# Basic Analytics of IMF Lending and Surveillance*

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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 relative to lenders in the market for sovereign debt. I show that the adverse selection problem in this market may be solved even in the absence of lending 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 transferred to lenders no matter the relative weighting of welfare and lenders' profits. In contrast, multilateral lending may not lead to 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 agency plays a purely informational role.

## 1 Introduction

Private 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 were 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, 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 private 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, private capital markets still fail, and 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 also fail. One must therefore demonstrate that public institutions can reasonably be expected to outperform

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

private ones. In the current context, Rodrik (1995) 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 are by themselves arguments for lending by multilateral institutions.

In the next section, I discuss whether one may make a case for multilateral lending based on one or both of these suggested advantages. I argue that a stronger case can be made starting from the public good aspect of information about the characteristics of borrowing countries. In the remainder of the paper, I formally analyse the conditions in which lending by a multilateral agency such as the IMF contributes to alleviating the adverse selection problem in the market for sovereign debt when the agency 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 ("cheap talk").

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 cheap-talk does not. Then again, if multilateral lending is subject to restrictions on loan size, lenders might be better informed if the multilateral agency had just stated its private information. Hence, while there is a case to be made for multilateral lending, care would have to be taken in devising financial arrangements offered to borrowers in order not to compromise the potential for information transmission.

## 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 private 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, providing 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 the IMF, I will in the formal analysis of the following sections refer to the multilateral agency as the IMF. The question posed is thus: Should there be IMF lending?

In answering this question, recall the two arguments Rodrik (1995) makes about how multilateral institutions may have certain advantages relative to private or bilateral public agents.[3] Firstly, information about the business environment in specific countries is a collective good and will therefore, if left to the market, not be produced in sufficient quantity. Secondly, as long as the multilateral financial institutions have some autonomy from the governments of the member countries, their relationship with the governments of borrower countries will be less politicised than bilateral relations. This could facilitate the application of conditionality since the governments that seek loans will be less inclined to think that the advice and conditions of the multilateral institutions are politically motivated. Presumably it is also easier for these governments to accept conditions for loans set by multilateral institutions of which they are themselves members than similar demands from private or bilateral actors. However, as Rodrik (1995: 168) points out: "Neither of these two potential advantages of multilateral lending has much to do with lending."

To understand why one may make such arguments as well as how they may in the end provide a rationale for lending, 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. 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 on the borrower in the event of default, but there will be credit-rationing that reduces investment levels below those that would be obtainable with adequate third-party enforcement. One way around the moral hazard problem would be for 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 be a substitute for collateral. By committing to policies that increase future output, the borrower will increase its willingness to honour any obligation incurred if default penalties are proportional to 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 (1995) asserts 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

[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 (1995) 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 that have no role in an analysis of the welfare economics of multilateral lending.

might be true, even though IMF programmes in particular have often been politically controversial,[4] 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%.[5] Hence, while multilateral conditionality might be self-enforcing to a greater extent than private or bilateral conditionality, it seems to be a rather weak argument for multilateral lending.

I therefore concentrate on the first issue, whether the public 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 public good in the sense that all potential investors benefit from it. Any one investor has no incentive to share knowledge gained about the general characteristic 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 tasks of uncovering the information and making it publicly known. By "certifying" the policies of member countries, they could improve the allocation of investment in the world economy, both directly and indirectly by guiding private lenders towards the more credit-worthy lenders. That is, while they cannot get at the moral hazard problem of sovereign lending through information provision, they might alleviate adverse selection problems in which poor credit risks reduce the credit 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."[6] Surveillance is carried out on a regular basis, usually yearly, with all members, in what is known as Article IV consultations. In the process, the IMF obviously gather 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 a member. In addition, the research department of the IMF continually analyses the state of the economies of members and the institution collects a host of economic data that are published in series like *International Financial Statistics* and *Government Finance Statistics*. Hence, it is reasonable to assume that the IMF has an informational advantage relative to

[4] Sachs (1989), 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.

[5] 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), and the World Bank (1998).

[6] 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."

private investors and lenders, particularly since it gets privileged access to information from its members.[7]

Rodrik (1995) notes that even though there is no necessary link, the monitoring done by the multilaterals is usually intensified when lending is an issue.[8] 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 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 would have an interest in misleading them. Moreover, while officials of the 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. Therefore, in the remainder of this paper, I analyse the impact a multilateral agency with a purely informational role might have on markets for sovereign debt and contrast the resulting equilibria with those that emerge when its instrument of communication is lending.

# 3 A Cheap-Talking IMF

## 3.1 The Sovereign Debt Market without IMF-lending

There are three types of players in the model, a developing country, 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 to the country. 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.[9]

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

[7] It is 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 (1995).

[8] Similarly, Krueger (1997: 31) argues that "[a] strong case can be made that the functions of lending, policy advice, training, research, and provision of information of both the Bank and the Fund are mutually complementary and that the spillovers from each of these functions to the others are large."

[9] 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.

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

where $\varphi$ is the discount factor. The budget constraints are

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

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

That is, in period 1 the country has some exogenous income $Y_1$, and may augment period 1 consumption ($C_1^{ij}$) through international borrowing ($B^{ij}$) and period 2 consumption ($C_2^{ij}$) through investment ($I^{ij}$). 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. 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 uncover during its surveillance operation. Of course, if $\kappa^i$ is a permanent feature of a 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 to picture this parameter as expressing the current state of the investment environment in the borrowing country.

If type $i$ fully services its debt in an equilibrium of type $j$, $\delta^{ij} = 0$, and the total returns to investment ($Y_2^{ij} = \left(1 + \kappa^i\right) I^{ij}$) are available for consumption. If it defaults by paying creditors anything less than principal plus interest ($\delta^{ij} = 1$), it incurs a loss of a fraction of period 2 income $\lambda \in (0, 1)$.[10] As we shall see, it is this potential loss that supports positive lending in the current context.

The first derivatives of the utility function are

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

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

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 $\frac{1}{1+\kappa^i} \leq \varphi \leq \frac{1}{1+r^{ij}}$; and would not borrow but would invest all of its period 1 income if $\varphi > \frac{1}{1+r^{ij}}$. On the other hand, if it plans to default, it would borrow as much as possible, but would only invest if $\varphi \geq \frac{1}{(1-\lambda)(1+\kappa^i)} > \frac{1}{1+\kappa^i}$.

The decision whether to default or not is taken 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, it is assumed that in this event the country incurs a loss of $\lambda Y_2^{ij}$. The critical value of debt at which it is indifferent between servicing its debt and incurring the loss is thus

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

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

If it borrows more than this amount, it will default, whereas all debts no higher than this limit will be repaid with interest.[11] Of course, it is never optimal for lenders to lend more than $\overline{B}^{ij}$ 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. I make the standard assumption of a competitive market in the sense of no profits in expectation. I also make the simplifying assumption that although they may inflict losses on the borrower ex post if it defaults, lenders do not recover any part of their due. That is, they receive nothing if the country defaults, as will be the case if $\lambda$ reflects e.g. trade sanctions imposed on the borrower. As the level of investment is not observed, the information provided by the IMF about the country's type is crucial to the lending decision. Denoting the ex post probability that the country is of type $L$ in an equilibrium of type $j$ by $q^j$, the no-expected-profits condition may be written as

$$\begin{aligned} & q^j \left(1-\delta^{Lj}\right)\left(1+r^{Lj}\right)B^{Lj} + \left(1-q^j\right)\left(1-\delta^{Hj}\right)\left(1+r^{Hj}\right)B^{Hj} \\ = \quad & (1+\phi)\left(B^{Lj}+B^{Hj}\right), \end{aligned} \tag{5}$$

where $\phi > 0$ is the risk-free rate of interest on the world market, which is the opportunity cost of lenders.

In a separating equilibrium, the IMF reveals the country's type to the international capital market. Hence, 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 lenders, the interest rate will therefore be equal to $\phi$ regardless of the country's type and the country will be able to borrow $\overline{B}^{iS}$. 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: $\frac{1}{1+\kappa^H} \leq \varphi \leq \frac{1}{1+\phi} < \frac{1}{1+\kappa^L}$.[12,13] Hence, $\overline{B}^{LS} = 0$; if the country has low returns to investment it will be shut off from international credit.[14] In order for lending not to be a "money machine" in this simple model, 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 $\overline{B}^{HS} = \frac{\lambda\left(1+\kappa^H\right)Y_1}{1+\phi-\lambda\left(1+\kappa^H\right)}$ is a finite, positive number.

Let

[11] Note that this does not depend on the linearity of $U^{ij}$. If $C_2^{ij}$ is evaluated according to a strictly concave function $u\left(C_2^{ij}\right)$, the limit will be defined by $u\left(\left(1-\lambda\right)Y_2^{ij}\right) \equiv u\left(Y_2^{ij} - \left(1+r^{ij}\right)B^{ij}\right) \Leftrightarrow \lambda Y_2^{ij} = \left(1+r^{ij}\right)B^{ij}$.

[12] 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 $\phi$ are not particularly interesting. Investigating equilibrium outcomes when there are gains from investing borrowed funds in an $L$-type is left for future research.

[13] With a 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 $\kappa^H > i$.

[14] $L$ might therefore be thought of as "truly" not creditworty, and instead, perhaps, being a candidate for aid.

$$\Pi^{ij} = \frac{\left(1-\delta^{ij}\right)\left(1+r^{ij}\right)B^{ij} - (1+\phi)B^{ij}}{1+\phi} \tag{6}$$

be ex post profits discounted by the risk-free interest rate if the country is of type $i$ and the equilibrium of type $j$. We may now calculate country welfare and profits in a separating equilibrium as a function of the country's type and the actions of lenders:

$$U^{LS} = C_1^{LS} = Y_1, U^{HS} = \varphi C_2^{HS} = \varphi\left[\left(1+\kappa^H\right)Y_1 + \left(\kappa^H - \phi\right)\overline{B}^{HS}\right]; \tag{7a}$$

$$\Pi^{LS} = \Pi^{HS} = 0. \tag{7b}$$

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: $q^P = p$. In a pooling equilibrium, lenders are not able to distinguish the types. They cannot be screened; even though the $H$-type might be willing to pay an interest rate higher than $\phi$ 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 a single loan at a single interest rate. The size of the loan obviously will not be so high that both types prefer to default: $\overline{B}^P < \overline{B}^{HS}$. On the other hand, lending nothing would leave potential profits on the table since there is some probability that the country is of type $H$ and thus will repay some strictly positive 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 $r^P = \frac{1+\phi}{1-p} - 1 > \phi$. Then $\overline{B}^P = \frac{\lambda\left(1+\kappa^H\right)Y_1}{1+r^P-\lambda(1+\kappa^H)} < \overline{B}^{HS}$. As long as $\varphi \leq \frac{1}{1+r^P}$, both types will borrow this amount. Then $U$ and $\Pi$ are given by

$$U^{LP} = Y_1 + \overline{B}^P, U^{HP} = \varphi\left[\left(1+\kappa^H\right)Y_1 + \left(\kappa^H - r^P\right)\overline{B}^P\right]; \tag{8a}$$

$$\Pi^{LP} = -\overline{B}^P, \Pi^{HP} = \left(\frac{r^p - \phi}{1+\phi}\right)\overline{B}^P. \tag{8b}$$

Not surprisingly, we see that compared to a separating equilibrium an $L$-type borrower gains and an $H$-type loses. Lenders lose if $i = L$ as the borrower then defaults whereas they earn positive profits if it turns out that $i = H$ since the possibility that the borrower is of the low-productivity kind make them charge a risk premium.

When $\varphi > \frac{1}{1+r^P}$, it is not optimal for $H$ to borrow. Thus, in this case the volume of lending is demand-determined whereas the amount of investment in an $H$-type borrower country will be constrained to 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. The resulting levels of country welfare and profits are found by setting $\overline{B}^P = 0$ in $(8a-b)$.

So far, I have described a fairly standard model of a sovereign debt market. Introducing a third-party called the IMF possessing private information about the borrower is the main innovation presented here. The IMF maximises a weighted-average of borrowing country welfare and lenders' profits:

$$W^{ij} = \omega U^{ij} + (1-\omega)\,\Pi^{ij}, \tag{9}$$

where $U^{ij}$ is given by (1), $\Pi^{ij}$ by (6), 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 interpreted as reflecting the fact that both the borrower countries and the countries to which any profits or losses on lending accrue are members of the IMF. A very similar interpretation follows from the fact that the IMF is charged with maintaining the international financial system. Here the presence of $L$ will in a pooling equilibrium reduce the level of investment in $H$ below what is implied by the moral hazard problem, and, if $\varphi > \frac{1}{1+r^P}$, will prevent any loans from being made.

Together with linearity, discounting profits by the lenders' own opportunity cost make them commensurate with borrowing country consumption in the following sense: if the country borrows a unit of funds but does not repay, its period 1 consumption is raised by one unit without any reduction in period 2 consumption while consumption in the lender countries is reduced by $-(1+\phi)$ in period 2, which is equal to $-1$ in terms of period 1 consumption. Hence, in this sense 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.[15] Lenders are typically persons or juridical entities residing in rich countries; and rich countries have not borrowed from the IMF since the mid-1970s. In fact, since 1962 it is the IMF that has borrowed funds from some of its richest 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 to the parties to the debt contract to possibly be weighted unequally, makes the approach adopted here flexible enough to incorporate these empirical asymmetries as well as analysing what different potential weighting schemes might imply.

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 when becoming a member, 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 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 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.

In both cases it is assumed that the institution does not try to apply conditionality. That is, it does not try to alter the character of borrower countries by imposing conditions on the kind of economic policies they may

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

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, it would be far too complicated to take into account the game determining which conditions are indeed fulfilled. Moreover, given the empirical record, it is no more unrealistic than assuming 100% compliance.

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. Firstly, in both papers conditionality is assumed to work.[16] Secondly, the multilateral institution in these models do not have an informational advantage relative to lenders.[17] Thus, they might be said to take the first potential advantage of multilaterals for granted while ignoring the second. A third major difference concerns the objectives of the multilateral agency, which are assumed to be much narrower than (9) or (15) below.[18] Fourthly, a debt-crisis, i.e., a case 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. In contrast, I abstract from such considerations to focus on the potential impact of multilaterals on the regular functioning of the market for sovereign debt.[19]

### 3.2 Cheap-Talk Equilibria

In the absence of IMF-lending, its means of communication with the capital market is 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 the IMF is the only truly strategic player. As already noted, the assumption that investment is unobservable coupled with the fact that

[16] Both sets of authors model conditionality as imposing a period 1 adjustment cost and producing an increase in period 2 output; in essence, when conditionality is imposed, the borrower makes an investment. This of course assumes away the incentive problems of implementation. But Diwan and Rodrik (1992) at least point out that conditionality in practice is much less effective.

[17] 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 anything more about country type than the latter.

[18] Diwan and Rodrik (1992) assume 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: i) the IMF maximises bank profits; ii) the IMF maximises country welfare, in both cases imposing a zero profit constraint on its actions. In the next section, all of these concerns are taken into account when the IMF makes its choices.

[19] Other models of sovereign debt markets with third-party involvement have been developed by Bhattacharya and Detragiache (1994), Bulow and Rogoff (1988), and Wells (1993). They tend to differ even more from the framework used here. Bulow and Rogoff (1988) are concerned with the effects of the intervention of a creditor-country government 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. 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.

whatever borrowing terms a country of type $H$ accepts a type $L$ accepts too mean that the country cannot do anything to 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 so 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, $\left\{\overline{B}^P, r^P\right\}$.

Recall that the IMF is assumed to learn the private information of the country with certainty and so might be said to be either an $L$-type or an $H$-type. We must therefore calculate the value of its objective function given its type and the possible reactions of lenders. This requires us to consider borrower country welfare and profits for each possible lender response for both IMF-types. Note that this includes the case where lenders mistakenly offer the terms they would present to the other type if there was no private 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. I start with the case where a type $H$ country borrows on the terms offered in a pooling equilibrium, thus allowing type $L$ access to credit too before I move on to the case where the market vanishes in such an equilibrium ($\varphi \in \left(\frac{1}{1+r^P}, \frac{1}{1+i}\right]$).

**Case 1:** $\varphi \in \left[\frac{1}{1+\kappa^H}, \frac{1}{1+r^P}\right]$

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 the results derived in the previous sub-section gives us the three possible values of the IMF's objective function:

$$W^{LS} = \omega U^{LS} + (1-\omega)\,\Pi^{LS} = \omega Y_1; \tag{10a}$$

$$W^{LF} = \omega U^{LF} + (1-\omega)\,\Pi^{LF} = \omega Y_1 + (2\omega - 1)\,\overline{B}^{HS}; \tag{10b}$$

$$W^{LP} = \omega U^{LP} + (1-\omega)\,\Pi^{LP} = \omega Y_1 + (2\omega - 1)\,\overline{B}^{P}. \tag{10c}$$

Recalling that $\overline{B}^{HS} > \overline{B}^P$, we thus have

$$\begin{aligned} W^{LS} &\gtreqless W^{LF} \Leftrightarrow \omega \gtreqless \frac{1}{2} \equiv \widehat{\omega}; \\ W^{LS} &\gtreqless W^{LP} \Leftrightarrow \omega \gtreqless \widehat{\omega}; \\ W^{LF} &\gtreqless W^{LP} \Leftrightarrow \omega \gtreqless \widehat{\omega}. \end{aligned}$$

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 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 yields

$$W^{HS} = \omega\varphi\left[\left(1+\kappa^H\right)Y_1 + \left(\kappa^H - \phi\right)\overline{B}^{HS}\right]; \tag{11a}$$

$$W^{HF} = \omega\varphi\left(1+\kappa^H\right)Y_1; \tag{11b}$$

$$W^{HP} = \omega\varphi\left[\left(1+\kappa^H\right)Y_1 + \left(\kappa^H - r^P\right)\overline{B}^{P}\right] + (1-\omega)\left(\frac{r^P-\phi}{1+\phi}\right)\overline{B}^{P}. \tag{11c}$$

We see 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, with the loss being higher in the former case since the interest rate is lower. Moreover, compared to a pooling equilibrium, there is a loss of profits for lenders. They make strictly positive profits in a pooling equilibrium because the fact that it is unknown that the type is $H$ induces them to charge a risk premium. 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

$$\begin{aligned} W^{HS} &\gtreqless W^{HP} \\ \Leftrightarrow\quad \omega &\gtreqless \omega_* = \frac{\left(r^P-\phi\right)\overline{B}^{P}}{\varphi\left(1+\phi\right)\left(\kappa^H-\phi\right)\left(\overline{B}^{HS}-\overline{B}^{P}\right) + \left[1+\varphi\left(1+\phi\right)\right]\left(r^P-\phi\right)\overline{B}^{P}}. \end{aligned}$$

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 numerator 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 $\omega_* < \widehat{\omega}$. Intuitively, the efficiency loss would make a multilateral applying uniform treatment to borrower and lenders prefer the separating equilibrium. Hence, the objective function must be tilted in favour of lender profits for pooling to be preferred to separation by a type-$H$ IMF.

Before proceeding to derive PBE, we need to clarify some issues pertaining to cheap talk games that set them apart from other dynamic games of incomplete information. They arise from the fact that by definition, cheap talk does not directly affect pay-offs. In the current context, for instance, the only way in which the 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 game 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 go by its prior, in turn making it equilibrium behaviour for the sender to send all possible messages with positive probability. Because all messages are sent, there are no out-of-equilibrium statements that may be used to refine the set of equilibria in the spirit of standard signalling games.[20] For the sake of concreteness, assume that the IMF can state either "the country is $L$" or "the country is $H$." If for some reason lenders react by treating both of these messages as uninformative, and therefore choose $\left\{\overline{B}^{P}, r^{P}\right\}$, it is equilibrium behaviour by both IMF-types to send each message with the same probability, thereby indeed passing no information on to lenders.

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."[21] I adopt his approach of assuming that the literal meaning of any message is 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.[22] 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 what I call a "Farrell-table" may be constructed, listing the IMFs pay-offs from the three possible responses by lenders, given the type of private information it has.

Table 1: Farrell-table

| Lenders' response/IMF's type | $L$ | $H$ |
|---|---|---|
| $\left\{\overline{B}^{LS}, \phi\right\}$ | $W^{LS}$ | $W^{HF}$ |
| $\left\{\overline{B}^{HS}, \phi\right\}$ | $W^{LF}$ | $W^{HS}$ |
| $\left\{\overline{B}^{P}, r^{P}\right\}$ | $W^{LP}$ | $W^{HP}$ |

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. Hence, letting $m^{ij}$ denote the equilibrium statement by a type $i$ IMF in a type $j$ equilibrium, we have $m^{LS} = L$ and

[20] Moreover, due to pay-off invariance any outcome resulting from an equilibrium in which some possible messages are not used may be generated by transforming the equilibrium into one in which all messages are sent in equilibrium; and any out-of-equilibrium message may be interpreted to mean the same as an equilibrium message, thereby rendering them essentially simply variations on equilibrium statements that are not utilised.

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

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

$m^{HS} = H$ no matter what out-of-equilibrium beliefs lenders have. The separating equilibrium is neologism-proof, something that will become even 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 by stating its true type. However, a type $L$ IMF 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.

As is the case in all cheap-talk games, 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. As can be seen from the calculations above $\Pi^{HP} > \Pi^{HS} = \Pi^{HF}$ 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 $\omega$ is low, the IMF puts a lot of weight on lenders' profits relative to country welfare. Hence, it has rather strong incentives to transmit its private information to lenders, resulting in a separating equilibrium.

The next range of parameter values is $\omega \in (\omega_*, \widehat{\omega}]$. 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. The only candidate is the strange equilibrium where $q^P(N) = p$, $q^P(L) = 0$, and $q^P(H) = 1$, which obviously is not neologism-proof since only $L$ has an incentive to claim it is $L$ and only $H$ wants to convince lenders it is of this type. Thus, the only PBE is the separating one.

Moving into $\omega \in (\widehat{\omega}, 1)$, 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 as they cannot distinguish this case from that of an $L$-type IMF just pretending to be an $H$-type. 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]

**Case 2:** $\varphi \in \left(\frac{1}{1+r^P}, \frac{1}{1+\phi}\right]$

When the borrowing country's discount rate is higher than $\frac{1}{1+r^P}$, the $H$-type does not want to borrow if lenders offer $\left\{\overline{B}^P, r^P\right\}$. Then, as argued above, the market breaks down unless the IMF passes on its private information to lenders. To see when it might have an incentive to do so, we must recalculate pay-offs to take into account that no credit is extended in a pooling equilibrium. We now have

[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.

$$W^{LS} = \omega Y_1; \tag{12a}$$

$$W^{LF} = \omega Y_1 + (2\omega - 1)\,\overline{B}^{HS}; \tag{12b}$$

$$W^{LP} = \omega Y_1. \tag{12c}$$

Hence, in this case an IMF of type $L$ is indifferent between the separating and pooling equilibrium outcomes. Whether it would like to mislead lenders into thinking that the borrower is of type $H$ instead of revealing its type or keeping them in the dark depends on whether $\omega \gtreqless \widehat{\omega}$.

When the IMF learns that the country is of type $H$, its pay-off structure is now

$$W^{HS} = \omega\varphi\left[\left(1+\kappa^H\right)Y_1 + \left(\kappa^H - \phi\right)\overline{B}^{HS}\right]; \tag{13a}$$

$$W^{HF} = \omega\varphi\left(1+\kappa^H\right)Y_1; \tag{13b}$$

$$W^{HP} = \omega\varphi\left(1+\kappa^H\right)Y_1. \tag{13c}$$

We see that the breakdown of lending in a pooling equilibrium makes a type-$H$ IMF indifferent between pooling and deceiving lenders. Moreover, it now always strictly prefers to separate out in order to realise the gains from investment in the borrowing country. Hence, it is easy to demonstrate that equilibrium outcomes follow the pattern in the more complicated case just analysed. When $\omega < \widehat{\omega}$, the $L$-type IMF has no incentive to fool lenders. On the other hand, as already noted, the $H$-type strictly prefers to separate out. Therefore, the message "the country is of type $H$" is self-signalling and only the separating equilibrium is neologism-proof. However, when $\omega \geq \widehat{\omega}$, $L$ will at least weakly prefer to mimick $H$, and so the IMF will be unable to inform lenders' opinions in equilibrium.

In sum, we have now derived Proposition 1:

**Proposition 1**

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 $\widehat{\omega} = \frac{1}{2}$ such that

i) when $\omega < \widehat{\omega}$ 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 $\omega \geq \widehat{\omega}$, 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. The prerequisite is that it must not be too concerned with borrowing country welfare. More precisely, if $\omega < \widehat{\omega}$ the IMF 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. Given the fact that 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. However, it can be proven that within the confines of the model, this is indeed the case in an ex ante sense:

**Proposition 2**

Given any linear combination of $U$ and $\Pi$, $\Upsilon$, the pre-game value of $\Upsilon$ is higher for $\omega < \widehat{\omega}$ than for $\omega \geq \widehat{\omega}$.

The proof is simple. Let $\Upsilon = \upsilon U + (1-\upsilon)\,\Pi$. Given linearity, the expected value of $\Upsilon$ 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, expected profits are always zero. Hence, $E[\Upsilon] = \upsilon E[U]$. For $\omega < \widehat{\omega}$, 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 $\omega \geq \widehat{\omega}$ inserting the values for borrowing country welfare in a pooling equilibrium and rearranging yields $E\left[U^P\right] = p\left(Y_1 + \overline{B}^P\right) + (1-p)\,\varphi\left[\left(1+\kappa^H\right)Y_1 + \left(\kappa^H - r^P\right)\overline{B}^P\right]$. It is readily seen that for values of such that the market vansishes ($\overline{B}^P = 0$), $E\left[U^S\right] > E\left[U^P\right]$. It is straightforward to show that given the assumptions on the returns to investment in the H-type made here the same holds true when $\overline{B}^P > 0$. 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 in the current model since the assumption that $L$ has no period 2 income unless it invests means that there are no actual costs associated with its default in a pooling equilibrium. Taken into account the resources wasted if $L$ had some income to which the penalty $\lambda$ applied even in the absence of investment would strengthen the case for having $\omega < \widehat{\omega}$.[25]

With these results in place, I now turn to analysing equilibrium outcomes when the IMF is making its own loans, thus allowing me to answer the question of whether there should in fact be such lending.

# 4 IMF Lending and Information Transmission

## 4.1 IMF Lending: Terms and Objectives

Let us now assume that the IMF lends an amount $M$ at the rate of $\rho$. Moreover, it is assumed that $\rho$ is the opportunity cost of funds for the IMF, i.e., what it may have earned by lending this amount to another member. Since its resources come from member countries and not from borrowing in the capital market, $\rho$ is most likely different from $\phi$. According to Guitián (1992: 41-42): "[F]or a long period of IMF history, levies on its financial

[25] Of course, it would also have increased $\widehat{\omega}$.

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. Moreover the concessionary element has been reduced.[26] Still, a rebate remains, and moreover, a case can be made for keeping IMF funding concessional (Guitan 1992: 42-43): "Not only do below-market ... rates of charge provide an incentive for members to resort to the IMF - indeed, this was a key rationale behind the original structure of charges - but in addition, by helping to keep external imbalances from being unduly neglected through early access to the IMF, they also contribute to an improved observance of the code of conduct, the essential aim of the surveillance responsibility of the institution." Within the context of this model, I take this to imply that $\rho < \phi$.

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

$$\Sigma(M) = \frac{(1-\delta)(1+\rho)M - (1+\rho)M}{1+\rho} = \begin{cases} 0, \delta = 0; \\ -M, \delta = 1. \end{cases} \tag{14}$$

Hence, if it is repaid the IMF safeguards its capital without adding to it whereas it loses an amount equal to the face value of the loan in the event of default.

I assume that $\Sigma$ enters the IMF's objective function in the following fashion

$$\Omega^{ij}(M) = \omega U^{ij} + (1-\omega)\Pi^{ij} + \Sigma^{ij}(M). \tag{15}$$

Note that with this objective function the IMF in effect gives higher 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 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."[27] The point is, of course, that the policies of the IMF and the World

[26] Bird (1995: 124-125) claims that charges have been rising more or less continually since 1950 and, moreover, 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.

[27] 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

Bank are determined by the member countries, which have vote shares that correspond roughly to their share of the capital of these institutions. A complete assessment of the role that the multilateral financial institutions can play therefore need to take into account the political character of these organisations, which I abstract from here.

I assume that there is an exogenous limit on the size of the loan that can be made $\widehat{M}$ so that $M \leq \widehat{M}$. The facilities offered by the IMF all have explicit limits 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, there is a limit of 190% of the member's quota, which may in exceptional circumstances be raised to 255%. Thus, such an assumption is reasonable.

Finally, note that the issue of debt seniority does not arise in this model due to the assumption that $\lambda$ reflects a pure dead-weight loss of default. 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,[28] I leave this to future research and concentrate on the basics here. This does not mean that multilateral lending does not affect the market for sovereign debt directly. 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 $Y_2$.[29] With the starting point being $(1+\phi)B+(1+\rho)M = \lambda Y_2$, in case 1, where there is private lending in a pooling equilibrium, the results are

$$\widetilde{B}^{LS} = 0 = \overline{B}^{LS}; \tag{16a}$$

$$\widetilde{B}^{HS} = \frac{\lambda\left(1+\kappa^H\right)Y_1}{1+\phi-\lambda\left(1+\kappa^H\right)} - \left[\frac{1+\rho-\lambda\left(1+\kappa^H\right)}{1+\phi-\lambda\left(1+\kappa^H\right)}\right]M \equiv \overline{B}^{HS} + \theta^S M; \tag{16b}$$

$$\widetilde{B}^{P} = \frac{\lambda\left(1+\kappa^H\right)Y_1}{1+r^P-\lambda\left(1+\kappa^H\right)} - \left[\frac{1+\rho-\lambda\left(1+\kappa^H\right)}{1+r^P-\lambda\left(1+\kappa^H\right)}\right]M \equiv \overline{B}^{P} + \theta^P M. \tag{16c}$$

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 since it will not invest. So multilateral lending has no impact on private credit in this case. But how does multilateral lending affect private credit 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 $\theta^S$ and $\theta^P$, respectively. It can be seen that the signs of these parameters are the same. 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 $\theta^S$ and $\theta^P$ 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

better judgment: Sudan, Zaire, Egypt, Argentina", but argues that "political decisionmaking is the exception, not the rule".

[28] See Rodrik (1995) and Krueger (1997), who argue that by reducing the riskiness of lending, seniority weakens the credibility of the multilaterals' actions.

[29] Considering a situation where the penalties incurred by defaulting differ between private and multilateral debt, thus opening the possibility of default on only one type of debt, would take us to far afield.

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.[30]

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

$$\widetilde{B}^{LS} + M = \overline{B}^{LS} + M = M; \tag{17a}$$

$$\widetilde{B}^{HS} + M = \overline{B}^{HS} + \eta^S M = \overline{B}^{HS} + \frac{(\phi-\rho)M}{1+\phi-\lambda\left(1+\kappa^H\right)}; \tag{17b}$$

$$\widetilde{B}^{P} + M = \overline{B}^{P} + \eta^P M = \overline{B}^{P} + \frac{\left(r^P-\rho\right)M}{1+r^P-\lambda\left(1+\kappa^H\right)}; \tag{17c}$$

where $\eta^S = 1+\theta^S$ is the marginal impact of $M$ on total credit in a separating equilibrium and $\eta^P$ 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 by extending its seal of approval it allows borrower countries to tap other sources of capital because other agents 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. The few studies that exist seem to point to a neutral effect overall, with private agents' negative reactions being approximately cancelled out by an increase in funding from other official sources.[31] 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.[32] 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 these relationships stated in $(17a-c)$ are only true for $M \leq \widetilde{M}$, 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. Secondly, $\widetilde{M} = \frac{\lambda\left(1+\kappa^H\right)Y_1}{1+\rho-\lambda\left(1+\kappa^H\right)} > \overline{B}^{HS}$ as long as $\rho < \phi$. Intuitively, the IMF can lend more than private lenders when there is a concessional element since the subsidy reduces the attractiveness of default. Thirdly, $\widetilde{M}$ is

[30] Note that $\left|\theta^S\right| \geq \left|\theta^P\right|$; there is more crowding-out or in in a separating equilibrium.

[31] Bird and Rowlands (1997) contains a good discussion of these issues, as well as a summary of empirical findings.

[32] Though, it should be noted that crowding-in or out is a purely mechanical effect in the present model. It is not due to a change in the probabilities of default, which here are constant for both types. To generate such an effect, period 2 borrower income would have to be stochastic.

also the value at which $\widetilde{B}^P = 0$. However, for $0 \leq M < \widetilde{M}$ it is still the case that $\widetilde{B}^{HS} > \widetilde{B}^P$. That is, for lower leves of multilateral lending 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.

The only thing that changes in case 2, when there is no private lending in a pooling equilibrium, is that multilateral lending is purely additional. With this final comment, we now have all the prerequisites for deriving the PBE of this game and move on to this task.

## 4.2 PBE with Multilateral Lending when Loan Size Is not constrained

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 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. As was the case for the cheap talk game, equilibrium outcomes depend on whether a developing country of type $H$ will borrow from private lenders in a pooling equilibrium. Here too, we start with the case where it does:

**Case 1:** $\varphi \in \left[\frac{1}{1+\kappa^H}, \frac{1}{1+r^P}\right]$

For the $L$-type, pay-offs are now

$$\Omega^{LS}(M) = \omega Y_1 - (1-\omega) M; \tag{18a}$$

$$\Omega^{LF}(M) = \omega Y_1 + (2\omega - 1)\widetilde{B}^{HS} - (1-\omega) M; \tag{18b}$$

$$\Omega^{LP}(M) = \omega Y_1 + (2\omega - 1)\widetilde{B}^{P} - (1-\omega) M. \tag{18c}$$

As already noted, a borrower of this type surely defaults. Since the IMF values its "profit" more highly 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 $\Omega^{LS}\left(\widetilde{M}\right) = \Omega^{LF}\left(\widetilde{M}\right) = \Omega^{LP}\left(\widetilde{M}\right) = \omega Y_1 - (1-\omega)\widetilde{M}$; 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:

$$\Omega^{LS}(M) = W^{LS} - (1-\omega) M; \tag{19a}$$

$$\Omega^{LF}(M) = W^{LF} + \left[\omega\theta^S - (1-\omega)\eta^S\right] M; \tag{19b}$$

$$\Omega^{LP}(M) = W^{LP} + \left[\omega\theta^P - (1-\omega)\eta^P\right] M; \tag{19c}$$

Hence, we see that if no loan is made, the values of the IMF's objective function are identical to its pay-offs in the cheap-talk game for every possible lender response. Also note that when $\theta^S, \theta^P < 0$, as is assumed here, these are declining in $M$ no matter the value of $\omega$ (as shown above, even in this case $\eta^S, \eta^P > 0$).

The pay-off schedules of the $H$-type are

$$\Omega^{HS}(M) = \omega\varphi\left[\left(1+\kappa^H\right)Y_1 + \left(\kappa^H - \phi\right)\widetilde{B}^{HS} + \left(\kappa^H - \rho\right)M\right]; \tag{20a}$$

$$\Omega^{HF}(M) = \omega\varphi\left[\left(1+\kappa^H\right)Y_1 + \left(\kappa^H - \rho\right)M\right]; \tag{20b}$$

$$\Omega^{HP}(M) = \omega\varphi\left[\left(1+\kappa^H\right)Y_1 + \left(\kappa^H - r^P\right)\widetilde{B}^P + \left(\kappa^H - \rho\right)M\right] + (1-\omega)\left(\frac{r^P - \phi}{1+\phi}\right)\widetilde{B}^P. \tag{20c}$$

For this type it must also be the case that lenders' beliefs does not matter if multilateral lending is so high that private credit is completely crowded out: $\Omega^{HS}\left(\widetilde{M}\right) = \Omega^{HF}\left(\widetilde{M}\right) = \Omega^{HP}\left(\widetilde{M}\right) = \omega\varphi\left[\left(1+\kappa^H\right)Y_1 + \left(\kappa^H - \rho\right)\widetilde{M}\right]$. Similarly, rewriting pay-offs using the definition of the marginal effects of multilateral lending on private lending brings out the fact that they are the same as in the cheap-talk game when $M = 0$:

$$\Omega^{HS}(M) = W^{HS} + \omega\varphi\left[\left(\kappa^H - \rho\right) + \left(\kappa^H - \phi\right)\theta^S\right]M; \tag{21a}$$

$$\Omega^{HF}(M) = W^{HF} + \omega\varphi\left(\kappa^H - \rho\right)M; \tag{21b}$$

$$\Omega^{HP}(M) = W^{HP} + \left\{\omega\varphi\left[\left(\kappa^H - \rho\right) + \left(\kappa^H - r^P\right)\theta^P\right] + (1-\omega)\left(\frac{r^P - \phi}{1+\phi}\right)\theta^P\right\}M. \tag{21c}$$

As may be seen $\frac{\partial\Omega^{HF}}{\partial M} > 0$. Inserting the value of $\theta^S$ it is straightforward to establish that $\frac{d\Omega^{HS}}{dM} > 0$ too. However, the sign of $\frac{d\Omega^{HP}}{dM}$ depends on the value of $\omega$. Specifically, it may be shown that $\frac{d\Omega^{HP}}{dM} \gtreqless 0 \Leftrightarrow \omega \gtreqless \omega_{**}$, and, moreover, that $\omega_{**} < \omega_*$. This turns out to be important for refining the set of PBE.

The starting point for deriving equilibrium outcomes will be the observation that if there was full information, the IMF would not lend to an $L$-type and would lend the minimum of $\widetilde{M}$ and $\widehat{M}$ 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 $\omega$ which is less than the "cost", which is unity. On the other hand $\frac{d\Omega^{HS}}{dM} > 0$, so unless it is institutionally constrained from lending this much, i.e., $\widehat{M} < \widetilde{M}$, it is optimal to give the maximum loan that the borrower will take without defaulting. This means that there will be no private lending. It is optimal to fully replace private lending with multilateral lending because the concessional element will allow investment by the $H$-type, which is efficient, to exceed the level that is obtainable with commercial credit.

Let us first assume that $\widehat{M} \geq \widetilde{M}$. 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 equilibrium lending choices. Of course, to complete the description of the equilibrium, I need to specify lenders' beliefs. 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

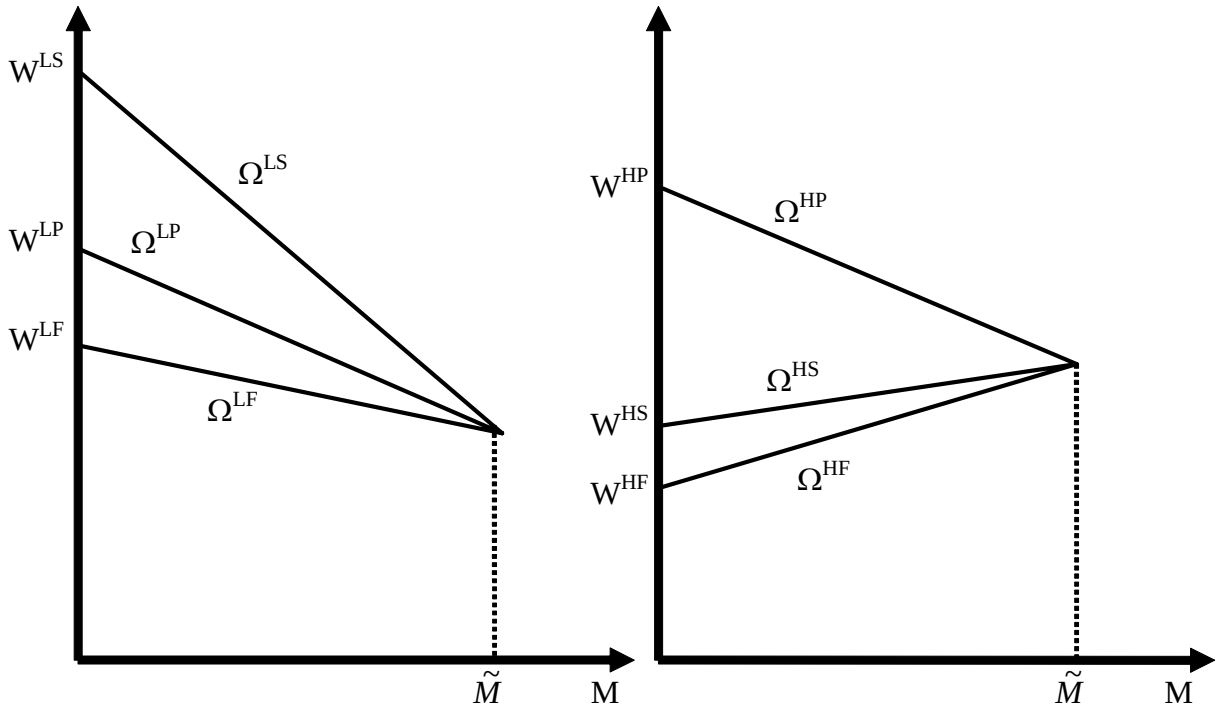


Figure 1: Pay-off schedules for $\omega \leq \omega_{**}$

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.

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 it gets a higher pay-off in such an equilibrium than in a separating equilibrium for any $M \leq \widetilde{M}$. 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 the beliefs held by lenders' for $M < \widetilde{M}$ and their resulting responses, $L$ is better off than at $\widetilde{M}$. A 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 make if doing so allows it to separate out. Hence, deviations to such $M$ must come from $L$, and once lenders hold such beliefs it is optimal for this type to deviate, thereby breaking the purported equilibrium.

For $\omega \geq \omega_{**}$, $\Omega^{HP}(M)$ is non-decreasing and there is no reason to worry about $H$ wanting to play a pooling

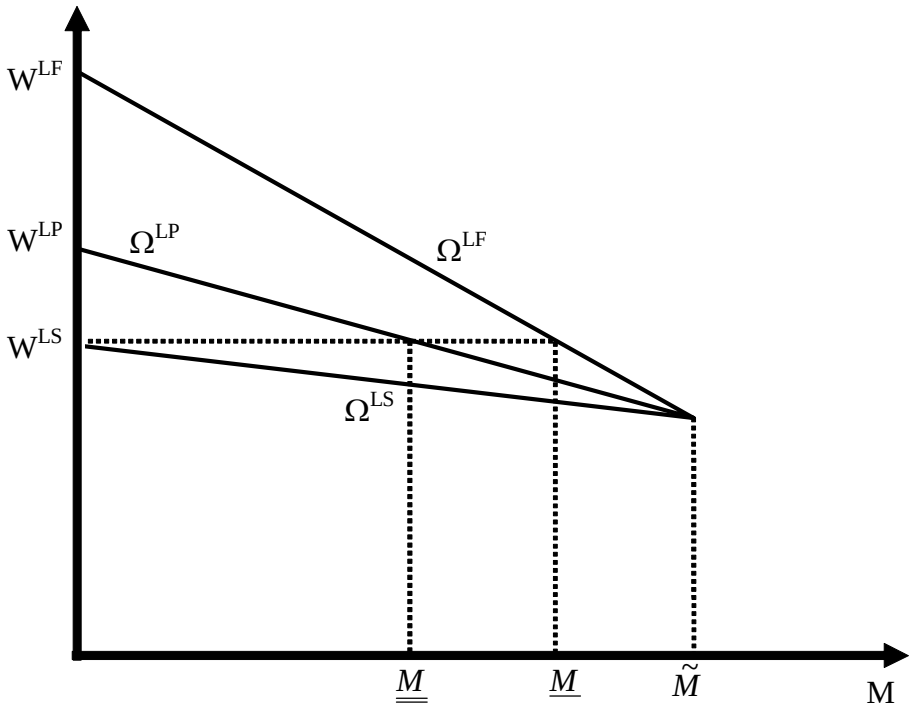


Figure 2: Pay-off schedules for $L$ when $\omega > \widehat{\omega}$

equilibrium. In fact, for $\omega \in [\omega_{**}, \widehat{\omega}]$, at $\widetilde{M}$ $L$'s pay-off is minimised while $H$'s pay-off is maximised regardless of lenders' beliefs. Moreover, $L$ achieves its highest possible pay-off at zero if lenders' choose not to extend credit. Hence, the only PBE is the separating one in which $M^{LS} = 0$ and $M^{HS} = \widehat{M}$. Thus, we have established that for $\omega \leq \widehat{\omega}$, 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 $\omega > \widehat{\omega}$? Recall that at $\widehat{\omega}$, pay-offs for $L$ in the cheap-talk equilibrium switched from $W^{LS} = W^{LF} = W^{LP}$ to $W^{LS} < W^{LP} < W^{LF}$. As may be seen from $(18a - c)$ and $(19a - c)$, the same change in rankings occurs at $\widehat{\omega}$ with costly signalling too. This is illustrated in figure 2:

In the figure, two critical values of lending are shown. These are defined by

$$\Omega^{LF}\left(\underline{M}\right) = W^{LS} \Leftrightarrow \underline{M} = \frac{(2\omega - 1)\,\lambda\left(1 + \kappa^{H}\right) Y_1}{\omega\left[1 + \rho - \lambda\left(1 + \kappa^{H}\right)\right] + (1 - \omega)\left[1 + \phi - (1 + \rho)\right]}; \tag{22a}$$

$$\Omega^{LP}\left(\underline{\underline{M}}\right) = W^{LS} \Leftrightarrow \underline{\underline{M}} = \frac{(2\omega - 1)\,\lambda\left(1 + \kappa^{H}\right) Y_1}{\omega\left[1 + \rho - \lambda\left(1 + \kappa^{H}\right)\right] + (1 - \omega)\left[1 + r^{P} - (1 + \rho)\right]}. \tag{22b}$$

Since $r^P > \phi$ , $\underline{M} > \underline{\underline{M}}$. Moreover, $Lim_{\omega \to 1}\underline{M} = \frac{\lambda\left(1+\kappa^{H}\right)Y_1}{1+\rho-\lambda\left(1+\kappa^{H}\right)} = \widetilde{M}$. Hence, $\underline{M} < \widetilde{M}$. The set $\left[\underline{M}, \widetilde{M}\right]$ 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, $\left[0, \underline{\underline{M}}\right]$ 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 loans. Figure 2 illustrates that as long as institutional restrictions on lending are not binding, a type $H$ IMF may separate out by choosing $\widetilde{M}$. In fact, there are no candidate pooling equilibria for $\widetilde{M} \leq \widehat{M}$, because the maximum loan that can be optimal for an $H$-type gives it the highest possible pay-off whatever lenders believe after observing this while $\widetilde{M}$ yields the lowest possible pay-off for an $L$-type regardless of beliefs. Hence, it is impossible to "prevent" $H$ from choosing $\widetilde{M}$ by specifying some belief for lenders that would make it inoptimal for it to make this loan.

**Case 2:** $\varphi \in \left(\frac{1}{1+r^P}, \frac{1}{1+\phi}\right]$

When $\varphi > \frac{1}{1+r^P}$, we know that the market for sovereign debt breaks down in the absence of information transmission by the IMF. The pay-offs to a type-$L$ IMF may be deduced from $(18a - c)$ by setting $\widetilde{B}^P = 0$. The noteworthy change is that now $\Omega^{LS}(M) = \Omega^{LP}(M)$. Thus, the $L$-type is in this case always indifferent between separating out and playing a pooling equilibrium if the level of multilateral lending is the same as it gets no private funding in either event. In sum, incentives do not change that much for the L type. What about the $H$-type? Its pay-off structure changes more drastically when $\widetilde{B}^P = 0$. From $(20a - c)$, it may be seen that now the schedule $\Omega^{HP}(M)$ is always increasing. Moreover, it is still true that $\Omega^{HS}\left(\widetilde{M}\right) = \Omega^{HF}\left(\widetilde{M}\right) = \Omega^{HP}\left(\widetilde{M}\right)$. Therefore, we do not have to go through the kind of argument that I made in connection with figure 1 in case 1. $\widetilde{M}$ always gives $H$ its highest possible pay-off and for $\omega \leq \widehat{\omega}$ no lending results in maximum pay-off to $L$. For $\omega \leq \widehat{\omega}$, it is thus clear that there is only the separating PBE with lending equal to full information levels. Moreover, the fact that $\Omega^{LS}(M) = \Omega^{LP}(M)$ does not change the situation for $\omega > \widehat{\omega}$. Unless $\widetilde{M} \leq \widehat{M}$, $H$ can always separate out by choosing $\widetilde{M}$ and prefers to do so.

In sum, we have

**Proposition 3**

If $\widetilde{M} \leq \widehat{M}$ the unique pure-strategy PBE with multilateral lending 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 $H$ regardless of its preferences.

In combination with Proposition 1, this yields

**Corollary 1**

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

## 4.3 PBE with Multilateral Lending when Loan Size Is constrained

What happens when $\widetilde{M} > \widehat{M}$? It is pretty obvious that if the restriction is severe enough, pooling might result. For example, when $\omega < \omega_{**}$ in case 1, 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.[33] When $\omega \in [\omega_{**}, \omega_*)$, pooling at $\widehat{M}$ will now give $H$ its highest possible pay-off because the schedule $\Omega^{HP}(M)$

[33] However, if $\widehat{M}$ is too low, the possibility arises that an $H$-type borrower will be better off refusing the IMF loan if it is thereby able to separate out. Thrashing out the details of this complication is left for another day.

lies above the others. However, $L$ will exploit this by deviating to a lower loan, implying that there will be a separating PBE in which $\left\{M^{LS}, M^{HS}\right\} = \left\{0, \widehat{M}\right\}$. For $\omega \in [\omega_{**}, \widehat{\omega}]$, it remains the case that $L$ get its highest possible pay-off at zero and $H$ at the maximum possible loan, which is now $\widehat{M}$. Looking back at figure 2, we see that as long as $\widehat{M} > \underline{M}$ the PBE must be separating with $\left\{M^{LS}, M^{HS}\right\} = \left\{0, \widehat{M}\right\}$ even when $\omega > \widehat{\omega}$. However, when $\widehat{M} \leq \underline{M}$ there are only pooling equilibria because $L$ would like to mimick $H$. In fact, all $M \in \left[0, \underline{\underline{M}}\right]$ 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.

In case 2, the unique pure-strategy PBE will be $\left\{M^{LS}, M^{HS}\right\} = \left\{0, \widehat{M}\right\}$ for $\omega \leq \widehat{\omega}$ since by making these choices both types get their highest possible pay-offs. This result extends to $\omega > \widehat{\omega}$ as long as $\widehat{M} > \underline{M}$. However, things change drastically when $\widehat{M} \leq \underline{M}$. Now $\underline{\underline{M}}$ does not exist as the schedules $\Omega^{LS}(M)$ and $\Omega^{LP}(M)$ coincide. This means that whereas $L$ will always mimick $H$ if it can fool lenders into extending credit, it will also always deviate to zero from any positive $M$ when they do not lend, which is something $H$ will not do. The only equilibrium is thus $M^P = 0$, which means that there will be no lending to the borrower country! I summarises these results as follows

**Proposition 4**

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 means that if the restriction on loan size is sufficiently strict the IMF cannot necessarily solve the adverse selection problem in the sovereign debt market and may even reduce the amount of private credit extended to borrowing countries.

# 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 lenders in the market for sovereign debt. I have shown that the adverse selection problem that reduce the amount of credit available to good credit risks and worsen 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 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 plays a purely informational role.

Needless to say, the results are based on a highly stylised model, which might usefully be extended in many directions that may shed further light on the important issue of whether there should be multilateral lending. Firstly, the multilateral could have less than completely accurate information about the borrower. Of course, if it is no better informed than lenders, it cannot play an informational role at all. But as long as it has an informational advantage, it 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. Secondly, one could study cases where it is efficient to have the low productivity country 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 lenders if they are mistaken become smaller. Thirdly, the issue of debt seniority could be analysed by assuming that part of the penalty incurred by the borrower in the event of default is transferrable to lenders, private as well as multilateral. 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, a fourth possible extension would be to include some borrowing country multilateral debt incurred before the game starts. If there is some probability 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. Thus, in a dynamic setting, the case for cheap-talking could be strengthened. Fiftly, one may 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. Finally, one could study what determines whether multilateral lending crowds in or out other forms of capital. While it is straightforward to extend the model presented here in that direction, one would ideally like to make such effects endogenous.

Other possible extensions such as analysing the political economy of multilateral lending and borrowing and the impact of policy advice from the multilaterals to the borrower, would be more difficult to tackle. I mention them here only to point out that a complete analysis would take into account incentives on both the supply-side and the demand-side for multilateral loans, which in the real world jointly determine how other actors evaluate a financial agreement between a multilateral agency and a borrower. But as one must learn to crawl before one can walk, this paper has hopefully made some contribution towards such a theory.

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