Rogoff (1988) are concerned with the effects of creditor-country government intervention on the bargaining game between debtors and creditors. Bhattacharya and Detragiache (1994) extend a simple version of their model to allow such agents to commit to not intervening by concluding an agreement with a multilateral institution. In Klimenko (2002), the multilateral is involved in bargaining with the debtor and its creditors over the division of the surplus from avoiding trade-sanctions levied in the event of default. It is assumed to have no resources on its own and cares only about the welfare of the debtor's trading partners. Wells (1993) presents a bargaining model with asymmetric information to analyse the impact of two different IMF strategies - unconditional lending and lending conditional upon an agreement between creditors and the debtor. However, the objectives of the IMF are not explicitly modelled, nor is it a strategic actor in the game. Similarly, in Fafchamps (1996) multilaterals are simply assumed to be able to enforce bargains on policies and debt relief made by creditors and the debtor.

[10]The essential common feature of the papers in this respect is that it is assumed that new loans from commercial banks or multilateral agencies will be withheld if no adjustment effort is made, thus disregarding the time-inconsistency problems that the empirical studies cited in footnote 6 demonstrate are for real. Diwan and Rodrik (1992) themselves point out that conditionality in practice is much less effective.

[11]Diwan and Rodrik (1992) briefly discuss some of the issues raised if the multilateral agency has an informational advantage relative to lenders, but do not explicitly analyse them. Marchesi and Thomas (1999) include an informational asymmetry between borrower and lenders, with the IMF not knowing more about country type than the latter.

In contrast, I assume that conditionality is not applied. That is, the multilateral institution does not try to alter the character of borrower countries by imposing conditions on the kind of economic policies they may pursue. As already noted, the multilaterals' conditionality has been much less than 100% effective. While it is extreme to assume that policies cannot be influenced at all, taking into account the game determining which conditions are indeed fulfilled would detract too much from the primary purpose of this paper. Moreover, given the empirical record, it is no more unrealistic than assuming 100% compliance.

A third major difference concerns the objectives of the multilateral agency, which are assumed to be much narrower than is the case here. Diwan and Rodrik (1992) posit that the multilateral institution is only interested in the ramifications of its involvement in the sovereign debt market for its own financial position. Marchesi and Thomas (1999) look at two cases where the IMF maximises bank profits and country welfare, respectively, in both instances imposing a zero profit constraint on its actions. In section 4, all of these concerns are taken into account when the IMF makes its lending decision.

Finally, a debt-crisis, i.e., a situation where there is a debt overhang implying default in some future states of the world if no action is taken, is the starting point for the analysis. I abstract from such considerations for two reasons. The first is that I want to focus on the potential impact of multilaterals on the regular functioning of the market for sovereign debt. The fact that the IMF in particular is putting increased emphasis on enhancing members' access to international capital markets makes this a highly relevant investigation.[12] The second is that Acharya and Diwan (1993) have shown that a debtor buying back its debt might signal its willingness to invest to creditors. In order to concentrate on the multilaterals' strategic role I therefore assume that the country has no accumulated debt.

In the next section, a simple model of the sovereign debt market in the absence of multilateral interventions is developed. Then the impact of multilateral certification on private lending and borrowing country investment is considered. In section 4, multilateral lending is introduced and the resulting equilibria are compared to those arising with certification. In the final section, extensions and conclusions are discussed.

[12] See e.g. Mody and Saravia (2003) and Bordo, Mody, and Oomes (2005).

3 A Cheap-Talking IMF

3.1 The Sovereign Debt Market without IMF-lending

There are three kinds of agents in the model, a developing country, private lenders, and the IMF. The country may be either of two types indexed by i, H having a higher capability of servicing its debt than L other things being equal. Its type is private information. The ex ante probability that lenders attach to the country being L is $p \in (0,1)$. Before the borrower and the lenders interact to determine the volume of lending and the interest rate, the IMF receives a perfectly accurate signal about the type of the country. This may be thought of as the IMF conducting a surveillance operation that is completely accurate with respect to uncovering the relevant information. It thereafter takes an action, either making a statement (in this section) or a loan (in the next section), that may signal what is then its private information to lenders.[13]

The government of the borrower country chooses investment and international borrowing to maximise the utility of the representative consumer:

$$U^i = C_1^i + \varphi C_2^i, \tag{1}$$

where φ is the discount factor. The budget constraints are

$$C_1^i = Y_1 + B^i - I^i; \tag{2a}$$

$$C_2^i = \left(1 - \delta^i \lambda\right)\left(1 + \kappa^i\right) I^i - \left(1 - \delta^i\right)\left(1 + r^i\right) B^i. \tag{2b}$$

That is, in period 1 the country has some exogenous income Y_1 and may augment period 1 consumption (C_1^i) through international borrowing (B^i) at an interest rate of r^i and period 2 consumption (C_2^i) through investment (I^i), with the values of these variables potentially depending on the type of equilibrium being played as well as country type. The difference between H and L is that the former has higher marginal returns to investment than the latter: $\kappa^H > \kappa^L$. One may think of this gap as reflecting differences in the business environment due to laws, regulations, and economic policies that the IMF discover during its surveillance operation. Of course, if κ^i is a permanent feature of the country one would expect lenders to learn its type as time goes by. However, circumstances and policies change over time, so it is more fruitful

[13] It is of course unrealistic to assume that the country's private information is transferred in full to the IMF, but it is a useful simplification when making a first cut at analysing these issues. Moreover, the results should continue to hold as long as the IMF has an informational advantage over private lenders.

to picture this parameter as expressing the current state of the investment environment in the borrowing country.

If type i fully services its debt $\delta^i = 0$ and the total returns to investment $\left(Y_2^i = \left(1+\kappa^i\right) I^i\right)$ are available for consumption in period 2. If it defaults by paying creditors anything less than principal plus interest $(\delta^i = 1)$, it incurs a loss of a fraction of period 2 income $\lambda \in (0,1)$.[14]

The first derivatives of the utility function are

$$\frac{\partial U^i}{\partial I^i} = -1 + \varphi\left(1-\delta^i\lambda\right)\left(1+\kappa^i\right); \tag{3a}$$

$$\frac{\partial U^i}{\partial B^i} = 1 - \varphi\left(1-\delta^i\right)\left(1+r^i\right). \tag{3b}$$

If the country plans to fullfil its obligations to its creditors, it thus would borrow as much as possible but not invest if $\varphi < \frac{1}{1+\kappa^i}$; would borrow as much as possible and invest all available resources if $\frac{1}{1+\kappa^i} \leq \varphi \leq \frac{1}{1+r^i}$; and would not borrow but would invest all of its period 1 income if $\varphi > \frac{1}{1+r^i}$. On the other hand, if it plans to default, it would borrow as much as possible, but would only invest if $\varphi \geq \frac{1}{(1-\lambda)(1+\kappa^i)}$. For simplicity, I will assume that it is efficient that only the H-type invests and that the developing country is always willing to borrow at the risk-free rate $\phi > 0$: $\frac{1}{1+\kappa^H} \leq \varphi \leq \frac{1}{1+\phi} < \frac{1}{1+\kappa^L}$.[15,16] L might therefore be thought of as "truly" not creditworty, and instead, perhaps, being a candidate for aid. However, the amount invested is assumed to be unobservable to lenders. In combination with the linearity of the objective function, this precludes the country from being a strategic player in the game and makes the information provided by the IMF about the country's type crucial to the decisions of private providers of credit.

The choice whether to default or not is made in period 2. Obviously, if it was unconstrained, the country would always choose to default ex post. Hence it would borrow as much as possible and repay nothing. This is the basic moral hazard problem of sovereign lending. However, as already noted, in this event the country incurs a loss of λY_2^i. The critical value of debt at which the borrower is indifferent between servicing it and incurring the loss is

[14] This assumption is common in the literature. For a good review of models of sovereign debt, see Eaton and Fernandez (1995).

[15] For obvious reasons, the case where even the H-type does not invest and the case where the country is not willing to borrow at an interest rate of ϕ are not particularly interesting. Investigating equilibrium outcomes when there are gains from investing borrowed funds in an L-type is left for future research.

[16] With a binding credit constraint, the shadow discount factor will be less than $\frac{1}{1+\phi}$ in a non-linear model too. Moreover, note that under these assumptions investment in H is efficient by both potential standards since $\varphi\left(1+\kappa^H\right) \geq 1$ and $\kappa^H > \phi$.

$$B^i = \frac{\lambda Y_2^i}{1+r^i} \equiv \overline{B}^i \tag{4}$$

Of course, it is never optimal for lenders to lend more than $\overline{B}^i$ if they know the country's type. Therefore, in general the volume of lending is supply-determined in this model.

Lenders are risk-neutral and thus maximise expected profits, with the risk-free rate of interest on the world market being their opportunity cost. I make the standard assumption of a competitive market in the sense of no profits in expectation. I also simplify by assuming that although losses are inflicted on the borrower if it defaults lenders do not recover any part of their due, as will be the case if λ reflects trade sanctions imposed on the borrower by creditor country governments, for example.

In a separating equilibrium, the IMF reveals the country's type to the international capital market. Denoting the ex post probability that the country is of type L in an equilibrium of type j by q^j, this means that either $q^S = 0$ or $q^S = 1$. Then lending no more than $\overline{B}^{iS}$ is risk-free for lenders. Due to competition among them, $r^{HS} = r^{LS} = \phi$ and the country will be able to borrow $\overline{B}^{iS}$. Even though investment is not observed everything else is common knowledge in a separating equilibrium, allowing lenders to calculate I^{iS}. Hence, $\overline{B}^{LS} = 0$ because $I^{LS} = 0$; if the country has low returns to investment it will be shut off from private credit. In order for lending not to be a "money machine", where every unit lent is invested with returns so high that the country's credit limit goes up, I need to assume that the returns to investment are not too high in an H-type borrower: $\frac{1+\phi}{1+\kappa^H} > \lambda$. Using the fact that $Y_2^{HS} = \left(1+\kappa^H\right)\left(Y_1 + \overline{B}^{HS}\right)$, it is then easily established that $\overline{B}^{HS} = \frac{\lambda\left(1+\kappa^H\right)Y_1}{1+\phi-\lambda(1+\kappa^H)}$ is a finite, positive number.

If the IMF's actions do not reveal new information to lenders, the ex post probability that the borrower has low returns to investment is equal to the ex ante probability: $q^P = p$. By assumption, this would be the situation if no multilateral institution existed. In a pooling equilibrium, lenders are not able to distinguish the two types. They cannot be screened; even though the H-type might be willing to pay an interest rate higher than ϕ in order to get more credit, so is L, which never invests and thus always defaults on payments for any positive level of debt. For the same reason, there is no way H may signal its type to lenders; whatever terms it is willing to accept in order to get more credit, L accepts too. Hence, in a pooling equilibrium lenders are confined to offering terms that are not type-contingent. The size of the loan obviously will not be so high that both types prefer to default. On the other hand, lending nothing would leave potential profits on the table since there is a strictly positive probability that the country is of type H and thus will repay some levels of debt given some risk-adjusted interest rates.

This means that $\overline{B}^P$ must be such that L defaults with certainty ($\delta^{LP} = 1$) while H repays the loan with interest with certainty ($\delta^{HP} = 0$). The no-expected-profits condition then reduces to $(1-p)\left(1+r^P\right)\overline{B}^P = (1+\phi)\,\overline{B}^P$, or $r^P = \frac{1+\phi}{1-p} - 1 > \phi$. Accordingly, $0 < \overline{B}^P = \frac{\lambda\left(1+\kappa^H\right)Y_1}{1+r^P-\lambda(1+\kappa^H)} < \overline{B}^{HS}$.

As long as $\varphi \leq \frac{1}{1+r^P}$, both types will borrow $\overline{B}^P$. When $\varphi > \frac{1}{1+r^P}$, it is not optimal for H to borrow in a pooling equilibrium. In this case the volume of lending is demand-determined and the amount of investment in an H-type borrower country will be constrained by what can be financed domestically. This leads to a loss of gains from investment, but cannot be avoided as the L-type is as likely to approach lenders claiming to be an H-type worthy of more credit on better terms as an actual H-type. This is the adverse selection problem of the sovereign debt market at its most severe. As it turns out, the results in this situation are basically the same as in the less extreme case of $\varphi \leq \frac{1}{1+r^P}$. I thus confine the analysis to the latter parameter configuration from now on.[17]

Let

$$\Pi^i = \frac{\left(1-\delta^i\right)\left(1+r^i\right)B^i - (1+\phi)\,B^i}{1+\phi} \tag{5}$$

be ex post profits discounted by ϕ if the country is of type i. We may now calculate borrower welfare and lenders' profits in the two types of equilibria as functions of the former's type and the latters' actions. The results are as follows:

Proposition 1

i) Equilibrium borrowing country welfare levels by type are $U^{HS} = \varphi\left[\left(1+\kappa^H\right)Y_1 + \left(\kappa^H - \phi\right)\overline{B}^{HS}\right] > \varphi\left[\left(1+\kappa^H\right)Y_1 + \left(\kappa^H - r^P\right)\overline{B}^P\right] = U^{HP}$ and $U^{LS} = Y_1 < Y_1 + \overline{B}^P = U^{LP}$.

ii) Equilibrium discounted ex post profits are $\Pi^{HP} = \left(\frac{r^p-\phi}{1+\phi}\right)\overline{B}^P > \Pi^{LS} = \Pi^{HS} = 0 > -\overline{B}^P = \Pi^{LP}$.

Not surprisingly, we see that compared to a separating equilibrium an L-type borrower gains and an H-type loses in a pooling equilibrium. In a separating equilibrium, ex post profits are equal to expected profits since there is no residual uncertainty. Lenders make a loss in a pooling equilibrium if $i = L$ as the borrower then defaults whereas they earn positive profits if $i = H$ since the possibility that the borrower is of the low-productivity kind make them charge a risk premium ex ante that ex post turns out not to have been warranted.

So far, I have described a fairly standard model of the sovereign debt market. Introducing a third-party called the IMF possessing private information about the borrower is the main

[17] However, the results are available upon request.

innovation here. It maximises a weighted-average of borrowing country welfare and lenders' profits:

$$W^i = \omega U^i + (1-\omega)\,\Pi^i, \tag{6}$$

where U^i is given by (1), Π^i by (5), and $\omega \in (0,1)$. Note that these are the actual values of country welfare and profits, not the expected ones, as the IMF is fully informed about the borrower's type. This objective function may be rationalised by the membership status of both the borrowers and the countries to which any profits accrue. A very similar interpretation follows from the fact that the IMF is charged with maintaining the international financial system. This implies that in addition to the welfare of borrowers, the profits of credit providers must be given consideration.

In combination with linearity, discounting profits by the lenders' own opportunity cost make consumption in capital-importing and -exporting countries commensurate in the following sense: if a unit of funds is borrowed but not repaid consumption in the borrower increases by one unit in period 1 without any reduction in period 2 while the period 2 decrease in the consumption of lenders is $-(1+\phi)$, which is equal to -1 in terms of period 1 consumption. Hence, in this way borrowers and lenders are treated symmetrically. As noted by Kenen (1986), the IMF began as a credit union where uniform treatment is the rule. However, over the years the institution has evolved in a way that makes the analogy less compelling.[18] Lenders are typically persons or juridical entities residing in rich countries and these have not borrowed from the IMF since the mid-1970s. In fact, from 1962 on it is the IMF that has borrowed funds from some of its wealthiest members over and above their quotas. Moreover, voting power in the IMF is determined by quotas, so the rich countries, which have higher quotas, have more say in its affairs. Allowing the gains and losses of the parties to the debt contract to possibly be weighted unequally makes it possible for me to analyse the consequences of both these empirical asymmetries as well as different potential weighting schemes.

As already noted, surveillance, which is a basic feature of IMF operations in which it evaluates members' policies to see whether they are compatible with the obligations undertaken, is here assumed to reveal the country's private information to it. Hence, we may say that the IMF can be either of two types, L or H. I start out investigating whether the IMF has an incentive to pass its private information on to lenders when its only instrument is statements about the type of the borrowing country. This will provide insights into what may be expected to result from a multilateral institution that is very different from the IMF of today - one that only collects

[18] This is pointed out by Kenen (1986) himself, as well as other analysts such as Bird (1995).

information about the policies of different countries and publishes it - as well as whether having resources to lend changes the impact it has on the market for sovereign debt.

3.2 Cheap-Talk Equilibria

In the absence of IMF lending, its means of communication with the capital market are public statements about its private information. That is, the IMF and lenders are playing a game of "cheap-talk" in which the latter update their beliefs about the borrowing country after thinking through the incentives the former has to make truthful statements. We are thus looking for perfect Bayesian equilibria (PBE) in which behaviour is strategically rational given beliefs, with Bayes' Rule determining beliefs along the equilibrium path. Note that the IMF is the only truly strategic player in this game. As I have already pointed out, the assumption that investment is unobservable coupled with the fact that whatever borrowing terms a country of type H accepts a type L accepts too mean that the country cannot signal its type to lenders. Furthermore, the latter are assumed to be atomistic. Hence, the game is much like a monetary policy game where the central bank has private information about its type and the labour market is competitive so that the only "task" of wage setters is to form expectations about the central bank's type. I confine the discussion to pure strategy equilibria. This means that either the type of the borrower is revealed to the lenders (in a separating equilibrium) or they learn nothing and must go by their priors (in a pooling equilibrium). Then lenders have only three responses: they offer the borrower terms corresponding to it being L or H or, if nothing is learnt, $\left\{\overline{B}^P, r^P\right\}$.

By definition, cheap-talk does not directly affect pay-offs. In the current context, for instance, the only way in which statements made by the IMF can have an impact on its objectives as well as lenders' profits is by changing lenders' beliefs about borrowing country type, thereby inducing them to change their offer. This is in contrast to games where signalling of private information is costly, as will be the case in the next section when the IMF makes loans and cares about the returns to its capital. In particular, it means that there is always what has been termed a "babbling" equilibrium in which the receiver of a message treats all statements as containing no information and therefore goes by its prior, in turn making it equilibrium behaviour for the sender to send all possible messages with positive probability. As noted by Farrell (1993: 518), the babbling equilibrium is not very plausible: "It requires [the sender] to randomize extensively, saying some very unnatural things, not for his own sake but for the sake of equilibrium."[19] I adopt his approach of assuming that the literal meaning of any message is

[19] Also see Farrell and Rabin (1996).

clear, so that incentives to deceive are the only barrier to communication. Specifically, I use his concept of neologism-proofness to refine the set of PBE: if there is an out-of-equilibrium message (a neologism) with, say, the literal meaning "the country is of type H", then if and only if the IMF would like lenders to believe this statement only when it is true, an equilibrium in which this statement is not made is not neologism-proof if the IMF has an incentive to use it (i.e., is better off is the message is sent and believed than in the purported equilibrium).

With this prerequisite in place, there are essentially only three meanings that the IMF may communicate to lenders in a pure-strategy PBE.[20] Besides "the country is L" and "the country is H", the IMF may not convince lenders that either is true, leaving them to go by their priors. The last case is equivalent to making the statement "(N)o comment." This message may thus be seen as shorthand for all kinds of statements made in order to refrain from passing on any information to lenders. I therefore assume that the possible statements are L, H, and N. Now the IMF's pay-offs from the three relevant responses by lenders may be calculated as functions of the private information it has. Note that this includes the case where lenders mistakenly offer the terms they would present to the other type if there was full information (denoted by superscript F below). While this will never be part of an equilibrium, it is required to establish when the different kinds of equilibria exist.

When the IMF learns that the country is of type L, it knows that it will not invest and that it will default if any debt is incurred. Hence, unless its type is revealed lenders will lose money, the more so if they for some reason believe it is H. Using Proposition 1, which implies $U^{LF} = Y_1 + \overline{B}^{HS}$, $\Pi^{LF} = -\overline{B}^{HS}$,$U^{HF} = \varphi\left(1+\kappa^H\right)Y_1$, and $\Pi^{HF} = 0$, gives us the three values of the IMF's objective function that we are looking for. In the appendix, it is shown that $W^{LF} = W^{LS} + (2\omega - 1)\,\overline{B}^{HS}$ and $W^{LP} = W^{LS} + (2\omega - 1)\,\overline{B}^{P}$.[21] Recalling that $\overline{B}^{HS} > \overline{B}^{P}$, we thus have

$$\begin{aligned} W^{LS} \quad &\mathsf{T} \quad W^{LF} \Leftrightarrow \omega \;\mathsf{S}\; \frac{1}{2} \equiv \omega^*; \\ W^{LS} \quad &\mathsf{T} \quad W^{LP} \Leftrightarrow \omega \;\mathsf{S}\; \omega^*; \\ W^{LF} \quad &\mathsf{T} \quad W^{LP} \Leftrightarrow \omega \;\mathsf{T}\; \omega^*. \end{aligned}$$

Why is the critical value of the weight the IMF attaches to country welfare equal to $\frac{1}{2}$? It is due to the fact that L does not invest. Hence, a unit of funds borrowed is consumed in period 1, leading to a unit increase in country welfare. The lenders then incur a loss on this

[20] C.f. Farrell and Gibbons (1989).

[21] The appendix contains all calculations of pay-offs in the various cases analysed in the following.

unit of $-(1+\phi)$ in period 2, which corresponds to a one unit reduction in discounted profits. In essence, the money is just a transfer from lenders to the country, and the IMF is indifferent to such a transfer being made if and only if it puts equal weight on country welfare and profits.

Doing the same sort of calculations for the H-type of multilateral institution one finds that it is always the case that $W^{HS} > W^{HF}$ and $W^{HP} > W^{HF}$. That is, the worst thing that can happen from the perspective of an IMF of type H is that lenders offer the terms suitable for an L-type borrower under full information. This would generate a loss from reduced investment in H compared both to a separating and to a pooling equilibrium. Moreover, compared to a pooling equilibrium there is a loss of profits for lenders. If $i = H$, they make strictly positive profits in a pooling equilibrium since they charge a risk premium as long as this fact is not revealed to them. While this premium is such that the do not make profits in expectation, a knowledgeable IMF may generate profits for them by keeping them in the dark if it is type H.

What remains to be checked, therefore, is when the H-type IMF is better off in a separating than in a pooling equilibrium. The condition is

$$W^{HS} \quad \mathsf{T} \quad W^{HP}$$

$$\Leftrightarrow \quad \omega \ \mathsf{T} \ \omega_* = \frac{\left(r^P - \phi\right)\overline{B}^P}{\varphi\left(1+\phi\right)\left(\kappa^H - \phi\right)\left(\overline{B}^{HS} - \overline{B}^P\right) + \left[1 + \varphi\left(1+\phi\right)\right]\left(r^P - \phi\right)\overline{B}^P}.$$

The numerator is the (undiscounted) transfer effected from the borrower to the lenders in a pooling equilibrium because the latter charge a higher rate of interest when there is asymmetric information. The denominator contains the weighted sum of the transfer and the efficiency loss relative to the separating equilibrium due to the lower level of lending in a pooling equilibrium. It may be shown that for the parameter values assumed here $\omega_* < \omega^*$. Intuitively, the efficiency loss would make a multilateral applying uniform treatment to borrower and lenders prefer the separating equilibrium.[22] Hence, the objective function must be tilted in favour of lenders' profits for pooling to be preferred to separation by a type-H IMF.

Starting with $\omega \leq \omega_*$, we have already established $W^{HP} \geq W^{HS} > W^{HF}$ and $W^{LS} > W^{LP} > W^{LF}$. In this case, there is clearly a separating PBE since both types prefer separating to mimicking the other type. Letting m^{ij} denote the equilibrium statement by a type i IMF in a type j equilibrium, we have $m^{LS} = L$ and $m^{HS} = H$ no matter what out-of-equilibrium beliefs lenders have. The separating equilibrium is neologism-proof, something that will become even

[22] This statement would be completely accurate if $\varphi = \frac{1}{1+\phi}$. Since $\varphi < \frac{1}{1+\phi}$ is assumed here, the country discounts its loss from the transfer more heavily than lenders discount their gain. This would result in a critical value greater than 0.5 in the absence of an efficiency effect.

clearer once I have demonstrated that the pooling equilibria are not. Consider the PBE where $m^{LP} = m^{HS} = N$, $q^P(L) = 0$, and $q^P(N) = p$. Lenders' beliefs if they were to receive H do not matter; given the structure of pay-offs, a type-H IMF would not want to break this equilibrium even if it could convince lenders of its true type. However, L will: $W^{LS} > W^{LP}$. Moreover, since $W^{HP} > W^{HF}$, an H-type has no incentive to mislead lenders. Therefore, the statement L is "self-signalling" for the L-type. Hence, it can be argued that the belief $q^P(L) = 0$, which is what keeps L from saying L in the first place, is not reasonable, and then the equilibrium cannot be sustained.

In cheap-talk games it is usually the case that the amount of information that may be passed on in equilibrium is a function of the extent to which the preferences of the sender and the receiver are aligned.[23] Incentives are pretty well aligned in this case. Using the results of the previous sub-section, we have $\Pi^{HP} > \Pi^{HS} = \Pi^{HF}$ and $\Pi^{LS} > \Pi^{LP} = \Pi^{LF}$ so that the ranking of profits is much like the IMF's ranking of outcomes. This is not surprising: when ω is low, the IMF puts a lot of weight on lenders' profits relative to country welfare. The fact that the market is atomistic implies that private lenders can benefit from being uncertain about the country's type when $i = H$. Still, in this event the IMF has no reason to deliberately mislead them. Since it has rather strong incentives to transmit its private information to lenders when $i = L$, a separating equilibrium results.

The next range of parameter values is $\omega \in (\omega_*, \omega^*]$. What is different compared to the range just considered is that $W^{HS} > W^{HP}$. Hence, both IMF-types have the same kind of ranking of outcomes. Most importantly, there are no pooling equilibria since both types want to separate out. Thus, the only PBE is the separating one.

Moving into $\omega \in (\omega^*, 1)$, there is more action. While H's relative pay-offs stay the same, L's change to $W^{LS} < W^{LP} < W^{LF}$. That is, the L-type IMF now wants to mimick the H-type. This implies that there is no separating equilibrium; making the statement H will not convince lenders that this is true even if it is in fact so. And because the statement H is not self-signalling, the pooling equilibrium in which both types send the message N is neologism-proof. That is, in the unique pure-strategy PBE, lenders are no wiser after hearing the IMF's statement than they were before the game started.[24]

In sum, we have now derived Proposition 2:

Proposition 2

[23] See e.g. the seminal article on cheap-talk games by Crawford and Sobel (1982).

[24] Of course, it is also an equilibrium for both types to say H. The main point remains: the IMF is not able to credibly transmit any information to lenders in equilibrium.

When the IMF's only means of communicating with lenders is through statements, there is a critical value of the weight it attaches to borrowing country welfare relative to lenders profits $\omega^* = \frac{1}{2}$ such that

i) when $\omega < \omega^*$ the only neologism-proof pure-strategy PBE is separating, implying that the IMF's private information is fully transmitted to lenders in equilibrium; whereas

ii) when $\omega \geq \omega^*$, lenders learn nothing from the IMF's statement, forcing them to rely on their prior beliefs in making their decisions.

Given the discussion above, there should be no need for a formal proof. Instead I focus on the significance of the results presented in the proposition: they demonstrate that the IMF can improve outcomes in the market for sovereign debt even if it does not risk its own capital. Hence, Rodrik's (1996) "conjecture" is not generally correct. The prerequisite for having such an impact is that the IMF must not be too concerned with borrowing country welfare. More precisely, if $\omega < \omega^*$ it can credibly communicate its private information to the market, thereby contributing to raising the level of investment in an H-type borrower. As already noted such investment is efficient whether judged by the country's internal standards or by the world market rate of return, but in the absence of information transmission from the IMF the adverse selection problem means that it will be reduced below the level that is constrained efficient given the moral hazard problem. Since the model is very stylised, one should be careful in making judgements about whether the IMF's current institutional set-up is such that it would in fact realise these gains without lending any money on its own. However, given the weight that the rich countries - home of most lenders in the sovereign debt market - have in the political structure of the organisation, it at least seems likely that this is the case.

As an L-type developing country never does better in a separating equilibrium compared to a pooling equilibrium, this of course does not prove that it is welfare enhancing to have a "tough" IMF, i.e., an institution with a mandate that puts little weight on borrower country welfare. However, it can be proven that within the confines of the model, this is indeed the case in an ex ante sense:

Proposition 3

Let Υ be any linear combination of U and Π giving strictly positive weight to U. The pre-game value of Υ is strictly higher for $\omega < \omega^*$ than for $\omega \geq \omega^*$.

The proof is simple. Let $\Upsilon = \upsilon U + (1 - \upsilon)\,\Pi$, with $\upsilon \in (0, 1]$. Given linearity, the expected value of Υ using the ex ante probabilities of country type may be written as the weighted average of expected borrowing country welfare and expected profits: $E[\Upsilon] = \upsilon E[U] + (1 - \upsilon)\,E[\Pi]$. By construction, $E[\Pi] = 0$. Hence, $E[\Upsilon] = \upsilon E[U]$. For $\omega < \omega^*$, a separating equilibrium

outcome is realised, and we may use the results above to calculate that $E\left[U^S\right] = pY_1 + (1-p)\,\varphi\left[\left(1+\kappa^H\right)Y_1 + \left(\kappa^H - \phi\right)\overline{B}^{HS}\right]$. Similarly, for $\omega \geq \omega^*$ inserting the values for borrowing country welfare in a pooling equilibrium and rearranging yields $E\left[U^P\right] = p\left(Y_1 + \overline{B}^P\right) + (1-p)\,\varphi\left[\left(1+\kappa^H\right)Y_1 + \left(\kappa^H - r^P\right)\overline{B}^P\right]$. $E\left[U^S\right] \geq E\left[U^P\right] \Leftrightarrow \varphi \geq \frac{(1+\phi)-\lambda\left(1+\kappa^H\right)}{(1-\lambda)(1+\phi)(1+\kappa^H)}$. As $\kappa^H > \phi$, this critical value is smaller than $\frac{1}{1+\kappa^H}$. Moreover, by assumption $\varphi \geq \frac{1}{1+\kappa^H}$. Hence, $E\left[\Upsilon^S\right] > E\left[\Upsilon^P\right]$. Moreover, it may be noted that the gains from information transmission are actually understated here since the assumption that L has no period 2 income unless it invests means that there are no actual costs associated with default in a pooling equilibrium. Taking into account the resources wasted if L had some income to which the penalty λ applied even in the absence of investment would strengthen the case for having $\omega < \omega^*$.[25]

With these results in place, I turn to analysing equilibrium outcomes when the IMF is extending credit, something that will allow me to answer the question of whether there should be such lending.

4 IMF Lending and Information Transmission

4.1 IMF Lending: Terms and Objectives

Now suppose that the IMF lends an amount M at the rate of ρ. Moreover, assume that ρ is the opportunity cost of funds for the IMF, i.e., what it could have earned by lending this amount to another member. Since its funds are acquired from member countries and not from borrowing in the capital market, ρ is most likely different from ϕ. According to Guitián (1992: 41-42): "[F]or a long period of IMF history, levies on its financial assistance were generally unrelated to world market interest rates." The fact that the IMF has had to supplement members' subscriptions with borrowing from some of its larger members has implied an increase in the charges levied on its borrowers. In the process, the concessionary element has been reduced. Still, a rebate remains, at least for the low-income countries.[26] Within the context of this model, I take this to imply that $\rho \leq \phi$. I also assume that the charges are not type-specific, which is a reasonable

[25] It would also have increased ω^*.

[26] Bird (1995: 124-125) claims that charges have been rising more or less continually since 1950 and that since the beginning of the 1980s the concessional element has been significantly reduced. Still, he notes that charges applying to the medium-term facilities are probably 2-3 percentage points below comparable private interest rates. Less impressionistic evidence is presented by Zettelmeyer and Joshi (2005), who find that in general IMF lending was subsidised until the 1980s. Since 1987 there has been no subsidy associated with lending from the non-concessional facilities, while the low-income countries have still benefited from the low charges associated with the concessional facilities.

assumption since they mainly depend on the kind of facility drawn on. While the facility chosen does reflect economic fundamentals in some ways, these still vary across members drawing on the same facility without corresponding variation in charges.

The assumption that charges reflects the opportunity cost of funds amounts to saying that the IMF is not aiming at making profits on its lending to members. That is, discounted IMF "profits" are

$$\Sigma^i(M) = \frac{\left(1-\delta^i\right)(1+\rho)M - (1+\rho)M}{1+\rho} = \begin{cases} 0, \delta^i = 0; \\ -M, \delta^i = 1. \end{cases} \tag{7}$$

Hence, if it is repaid the IMF preserves its capital without adding to it whereas it loses an amount equal to the face value of the loan in the event of default. The potential loss is limited by a cap on loan size: $M \leq \widehat{M}$. The facilities offered by the IMF all have explicit caps on lending (see IMF 1998). For example, the Extended Fund Facility has an annual limit of 100% of the borrower's IMF quota, with the cumulative limit being 300%. Similarly, under the Enhanced Structural Adjustment Facility, the cap is at 190% of the member's quota, which may in exceptional circumstances be raised to 255%.

Σ enters the IMF's objective function in the following fashion[27]

$$\Omega^i(M) = \omega U^i(M) + (1-\omega)\Pi^i(M) + \Sigma^i(M). \tag{8}$$

Note that with this objective function the IMF attaches greater weight to the financial repercussions of its lending activities than to either country welfare or profits. This may be justified in terms of the need to safeguard its capital in order to be able to continue its operations in the future, a provision that is in fact enshrined in the Articles of Agreement. In fact, the objective function specified here seems to reflect the spirit of Article 1(v) fairly well; according to it, the IMF is "to give confidence to members by making the general resources of the Fund temporarily available to them under adequate safeguards, thus providing them with opportunity to correct maladjustments in their balance of payments without resorting to measures destructive of national or international prosperity." This is not to deny that other considerations enter the IMF's judgment from time to time. For example, Edwards (1989: 39) claims that "[i]n many cases [the] participation [of the IMF] was the result of political decisions made by the largest

[27] A similar objective function could be constructed for the IBRD. However, the justification for including profits would then be the influence that rich countries have due to their voting power. The IBRD's surplus from lending would be given weight as it has to preserve its good credit rating in order to be able to use the favourable terms at which it is able to borrow to extend concessional credit to its own borrowers.

members, in particular by the United States. For political reasons – dictated by geopolitical or other considerations – and many times against the judgement of the staff, U.S. and other industrialized countries saw fit to request (force?) the Fund to approve unrealistic programs from Egypt, the Sudan, Nicaragua, Argentina, and Brazil."[28] The genereal point is that the policies of the IMF and the World Bank are determined by the member countries, which have vote shares roughly corresponding to their share of the capital of these institutions. Furthermore, as in all organisations there are agency problems, a relevant example being the "disbursement imperative" under which loan officers in the Bank are labouring.[29] A complete assessment of the role that multilateral financial institutions can play therefore need to take into account political and bureaucratic aspects of these organisations that I abstract from here.

Finally, note that debt seniority is not an issue in this model due to the assumption that λ reflects a pure dead-weight loss. Since creditors receive nothing in the event of default it does not matter whether multilateral loans are senior to private debt (which is in fact the case) or not. While the implications of the seniority of multilateral debt for information transmission are worth pursuing,[30] I leave this to future research and concentrate on the basics here. This does not mean that multilateral lending has no direct impact on the market for sovereign debt. In fact, the calculation of private lending limits must now be based on the total value of debt service, since the borrowing country will default if the sum of private and multilateral interest and principal exceeds Y_2.[31] With the starting point being $(1+r^i)\,B + (1+\rho)\,M = \lambda Y_2$, the results are[32]

[28] Emphasis in original. Also see the ultimate insider Polak (1991: 32), who acknowledges that "[t]here have been several cases during the last decade in which, at one stage or another, the Fund gave in to political pressure by major members against the staff's better judgment: Sudan, Zaire, Egypt, Argentina", but argues that "political decisionmaking is the exception, not the rule". Econometric studies such as Bird and Rowlands (2001a) and Sturm, Berger, and de Haan (2002) seem to indicate that political factors, while present, do not dominate the decision process at the IMF. However, Barro and Lee (2002) find somewhat stronger evidence to that effect.

[29] See e.g. Mosley, Harrigan, and Toye (1991).

[30] See Rodrik (1996) and Krueger (1997), who argue that by reducing the riskiness of lending seniority weakens the credibility of the multilaterals' actions.

[31] Considering a situation where the penalties incurred by defaulting differ between private and multilateral debt, thus possibly making default on only one type of debt optimal, would take us too far afield.

[32] See the appendix for details of the derivation of θ^S and θ^P as well as the parameters η^S and η^P discussed below.

$$\widetilde{B}^{LS} = 0 = \overline{B}^{LS}; \tag{9a}$$

$$\widetilde{B}^{HS} = \overline{B}^{HS} + \theta^S M; \tag{9b}$$

$$\widetilde{B}^{P} = \overline{B}^{P} + \theta^P M. \tag{9c}$$

I use a tilda for these cut-off values in order to distinguish them from those existing in the absence of multilateral lending. However, as may be seen, they are clearly connected. Obviously, an L-type borrower still gets no private credit in a separating equilibrium since it will not invest. So multilateral lending has no impact on private credit in this case. How does multilateral lending affect private and total credit to the borrower in the other cases? The marginal impacts of M on $\widetilde{B}^{HS}$ and $\widetilde{B}^{P}$ are given by θ^S and θ^P, respectively. The signs of these parameters are the same. Specifically, $sign\ \theta^S = sign\ \theta^P = -sign\left[1+\rho-\lambda\left(1+\kappa^H\right)\right]$. When $1+\rho = \lambda\left(1+\kappa^H\right)$, multilateral lending has no effect on private lending because it does not change the borrower's incentives to default. When $1+\rho < \lambda\left(1+\kappa^H\right)$ both θ^S and θ^P are positive, i.e., there is crowding-in of private lending. Private actors extend more credit because the combination of highly concessional multilateral funds and the fact that the H-type invests all available resources make the country more creditworthy. It is then optimal to increase the lending limit even when there is uncertainty about country type. Finally, when $1+\rho > \lambda\left(1+\kappa^H\right)$ there is crowding-out of private lending as the degree of concessionality is so low that even though an H-type invests all available resources a unit borrowed from the IMF still increases its incentives to default, making private lenders reduce their credit to restore incentive compatibility.

Subject to a proviso to be discussed shortly, total credit to the borrower is

$$\widetilde{B}^{LS} + M = \overline{B}^{LS} + M = M; \tag{10a}$$

$$\widetilde{B}^{HS} + M = \overline{B}^{HS} + \eta^S M; \tag{10b}$$

$$\widetilde{B}^{P} + M = \overline{B}^{P} + \eta^P M; \tag{10c}$$

where $\eta^S = 1 + \theta^S$ is the marginal impact of M on total credit in a separating equilibrium and η^P is correspondingly defined. Total credit to a borrower revealed to be an L-type is equal to multilateral credit. When $\theta^S = \theta^P = 0$, multilateral lending is purely additional, i.e., increases total credit one-for-one. With crowding-in total credit increases by more than one unit for every additional unit of M. The IMF often claims that there is a large "catalytic" effect from its programmes, i.e., that stamping its seal of approval on a borrower allows the latter to tap other sources of capital because third-parties become convinced that the money will be

put to good use. Presently, there is not much evidence to back up this claim. In fact, one might easily argue to the contrary, pointing out that many countries are "serial borrowers" from the Fund, indicating that it is the "basket cases" that approach the IMF to request funding.[33] Empirical studies indicate a neutral effect overall, with private agents' negative reactions being approximately cancelled out by an increase in funding from other official sources.[34] As such the case where there is crowding-out of private lending - $1+\rho > \lambda\left(1+\kappa^H\right)$ - is perhaps the most empirically relevant. For the sake of brevity, I therefore focus on this parameter configuration in the following.

Note that due to concessionality total credit increases with M even when private lending is reduced. That is, when there is crowding-out $\theta^S, \theta^P \in (-1, 0)$ so that $\eta^S, \eta^P \in (0, 1)$. However, there is only so much private credit to crowd out, so the relationships stated in $(10a - c)$ are only true for $M < \widetilde{M}$, where $\widetilde{M}$ is defined by $\widetilde{B}^{HS} \equiv 0$. Beyond this point, total credit is equal to multilateral credit and thus increases one-for-one with IMF lending. There are three things to note about $\widetilde{M}$. Firstly, if $M > \widetilde{M}$ even an H-type will default. It will therefore never be optimal for the IMF to lend more than $\widetilde{M}$; if it did, investment in H will discouraged due to the penalty incurred in period 2, which is, moreover, assumed to be a pure deadweight loss. Hence, the IMF will lose money too. I therefore restrict the analysis to $M \in \left[0, \widetilde{M}\right]$ from now on. Secondly, $\widetilde{M} = \frac{\lambda\left(1+\kappa^H\right)Y_1}{1+\rho-\lambda(1+\kappa^H)} \geq \overline{B}^{HS}$ as long as $\rho \leq \phi$. Intuitively, if its loans are given on concessional terms the IMF can provide more credit than private lenders since the subsidised interest rate reduces the attractiveness of default. Thirdly, $\widetilde{M}$ is also the value at which $\widetilde{B}^P = 0$. However, for $M \in \left[0, \widetilde{M}\right)$ it is still the case that $\widetilde{B}^{HS} > \widetilde{B}^P$. That is, for $M < \widetilde{M}$ private lenders still extend more credit when they are certain that the borrower is of type H than they do when they have to go by their priors. This follows directly from the indifference condition defining the credit limits and from the fact that r^P is constant. In fact, r^P is still equal to $\frac{1+\phi}{1-p} - 1$ as the no-profit condition is unchanged. With all the prerequisites for deriving the PBE of this game in place, I move on to that task.

[33] The IMF itself is sufficiently concerned with the phenomenon of "prolonged use" of its resources by member countries that the first report of its new Independent Evaluation Office is devoted to this issue, c.f. IMF (2002).

[34] Bird and Rowlands (1997) contains a good discussion of these issues, as well as a summary of earlier empirical studies. The more recent review of the literature by Cottarelli and Ginannini (2002) supports the conclusion that the aggregate catalytic effect of IMF lending is weak. The latest studies of the effects of World Bank financing produces conflicting results, see e.g. Bird and Rowlands (2001b), Clemens (2002), Dasgupta and Ratha (2000), and Ratha (2001).

4.2 PBE with Multilateral Lending when Loan Size Is unconstrained

When loans to the borrower are the main instruments of the IMF's communication with private lenders, the model turns into a standard signalling game. That is, signalling is now costly, in contrast to the cheap-talk of the last section. We are of course still looking for pure-strategy PBE. In deriving these, we need to recalculate the pay-offs to the two types of IMF as functions of the lenders' reactions. I first assume that $\widetilde{M} \leq \widehat{M}$, postponing the discussion of the results when this condition does not hold until the next sub-section.

As already noted, a borrower of type L surely defaults. Since the IMF values its "profit" more strongly than country welfare, this means that making a loan directly reduces the value of its objective function by $(1-\omega)M$. In addition, of course, there is the negative impact on private credit when such loans are made. In fact, $\Omega^{LS}\left(\widetilde{M}\right) = \Omega^{LF}\left(\widetilde{M}\right) = \Omega^{LP}\left(\widetilde{M}\right)$; if private credit is completely crowded out, lenders' response is the same no matter their beliefs.

Making use of the definitions made in the previous sub-section we may rewrite these pay-offs to bring out their relationship to the corresponding ones in the cheap-talk game:

$$\Omega^{LS}(M) = W^{LS} - (1-\omega)M; \tag{11a}$$

$$\Omega^{LF}(M) = W^{LF} + \left[\omega\theta^S - (1-\omega)\eta^S\right]M; \tag{11b}$$

$$\Omega^{LP}(M) = W^{LP} + \left[\omega\theta^P - (1-\omega)\eta^P\right]M; \tag{11c}$$

Note that if no loan is made the value of the IMF's objective function is identical to its pay-off in the cheap-talk game for every relevant lender response. Therefore, the relative values of $\Omega^{Lj}(0)$ depend on whether $\omega \ \mathsf{T} \ \omega^*$. Also note that when $\theta^S, \theta^P < 0$, as is assumed here, the pay-off schedules are declining in M no matter the value of ω (as pointed out above, even in this case $\eta^S, \eta^P > 0$).

For the H-type it must also be the case that lenders' beliefs do not matter if multilateral lending is so high that private credit goes to zero: $\Omega^{HS}\left(\widetilde{M}\right) = \Omega^{HF}\left(\widetilde{M}\right) = \Omega^{HP}\left(\widetilde{M}\right)$. Similarly, rewriting pay-offs using the definition of the marginal effects of multilateral lending on private credit brings out the fact that they are the same as in the cheap-talk game when $M = 0$:

$$\Omega^{HS}(M) = W^{HS} + \omega\varphi\left[\left(\kappa^H - \rho\right) + \left(\kappa^H - \phi\right)\theta^S\right]M; \tag{12a}$$

$$\Omega^{HF}(M) = W^{HF} + \omega\varphi\left(\kappa^H - \rho\right)M; \tag{12b}$$

$$\Omega^{HP}(M) = W^{HP} + \left\{\omega\varphi\left[\left(\kappa^H - \rho\right) + \left(\kappa^H - r^P\right)\theta^P\right] + (1-\omega)\left(\frac{r^P - \phi}{1+\phi}\right)\theta^P\right\}M. \tag{12c}$$

As may be seen $\frac{\partial \Omega^{HF}}{\partial M} > 0$. Inserting the value of θ^S it is straightforward to establish that $\frac{d\Omega^{HS}}{dM} > 0$ too. A borrower of type H benefits from more multilateral credit if its type is known to private lenders as crowding out is less that 1:1 and multilateral terms concessional. Moreover, lenders make no profit no matter the volume of their lending. However, the sign of $\frac{d\Omega^{HP}}{dM}$ depends on the value of ω as in this case the IMF knows that higher values of M benefits the borrower at the expense of lenders, whose ex post profits decline along with their lending volume. Specifically, in the appendix I show that $\frac{d\Omega^{HP}}{dM} \ \mathsf{T} \ 0 \Leftrightarrow \omega \ \mathsf{T} \ \omega_{**}$ and, moreover, that $\omega_{**} < \omega_*$. This turns out to be important for refining the set of PBE.

The starting point for deriving equilibrium outcomes is the observation that if there was full information the IMF would not lend to an L-type and would lend $\widetilde{M}$ to an H-type. Lending to an L-type is a pure transfer when the beliefs of private lenders cannot be affected, and as such generate a marginal "benefit" of ω that is less than the "cost", which is unity. On the other hand $\frac{d\Omega^{HS}}{dM} > 0$, so it is optimal to give the maximum loan that the H-type borrower will take without defaulting. This means that there will be no private lending. It is optimal to fully replace private with multilateral lending because the concessional element allows investment by the H-type, which is efficient, to exceed the level that is obtainable with commercial credit.

As will shortly become clear, the search for a separating PBE where $\left\{M^{LS}, M^{HS}\right\} = \left\{0, \widetilde{M}\right\}$ should start in the range $\omega < \omega_{**}$. Figure 1 will prove useful in illustrating the arguments that follow. I claim that in this case there is a PBE where the two IMF types choose their full information lending choices. Of course, to complete the description of the equilibrium, lenders' beliefs must be specified. In equilibrium, these are $q^S(0) = 1$ and $q^S\left(\widetilde{M}\right) = 0$; out of equilibrium, $q^S(M) = 0 \ \forall M \in \left(0, \widetilde{M}\right)$ support the equilibrium. Moreover, these out-of-equilibrium beliefs are reasonable in the following sense: there is no response that lenders might choose upon seeing an out-of-equilibrium loan $M \in \left(0, \widetilde{M}\right)$ such that the L-type can benefit from making the deviation. In the parlance of Cho and Kreps (1987), such loans are equilibrium-dominated for L. This implies that these beliefs satisfy their Intuitive Criterion.

[Figure 1 about here]

I will now argue that although pooling PBE exist, none of them satisfy this criterion. As may be seen, H would like a pooling equilibrium to materialise since, with the exception of $M^P = \widetilde{M}$, it gets a higher pay-off in such an equilibrium than in a separating one. Consider first $M^P = \widetilde{M}$. This is obviously not a candidate for a pooling PBE as L gets its lowest possible pay-off. Regardless of which of the packages $\left\{\overline{B}^{LS}, \phi\right\}$, $\left\{\overline{B}^{HS}, \phi\right\}$, or $\left\{\overline{B}^{P}, r^P\right\}$ the lenders' present in response to an $M < \widetilde{M}$, L is better off. Similar logic rules out all other $M \geq M^*$, where M^* is defined by $\Omega^{LP}(M^*) = W^{LF}$. For these values of M Figure 1 demonstrates that

there is always some $M' \in [0, M^*)$ such that whatever the response of lenders L gets a higher pay-off by extending this loan. Thus, the candidate pooling equilibria are $M^P \in [0, M^*)$. Neither type will then deviate if lenders hold the out-of-equilibrium beliefs $q^P(M) = 0 \; \forall M \neq M^P$. But these beliefs are not reasonable. More specifically, assuming $q^P(M) = 0 \; \forall M > M^P$ does not satisfy the Intuitive Criterion because any deviation to a higher lending level can at best yield a pay-off to H that is lower than its equilibrium pay-off while there are obviously some loans a little higher than M^P that L will extend if doing so allows it to separate out. Hence, such deviations must be made by this type. Once lenders draw this conclusion it is optimal for L to deviate, thereby breaking the purported equilibrium.

For $\omega \in [\omega_{**}, \omega^*]$, at $\widetilde{M}$ L's pay-off is minimised while H's pay-off is maximised regardless of lenders' response. This means that L can break any pooling equilibrium by deviating to a smaller loan: applying the Intuitive Criterion, lenders should realise that whereas H cannot possibly gain from such deviations, L can.[35] Then, since L achieves its highest possible pay-off at zero if lenders' choose not to extend credit, the only PBE is the separating one in which $M^{LS} = 0$ and $M^{HS} = \widetilde{M}$. Thus, we have established that for $\omega \leq \omega^*$ multilateral lending does not change the amount of information transmitted to the market. Whether the IMF engages in costly signalling or is cheap-talking the borrower's type is revealed to the market.

Does the same invariance result extend to the case of $\omega > \omega^*$? It is still the case that $\widetilde{M}$ gives an H-type its highest possible pay-off however lenders respond, while it yields the lowest possible pay-off for an L-type. So even though mimicking now results in the highest pay-off for L for any $M < \widetilde{M}$, it will not pose as H if the latter chooses $\widetilde{M}$. Moreover, given separation, L will choose $M = 0$; there is no point in wasting money on the developing country if lenders are not fooled. It follows that the unique pure-strategy PBE for this parameter configuration is also $\left\{M^{LS}, M^{HS}\right\} = \left\{0, \widetilde{M}\right\}$.

In sum, we have

Proposition 4

For all $\omega \in (0, 1)$, the only pure-strategy PBE with unconstrained multilateral lending satisfying the Intuitive Criterion is a separating one in which the IMF gives no loan if the borrower is of type L and chooses $\widetilde{M}$ if it is of type H.

[35] This is strictly speaking only correct for $\omega > \omega_{**}$. When $\omega = \omega_{**}$, $\Omega^{HP}(M) = W^{HP} \; \forall M \in \left[0, \widetilde{M}\right]$ and this schedule lies above the others except at $\widetilde{M}$. Hence, no potential deviations are equilibrium-dominated for H, making it impossible for L to break pooling equilibria. Therefore all $M \in \left[0, \widetilde{M}\right]$ are pooling PBE if out-of-equilibrium beliefs are $q^P(M) = 0 \; \forall M \neq M^P$. Here I ignore this knife-edge possibility, which could be avoided by applying only slightly stronger refinements.

In combination with Proposition 2, this yields

Corollary 1

Unconstrained multilateral lending solves the adverse selection problem in the market for sovereign debt while certification only works if the IMF puts less weight on borrowing country welfare than profits.

Corollary 2

Concessional multilateral lending reduces the moral hazard problem in the market for sovereign debt.

By lending on concessional terms the IMF not only solves the adverse selection problem as reflected in private lending, it improves upon the outcome produced by the basic moral hazard problem. A borrower with low productivity of investment gets neither multilateral nor private credit, which is as it should be. Furthermore, when multilateral loans are concessional credit to a highly productive borrower, and thus investment by it, increases by $\widetilde{M} - \overline{B}^P > \overline{B}^{HS} - \overline{B}^P$. In the linear model used here, the optimal level of investment in a type-H developing country is infinite, but this obviously does not imply that all the resources in the world should be channeled through the IMF. Yet even in a more realistic model the result would hold up as the moral hazard problem would cause investment in a highly productive borrower to be below the level at which its marginal product of capital is equal to the world market rate of interest. The result therefore provides a rationale for unconstrained multilateral lending on concessional terms. Currently, though, multilateral lending is concessional but not unlimited. Would a binding constraint on loan volumes change outcomes?

4.3 PBE with Multilateral Lending when Loan Size Is constrained

I now investigate what happens when $\widetilde{M} > \widehat{M} > 0$. Intuitively, if the restriction on loan size is severe enough pooling becomes equilibrium behaviour. For example, when $\omega < \omega_{**}$ there will be pooling at $\widehat{M}$ if $\widehat{M} < M^*$. The argument made in connection with Figure 1 was that any pooling equilibrium in which $M^P \in [0, M^*)$ could be broken through a deviation by L to some slightly higher loan. This is clearly not possible if $M^P = \widehat{M}$ as loan size cannot exceed this level. It follows that $M^P = \widehat{M}$ and $q^P(M) = 0 \ \forall M \in \left[0, \widehat{M}\right)$ is a PBE for these parameter values.

When $\omega \in [\omega_{**}, \omega_*)$, pooling at $\widehat{M}$ will still give H its highest possible pay-off because the schedule $\Omega^{HP}(M)$ lies above the others. However, L will exploit the fact that all H's pay-off schedules are upward sloping by deviating to a lower loan, implying that there will be a

separating PBE in which $\left\{M^{LS}, M^{HS}\right\} = \left\{0, \widehat{M}\right\}$.[36] For $\omega \in [\omega_*, \omega^*]$, it remains the case that separation by choosing 0 and $\widehat{M}$, respectively, results in maximum pay-offs for L and H.

[Figure 2 about here]

Figure 2 is a valuable aid in demonstrating the workings of the model when $\omega > \omega^*$. In it, two critical values of lending are shown. These are defined by $\Omega^{LF}(M^{***}) = W^{LS}$ and $\Omega^{LP}(M^{**}) = W^{LS}$. In the appendix, I demonstrate that $M^{**} < M^{***} < \widetilde{M}$. The set $\left[M^{***}, \widetilde{M}\right]$ contains all potential separating equilibrium choices by H. By definition, these are the values of M such that L prefers separating out by choosing $M = 0$ to mimicking H. On the other hand, $[0, M^{**}]$ is the set of potential pooling equilibria. It is the loans that give L a higher pay-off than separating out by not lending provided lenders are no wiser than they were ex ante after observing such M. Looking at Figure 2 we see that as long as $\widehat{M} > M^{***}$ the PBE must be separating with $\left\{M^{LS}, M^{HS}\right\} = \left\{0, \widehat{M}\right\}$ even when $\omega > \omega^*$. However, when $\widehat{M} \leq M^{***}$ there are only pooling equilibria because L would like to mimick H. In fact, all $M \in [0, M^{**}]$ are pooling PBE as long as it is believed that any possible deviation comes from L; the Intuitive Criterion cannot rule out such beliefs as deviations are not equilibrium-dominated for either type.

One potential worry arising when the equilibrium is pooling is that the H-type country would like to separate out by refusing the loan from the IMF. This possibility does not arise in the separating equilibrium. The L-borrower is not given the option to refuse since it gets no loan from the multilateral. The H-type borrower does not want to refuse the loan as it ends up with more credit in total than it could get by just borrowing from private lenders and in addition this credit is (wholly or partially) on concessional instead of commercial terms. However, when, say, $M^P = \widehat{M}$ and the lending cap is low, the country could potentially benefit from only borrowing from private lenders if it can convince them that it is in fact of type H.

It may be shown that this worry is not real. If refusing an IMF loan is interpreted as signalling type H, it is the case that the true type-H borrower will be better off by not lending from the IMF if M^P is low enough. But the L-type country will then also deviate. Intuitively, the size of the multilateral loan required to "bribe" L into accepting the pooling equilibrium is higher than for H as the latter type will repay private lenders instead of just taking the money and consume it in period 1. So a separating equilibrium where L gets only multilateral funding and H only private loans does not exist in this model. On the other hand, pooling equilibria as just described exist if rejection as well as other values of M are interpreted as implying $i = L$. In such an equilibrium both types of developing country receive more funds by accepting than

[36] This statement is subject to the caveat mentioned in the previous footnote.

rejecting the IMF's offer; and we already know that for such out-of-equilibrium beliefs the IMF would not want to change the size of its loan.

These results may be summarised as follows:

Proposition 5

If the restriction on multilateral lending binds, i.e., $\widehat{M} < \widetilde{M}$, the pure-strategy PBE lending decisions of the IMF are

i) for $\omega < \omega_{**}$: a) $\widehat{M} \geq M^*$, $\left\{M^{LS}, M^{HS}\right\} = \left\{0, \widehat{M}\right\}$; b) $\widehat{M} < M^*$, $M^P = \widehat{M}$;

ii) for $\omega \in [\omega_{**}, \omega^*]$: $\left\{M^{LS}, M^{HS}\right\} = \left\{0, \widehat{M}\right\}$;

iii) for $\omega > \omega^*$: a) $\widehat{M} > M^{***}$, $\left\{M^{LS}, M^{HS}\right\} = \left\{0, \widehat{M}\right\}$; b) $\widehat{M} \leq M^{***}$, $M^P \in [0, M^{**}]$.

In other words, if $\widetilde{M} > \widehat{M}$ pooling equilibria where the IMF extends the same loan regardless of its private information exist for some parameter values, including ones in which there was separation with cheap-talk. This result demonstrate that if the restriction on loan size is sufficiently strict the IMF cannot necessarily solve the adverse selection problem in the sovereign debt market. Since total credit is increasing in M it is true that investment in the highly productive type of borrowing country goes up with multilateral lending even if the IMF does not succeed in transmitting its private information to private lenders. Yet it rises by much less than is the case in the separating equilibrium. In addition, the low productivity type now actually receives more funding, not less, with the IMF limiting the losses private lenders incur in this event by transferring some of its own capital to the borrower. As it does not make a profit when $i = H$ this situation cannot continue without sustained increases in members' quotas. This is an unrealistic scenario. Therefore, while there may be good reasons for capping loan size that are not considered here, such as not putting all one's eggs in one basket, care must taking in devising such limits. If they become too stringent the potentially beneficial role that we have seen that multilateral lending can play is jeopardised.

5 Concluding Remarks

In this paper, I have analysed whether multilateral lending may be justified if multilateral financial institutions have an informational advantage relative to private actors in the market for sovereign debt. I have shown that the adverse selection problem that reduces the amount of credit available to good risks and worsens the terms at which they can borrow may be solved even in the absence of lending provided the multilateral agency does not care too much about borrower country welfare. However, unconstrained multilateral lending does at least as well in this respect as the private information of the multilateral will be transferred to lenders no matter

the relative weighting of country welfare and lenders' profits. In contrast, multilateral lending may not lead to private lenders being able to distinguish good from bad borrowers if loan size is restricted, and may in fact worsen the problem compared to a situation where the multilateral agency merely certifies borrowers.

Needless to say, the results are based on a highly stylised model, which might usefully be extended in many directions. Some of the extensions could change the relative merits of certification and lending. For example, in this paper I have assumed that the quality of the information possessed by the multilateral is given. With endogenous quality, it could be the case that the multilateral would gather more accurate information if the returns to its capital depend on it. This would strengthen the case for lending as the preferred tool for information transmission. One may also allow for more types of borrowers. This is likely to reduce the amount of information that can be transmitted in a cheap-talk equilibrium (c.f. Crawford and Sobel 1982), providing greater scope for lending to improve matters. On the other hand, one can also think of extensions that make certification more attractive relative to lending. As already mentioned, seniority of multilateral debt could reduce the power of lending as an instrument for revealing the multilateral's private information as its risk of losing money is reduced. Likewise, if the borrowing country has multilateral debt incurred before the game starts and it is possible that this debt will not be honoured in some future states of the world, the multilateral might engage in defensive lending, i.e., extend new loans in the hope of recouping more of the old debt. This will reduce the information content of multilateral lending and strengthen the case for cheap-talking.

Other interesting extensions that do not necessarily have a direct bearing on the question of lending or certification include the case where the multilateral have less than completely accurate information about the borrower. Of course, if it is no better informed than lenders, the multilateral cannot play an informational role at all. But as long as it has an informational advantage, the multilateral should be able to contribute to improved efficiency in at least some cases. How this would affect the comparison of cheap-talk and costly signalling is not obvious, however. One could also study cases where it is efficient to have the low productivity borrower invest. It seems reasonable to venture that as the two types become more similar, there is less potential for welfare improvement through information transmission as the consequences for private lenders if they are mistaken become smaller. This would weaken the informational rationale for having a multilateral institution no matter what its instrument of operation is. Thus, paradoxically, if the multilaterals' policy advice is heeded, creating greater similarity among borrowing countries, they might undermine their own importance to private actors. Finally, one could study what determines whether multilateral lending crowds in or out other forms of capital such as FDI or

bilateral aid. This would be a step towards understanding the broader economic consequences of the existence of the multilaterals for developing countries. However, a complete analysis of the contribution of multilateral lending to financing economic development in a world of globalised capital markets would have to take into account incentives on both the supply-side and the demand-side, which in the real world jointly determine how other actors evaluate the outcome of the interaction between a multilateral agency and a borrower country.

6 Appendix

IMF cheap-talk

The derivation of the specific values of the IMF's objective function leading to the critical values of ω shown in the main text proceeds as follows. Starting with the cheap-talk game, Proposition 1 gives us U^{LS}, U^{LP}, Π^{LS}, and Π^{LP}. It also implies that $U^{LF} = Y_1 + \overline{B}^{HS}$ and $\Pi^{LF} = -\overline{B}^{HS}$. Inserting these values into (6) leads to

$$W^{LS} = \omega U^{LS} + (1-\omega)\,\Pi^{LS} = \omega Y_1; \tag{A1a}$$

$$W^{LF} = \omega U^{LF} + (1-\omega)\,\Pi^{LF} = \omega Y_1 + (2\omega - 1)\,\overline{B}^{HS}; \tag{A1b}$$

$$W^{LP} = \omega U^{LP} + (1-\omega)\,\Pi^{LP} = \omega Y_1 + (2\omega - 1)\,\overline{B}^{P}. \tag{A1c}$$

We thus see that the critical value of ω, denoted by ω^*, at which $W^{LS} = W^{LF} = W^{LP}$ is equal to 0.5. The ranking of pay-offs is completed by using the fact that $\overline{B}^{HS} > \overline{B}^{P}$.

Performing the same kind of exercise for the H-type of multilateral institution, inferring from Proposition 1 that $U^{HF} = \varphi\left(1+\kappa^H\right)Y_1$ and $\Pi^{HF} = 0$, yields

$$W^{HS} = \omega\varphi\left[\left(1+\kappa^H\right)Y_1 + \left(\kappa^H - \phi\right)\overline{B}^{HS}\right]; \tag{A2a}$$

$$W^{HF} = \omega\varphi\left(1+\kappa^H\right)Y_1; \tag{A2b}$$

$$W^{HP} = \omega\varphi\left[\left(1+\kappa^H\right)Y_1 + \left(\kappa^H - r^P\right)\overline{B}^{P}\right] + (1-\omega)\left(\frac{r^P - \phi}{1+\phi}\right)\overline{B}^{P}. \tag{A2c}$$

As $\kappa^H > r^P > \phi$ and both $\overline{B}^{HS}$ and $\overline{B}^{P}$ are strictly positive, $W^{HS} > W^{HF}$ and $W^{HP} > W^{HF}$. Moreover, W^{HS} T $W^{HP} \Leftrightarrow \omega$ T ω_*, where ω_* is defined in the main text.

IMF Lending

The condition defining sovereign indifference between servicing its debt and defaulting is now $(1+r^i)\,B + (1+\rho)\,M = \lambda Y_2$. From it, one may derive that

$$\widetilde{B}^{LS} = 0 = \overline{B}^{LS}; \tag{A3a}$$

$$\widetilde{B}^{HS} = \frac{\lambda\left(1+\kappa^H\right)Y_1}{1+\phi-\lambda\left(1+\kappa^H\right)} - \left[\frac{1+\rho-\lambda\left(1+\kappa^H\right)}{1+\phi-\lambda\left(1+\kappa^H\right)}\right]M \equiv \overline{B}^{HS} + \theta^S M; \tag{A3b}$$

$$\widetilde{B}^{P} = \frac{\lambda\left(1+\kappa^H\right)Y_1}{1+r^P-\lambda\left(1+\kappa^H\right)} - \left[\frac{1+\rho-\lambda\left(1+\kappa^H\right)}{1+r^P-\lambda\left(1+\kappa^H\right)}\right]M \equiv \overline{B}^{P} + \theta^P M, \tag{A3c}$$

where the definitions $\theta^S = -\left[\frac{1+\rho-\lambda\left(1+\kappa^H\right)}{1+\phi-\lambda\left(1+\kappa^H\right)}\right]$ and $\theta^P = -\left[\frac{1+\rho-\lambda\left(1+\kappa^H\right)}{1+r^P-\lambda\left(1+\kappa^H\right)}\right]$ have been made. By assumption, $1+\phi > \lambda\left(1+\kappa^H\right)$. Since $r^P > \phi$, $1+r^P > \lambda\left(1+\kappa^H\right)$. Hence, $sign\ \theta^S = sign\ \theta^P = -sign\left[1+\rho-\lambda\left(1+\kappa^H\right)\right]$ and there is crowding-out of private lending to an H-type borrower in a separating equilibrium and to both types in a pooling equilibrium ($\theta^P, \theta^S < 0$) when $1+\rho > \lambda\left(1+\kappa^H\right)$. It may also be deduced that $0 < \left|\theta^P\right| \leq \left|\theta^S\right| < 1$.

Given the assumptions, $\widetilde{B}^{LS} = \overline{B}^{LS} = 0$. Hence, multilateral credit has no impact on private lending in that case. Denote the level of multilateral lending at which private credit is zero in the situations where the former crowds out the latter by $\widetilde{M}$. From $(A3b-c)$ it may be seen that it does not depend on the type of equilibrium being realised and that it is equal to $\frac{\lambda\left(1+\kappa^H\right)Y_1}{1+\rho-\lambda\left(1+\kappa^H\right)}$, which is at least as high as $\overline{B}^{HS}$ because $\rho \leq \phi$.

As discussed in the main text, subject to $M < \widetilde{M}$, total credit to the borrower is

$$\widetilde{B}^{LS} + M = \overline{B}^{LS} + M = M; \tag{A4a}$$

$$\widetilde{B}^{HS} + M = \overline{B}^{HS} + \left[\frac{(\phi-\rho)}{1+\phi-\lambda\left(1+\kappa^H\right)}\right]M \equiv \overline{B}^{HS} + \eta^S M; \tag{A4b}$$

$$\widetilde{B}^{P} + M = \overline{B}^{P} + \left[\frac{\left(r^P-\rho\right)}{1+r^P-\lambda\left(1+\kappa^H\right)}\right]M \equiv \overline{B}^{P} + \eta^P M; \tag{A4c}$$

where $\frac{\partial\left(\widetilde{B}^{HS}+M\right)}{\partial M} = 1+\theta^S \equiv \eta^S$ and η^P is correspondingly defined. As shown above, with crowding-out $0 > \theta^P > \theta^S > -1$. Then $0 < \eta^S < \eta^P < 1$.

For the L-type IMF, pay-offs with lending are

$$\Omega^{LS}(M) = \omega Y_1 - (1-\omega)M; \tag{A5a}$$

$$\Omega^{LF}(M) = \omega Y_1 + (2\omega-1)\widetilde{B}^{HS} - (1-\omega)M; \tag{A5b}$$

$$\Omega^{LP}(M) = \omega Y_1 + (2\omega-1)\widetilde{B}^{P} - (1-\omega)M. \tag{A5c}$$

Note that whatever the strategy of lenders, the IMF's pay-off is decreasing in M. Moreover, as $\widetilde{B}^{HS} = \widetilde{B}^{P} = 0$ at $\widetilde{M}$, $\Omega^{LS}\left(\widetilde{M}\right) = \Omega^{LF}\left(\widetilde{M}\right) = \Omega^{LP}\left(\widetilde{M}\right) = \omega Y_1 - (1-\omega)\widetilde{M}$. Using the definitions of θ^j and η^j, $j = S, P$, one may rewrite $(A5b-c)$ as $(11b-c)$.

The corresponding pay-off schedules for the H-type are

$$\Omega^{HS}(M) = \omega\varphi\left[\left(1+\kappa^H\right)Y_1 + \left(\kappa^H-\phi\right)\widetilde{B}^{HS} + \left(\kappa^H-\rho\right)M\right]; \tag{A6a}$$

$$\Omega^{HF}(M) = \omega\varphi\left[\left(1+\kappa^H\right)Y_1 + \left(\kappa^H-\rho\right)M\right]; \tag{A6b}$$

$$\Omega^{HP}(M) = \omega\varphi\left[\left(1+\kappa^H\right)Y_1 + \left(\kappa^H-r^P\right)\widetilde{B}^{P} + \left(\kappa^H-\rho\right)M\right] + (1-\omega)\left(\frac{r^P-\phi}{1+\phi}\right)\widetilde{B}^{P} \tag{A6c}$$

Observe that $\Omega^{LS}\left(\widetilde{M}\right) = \Omega^{LF}\left(\widetilde{M}\right) = \Omega^{LP}\left(\widetilde{M}\right) = \omega\varphi\left[\left(1+\kappa^H\right)Y_1 + \left(\kappa^H-\rho\right)\widetilde{M}\right]$. Using the definitions of θ^j and η^j, $j = S, P$, $(A6a)$ and $(A6c)$ may be stated as $(12a)$ and $(12c)$, respectively.

The derivatives of $(A6a-c)$ with respect to M are

$$\frac{d\Omega^{HS}}{dM} = \omega\varphi\left[\left(\kappa^H-\phi\right)\theta^S + \left(\kappa^H-\rho\right)\right] = \omega\varphi\left[\frac{(1-\lambda)\left(1+\kappa^H\right)(\phi-\rho)}{(1+\phi)-\lambda\left(1+\kappa^H\right)}\right] > 0; \tag{A7a}$$

$$\frac{\partial\Omega^{HF}}{\partial M} = \omega\varphi\left(\kappa^H-\rho\right) > 0; \tag{A7b}$$

$$\frac{d\Omega^{HP}}{dM} = \omega\varphi\left[\left(\kappa^H-\rho\right) + \left(\kappa^H-r^P\right)\theta^P\right] + (1-\omega)\left(\frac{r^P-\phi}{1+\phi}\right)\theta^P \tag{A7c}$$

It is tedious but straightforward to verify that

$$\frac{d\Omega^{HP}}{dM} \;\mathsf{T}\; 0 \Leftrightarrow \omega \;\mathsf{T}\; \omega_{**} = \frac{\left(r^P-\phi\right)\left[(1+\rho)-\lambda\left(1+\kappa^H\right)\right]}{\varphi(1+\phi)(1-\lambda)\left(1+\kappa^H\right)\left(r^P-\rho\right)+\left(r^P-\phi\right)\left[(1+\rho)-\lambda\left(1+\kappa^H\right)\right]}, \tag{A8}$$

and that given the assumptions made $\omega_{**} < \omega_*$.

The critical value of multilateral lending shown in figure 1 is defined in the following way:

$$\Omega^{LP}(M^*) = W^{LF} \Leftrightarrow M^* = \left[\frac{(1-2\omega)\left(r^P-\phi\right)}{\omega\left[1+\rho-\lambda\left(1+\kappa^H\right)\right]+(1-\omega)\left(r^P-\rho\right)}\right]\overline{B}^{HS}. \tag{A9}$$

Given the assumed parameter values, the term in brackets is less than one and so $M^* < \overline{B}^{HS} \leq \widetilde{M}$.

The critical values of IMF-lending shown in figure 2 are derived as follows

$$\Omega^{LF}(M^{***}) = W^{LS} \Leftrightarrow M^{***} = \frac{(2\omega-1)\lambda\left(1+\kappa^H\right)Y_1}{\omega\left[1+\rho-\lambda\left(1+\kappa^H\right)\right]+(1-\omega)(\phi-\rho)}; \tag{A10a}$$

$$\Omega^{LP}(M^{**}) = W^{LS} \Leftrightarrow M^{**} = \frac{(2\omega-1)\lambda\left(1+\kappa^H\right)Y_1}{\omega\left[1+\rho-\lambda\left(1+\kappa^H\right)\right]+(1-\omega)\left(r^P-\rho\right)}. \tag{A10b}$$

Since $r^P > \phi$, $M^{***} > M^{**}$. Moreover, $\frac{\partial M^{***}}{\partial\omega} > 0$ and $Lim_{\omega\to 1}M^{***} = \frac{\lambda\left(1+\kappa^H\right)Y_1}{1+\rho-\lambda\left(1+\kappa^H\right)} = \widetilde{M}$. Hence, $M^{***} < \widetilde{M}$.

References

[1] Acharya, S. and I. Diwan (1993): "Debt Buy-Backs Signal Sovereign Countries' Creditworthiness: Theory and Tests." International Economic Review 34: 795-817.

[2] Barro, R.J. and J. Lee (2002): IMF Programs: Who Is Chosen and What Are the Effects? National Bureau of Economic Research Working Paper 8951.

[3] Bhattacharya, S. and E. Detragiache (1994): "The Role of Multilateral Institutions in the Market for Sovereign Debt." Scandinavian Journal of Economics 96: 515-529.

[4] Bird, G. (1995): IMF Lending to Developing Countries. Issues and Evidence. Routledge.

[5] Bird, G. and D. Rowlands (1997): "The Catalytic Effect of Lending by the International Financial Institutions." World Economy 20: 967-91.

[6] Bird, G. and D. Rowlands (2001a): "IMF Lending: How Is it Affected by Economic, Political and Institutional Factors?" Journal of Policy Reform 4: 243-270.

[7] Bird, G. and D. Rowlands (2001b): "World Bank Lending and other Financial Flows: Is there a Connection?" Journal of Development Studies 37: 83-103.

[8] Bordo, M.D. and H. James (2000): The International Monetary Fund: Its present Role in Historical Perspective. National Bureau of Economic Research Working Paper 7724.

[9] Bordo, M.D., A. Mody, and N. Oomes (2004): Keeping Capital Flowing: the Role of the IMF. National Bureau of Economic Research Working Paper 10834.

[10] Bulow, J. and K. Rogoff (1988): Multilateral Negotiations for Rescheduling Developing Country Debt: a Bargaining-Theoretic Framework. In J.A. Frenkel, M.P. Dooley, and P. Wickham: Analytical Issues in Debt, IMF.

[11] Clemens, M.A. (2002): World Bank Lending neither Complements nor Substitutes for Private Capital. Center for Global Development Working Paper 20.

[12] Cho, I-K. and D.M. Kreps (1987): "Signaling Games and Stable Equilibria." Quarterly Journal of Economics 102: 179-222.

[13] Cottarelli, C. and C. Ginannini (2002): Bedfellows, Hostages, or Perfect Strangers? Global Capital Markets and the Catalytic Effect of IMF Crisis Lending. IMF Working Paper 02/193.

[14] Crawford, J.P. and J. Sobel (1982): "Strategic Information Transmission." Econometrica 50: 1431-1451.

[15] Dasgupta, D. and D. Ratha (2000): What Factors appear to Drive Private Capital Flows to Developing Countries? And how Does Official Lending Respond? World Bank Policy Research Working Paper 2392.

[16] Diwan, I. and D. Rodrik (1992): External Debt, Adjustment, and Burden Sharing: a Unified Framework. Princeton Studies in International Finance 73.

[17] Easterly, W. (2005): "What Did Structural Adjustment Adjust? The Association of Policies and Growth with repeated IMF and World Bank Adjustment Loans." Journal of Development Economics 76: 1-22.

[18] Eaton, J. and R. Fernandez (1995): Sovereign Debt. In G. Grossman and K. Rogoff (eds.): Handbook of International Economics, volume III. Elsevier Science.

[19] Edwards, S. (1989): "The International Monetary Fund and the Developing Countries: a Critical Evaluation." Carnegie-Rochester Conference Series on Public Policy 31: 7-68.

[20] Fafchamps, M. (1996): "Sovereign Debt, Structural Adjustment, and Conditionality." Journal of Development Economics 50: 313-335.

[21] Farrell, J. (1993): "Meaning and Credibility in Cheap-Talk Games." Games and Economic Behavior 5: 514-531.

[22] Farrell, J. and R. Gibbons (1989): "Cheap Talk with Two Audiences." American Economic Review 79: 1214-1223.

[23] Farrell, J. and M. Rabin (1996): "Cheap Talk." Journal of Economic Perspectives 10: 103-118.

[24] Gavin, M. and D. Rodrik (1995): "The World Bank in Historical Perspective." American Economic Review 85: 329-334.

[25] Guitián, M. (1992): The Unique Nature of the Responsibilities of the International Monetary Fund. IMF Pamphlet Series No. 46.

[26] IMF (1998): Financial Organization and Operations of the IMF. IMF Pamphlet Series No. 45.

[27] IMF (2002): Evaluation of Prolonged Use of IMF Resources. Evaluation Report, Independent Evaluation Office, IMF.

[28] Kenen, P.B. (1986): Financing, Adjustment, and the International Monetary Fund. Studies in International Economics, the Brookings Institution.

[29] Killick, T. (1995). IMF Programmes in Developing Countries. Design and Impact. Routledge.

[30] Killick, T. with R. Gunatilaka and A. Marr (1998). Aid and the Political Economy of Policy Change. Routledge.

[31] Klimenko, M.M. (2002): "Trade Interdependence, the International Financial Institutions, and the Recent Evolution of Sovereign-Debt Renegotiations." Journal of International Economics 58: 177-209.

[32] Krueger, A.O. (1997): Whither the World Bank and the IMF? National Bureau of Economic Research Working Paper 6327.

[33] Marchesi, S. and J.P. Thomas (1999): "IMF Conditionality as a Screening Device." Economic Journal 109: C111-C125.

[34] Mody, A. and D. Saravia (2003): Catalyzing Capital Flows: Do IMF-Supported Programs Work as Commitment Devices? IMF Working Paper 03/100.

[35] Mosley, P., J. Harrigan, and J. Toye (1991). Aid and Power. The World Bank and Policy-Based Lending. Routledge.

[36] Polak, J. (1991): The Changing Nature of IMF Conditionality. Princeton Essays in International Finance 184.

[37] Ratha, D. (2001): Complementarity between Multilateral Lending and Private Flows to Developing Countries: Some Empirical Results. World Bank Policy Research Working Paper 2746.

[38] Rodrik, D. (1996): Why Is there Multilateral Lending? In M. Bruno and B. Pleskovic (eds.): Annual World Bank Conference on Development Economics 1995, the World Bank.

[39] Roubini, N. and B. Setser (2004): Bailouts or Bail-Ins? Responding to Financial Crises in Emerging Market Economies. Institute for International Economics.

[40] Sachs, J. (1989): Conditionality, Debt Relief, and the Developing Country Debt Crisis. In J. Sachs (ed.): Developing Country Debt and Economic Performance, Volume 1, University of Chicago Press.

[41] Sturm, J-E., H. Berger, and J. de Haan (2002): IMF Credit: How Important Are Political Factors? A Robustness Analysis. CESifo Working Paper 642.

[42] Wells, R. (1993): "Tolerance of Arrearages: How IMF Loan Policy Can Effect Debt Reduction." American Economic Review 83: 621-633.

[43] World Bank (1998): Assessing Aid. What Works, What Doesn't, and Why. Oxford University Press.

[44] Zettelmeyer, J. and P. Joshi (2005): Implicit Transfers in IMF Lending, 1973-2003. IMF Working Paper 05/8.

Figure 1: Pay-off Schedules for $\omega<\omega_{**}$

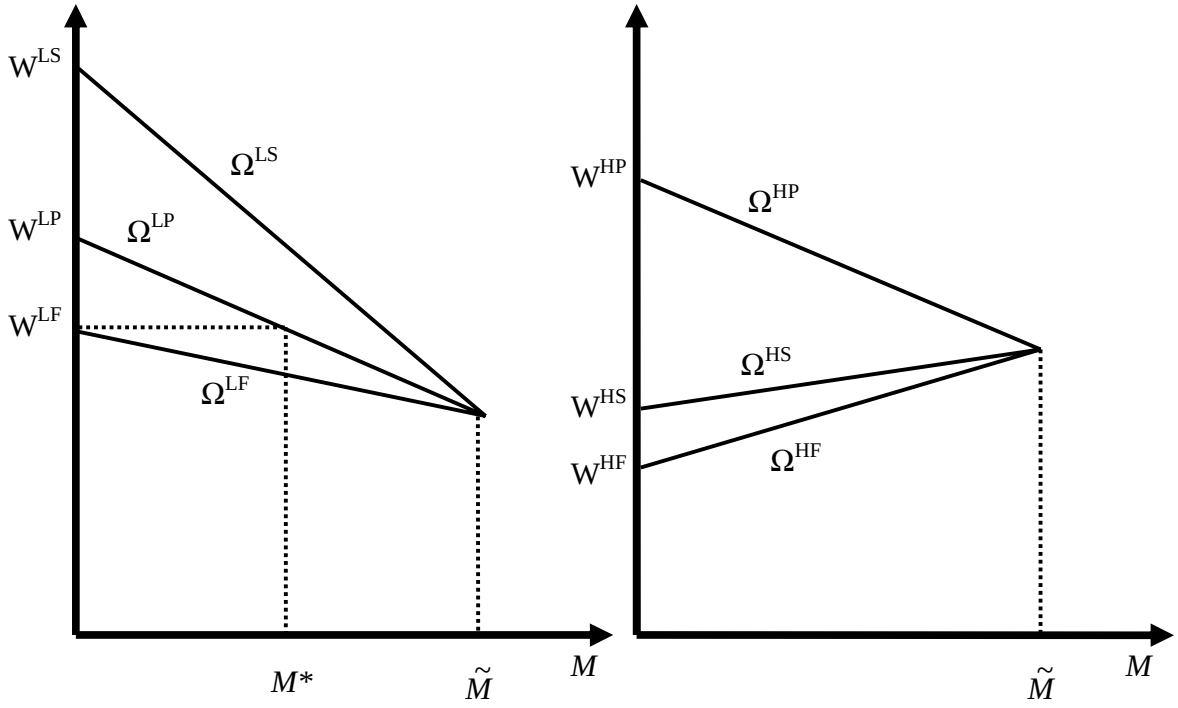

Figure 2: Pay-off Schedules for *L* when $\omega>\omega^{*}$