

Gatekeeper? The IMF, Aid Flows, and
Policymaking in Low-Income Countries*
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Abstract

Case studies suggest most aid donors take their cues from the IMF when it comes to the quality of the macroeconomic policies of recipients. I formally investigate this "gatekeeping" function. In particular, I look at how the Fund's signalling of what its surveillance has revealed about a particular member influences aid flows to and policy choice in that country. The IMF's public statements are "cheap talk" observed by both the donor and the recipient. I find that if the Fund is able to credibly state the policy-relevant information it obtains through surveillance it will affect recipient policymaking in complex ways depending on whether the information strengthens or weakens the other actors' pre-existing biases. In this case, the IMF acts as a gatekeeper of aid flows. A surprising result is that the Fund sometimes induces the recipient's policy-choice to be less informative the better the IMF's information is. Only in the case where its advice is not credible is the Fund without influence on aid flows.

1 Introduction

The international financial crisis has put the IMF in the spotlight again as it plays a significant role in high-income countries for the first time since the 1970s. It is then perhaps easy to forget that the Fund still is important in the parts

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of the world where it has been operating in the intervening decades. Moreover, there is a paucity of formal analyses of the functions the IMF plays in both rich and poor member countries. In this paper I focus on a vital role that the IMF has been playing in the latter, namely that of “gatekeeping” the aid flows that are the most important foreign funds these countries receive. This has been most noteworthy in the context of debt relief operations. To be considered for debt relief, members of the Paris Club require debtors to have an IMF programme. The same requirement has been part of the large HIPC and MDRI debt relief programmes. In a survey the Fund conducted in connection with a review of its surveillance activities, 97% of the responding donor members provided an affirmative answer to the question “Do you use Fund ‘information/signals’ to inform your assistance decisions?” (IMF 2005)¹ However, Bal Gündüz and Crystalinn (2014) provide econometric evidence showing that even excluding debt relief IMF programmes seem to induce donors to provide more aid.

The gatekeeping function is to some extent a side-effect of the IMF’s bilateral surveillance of the member countries.² Such surveillance is carried out on a regular basis through what is known as Article IV consultations. These are mandatory and usually occur annually. In the course of carrying them out, the IMF collects an enormous amount of information about members’ economies as well as the policies of their governments. Data collection also takes place during negotiations over financial arrangements with the Fund. Moreover, most members voluntarily provide the Fund with certain forms of economic and financial data, first and foremost through the General Data Dissemination System.

It is thus reasonable to assume that the IMF has an informational advantage relative to the average aid donor, particularly since it has privileged access to information from its members.³ Most aid has historically been attached to projects designed and run by donors. The smaller bilateral donors have in general had little capacity to analyse the macroeconomic outlook of the countries receiving their aid and for the larger ones the fact remains that there are cost savings to be had from relying on the Fund in these matters. Indeed, even the World Bank usually does so as part of the division of labour between the two institutions, sometimes to the extent of making it a prerequisite for its loans (Radelet 2006).

It has been argued that this is one reason why IMF conditionality persists even in an era where according to donor rhetoric recipient governments should have “ownership” of their own policies: “[c]onditionality continues to be but-

¹Apparently, private creditors do so too, c.f. Marchesi (2003).

²According to its mandate, the Fund is to oversee the international monetary system and monitor the economic and financial policies of its member countries. These activities are called multilateral and bilateral surveillance, respectively.

³It is true that the IMF publishes some of the data. This is nowadays also the case for selected documents that are part of the decision-making process. However, there is a lag between collection and publication and “softer” types of information are not made public. It is also true that private companies sell risk assessments. Still, they do not have the kind of access to governments that a multilateral institution has. Thus, the quality of their analyses must in general be expected to be poorer. For more on these issues, see Krueger (1998) and Rodrik (1996).

tressed by the fact that the multilateral development banks and bilateral donors require that recipient governments have IMF programmes (or approval) before giving aid. Indeed [an] internal IMF review concluded that a key reason that the IMF found it very difficult to move away from conditionality is that other donors use Fund arrangements as monitoring and surveillance mechanisms.” (Fraser and Whitfield 2009: 86)

However, even if one accepts that the IMF has an informational advantage it does not follow that its statements always have an impact. The empirical literature on IMF forecasting shows that these projections often suffer from biases and are inefficient.⁴ There are several possible explanations for these findings. One is that the influence of important members (in particular, the US), which have been decisively demonstrated for IMF lending and conditionality, might extend to surveillance.⁵ These members and their allies could benefit from overoptimistic forecasts of growth at election times, for example. In addition to this political explanation, there could be organisational incentives for tampering with forecasts. In the same way as the Fund is sometimes accused of engaging in “defensive lending” in order to protect its financial position in members that are highly indebted to it, “defensive forecasting” could induce other providers of capital to supply more funds, averting the danger of default.⁶ Countries of systemic importance could conceivably also see overoptimistic projections as the Fund tries to avoid setting off a financial crisis. Finally, IMF staff has considerable autonomy, which might allow them to pursue their professional and ideological inclinations in ways that biases organisational decisions.⁷

The context in which surveillance takes place arguably matters too. In some of the more ad-hoc arrangements the Fund has created over the years the standards used have not always been explicit, generating confusion over what its seal of approval implies.⁸ The end product of Article IV consultations is also generally considered to be rather vague and as such do not provide clear-cut signals to interested third-parties. Whether a member is on track or not in a financial programme with the IMF only indicates that its policies are acceptable or not according to some standard, and not how far it is above or below that hurdle.⁹ Bevan (2009) and Taylor (2006) are of the opinion that non-funded programmes provide a stronger signal with respect to the quality of economic policies, for two reasons. Firstly, when there can be no suspicion that a

⁴See Aldenhoff (2007), Dreher et al. (2008), and Fratzscher and Renaud (2011).

⁵Dreher et al. (2013) is a recent study providing both a survey of this literature and new empirical results. For a detailed account of how US influence shapes decision making at the Fund, see Stone (2011).

⁶It should be noted that the evidence for the charge that the IMF throws good money after bad in order to protect its financial position is rather weak. While some suggestive cases can be found in IMF (2002), the extreme bound analysis of Sturm et al. (2005) indicates that member country indebtedness is not a significant factor.

⁷For evidence on such mechanisms at work, see Chwioroth (2014) and Nelson (2013).

⁸For examples of such arrangements, see the excellent discussion of the pros and cons of various mechanisms for signalling the private information of the Fund to outsiders without committing financial resources in IMF (2004).

⁹The same of course pertains to the decision of whether or not to let a member draw resources beyond the first tranche (to which all members are entitled).

programme has been “bought,” it is clear to all that the government is responsible for implementing it. Secondly, providing funding involves a potential conflict of interest for the Fund, which in the event that a member country is indebted to it would benefit from any catalytic effect of its seal of approval on financing from other sources.¹⁰ Lane (2009) reaches the opposite conclusion: the IMF has a greater incentive to monitor policies when its own money is at stake. Being better informed in this case, its seal of approval should convey a stronger signal. In Hagen (2009) I investigated this issue for members that rely on commercial providers of capital and found that lending is not a necessary condition for informative communication by the IMF. However, putting its money where its mouth is enables the Fund to credibly reveal its private information to private lenders in cases where pure “certification” does not.

In recent years the IMF has provided a non-funded signalling mechanism for a subgroup of its low-income members; the Policy Support Instrument (PSI). These so-called “mature stabilisers” have achieved a reasonable degree of macro-economic stability. This fact might allow them the luxury of going without financing from the Fund and could also mean that they gain access to the international capital market. However, the IMF argues that even though these members have in this sense graduated from its concessional credit facilities, they might still want its seal of approval. While such countries are of course subject to regular Article IV surveillance, the PSI provides an explicit endorsement as well as more frequent assessments of a participating member’s policies. And in contrast to the compulsory nature of Article IV surveillance the PSI is demand-driven. Thus far a handful of African countries has had one or more PSIs.¹¹ In Hagen (2012) I explored the potential implications of the PSI for countries at the cross-roads of concessional and commercial development finance.

In this paper I focus on Fund members that still have to rely exclusively on foreign aid.¹² The setting is one where first of all, the recipient government is more informed about the state of the world than donors, and secondly, the optimal policy is state-specific. Mukand (2006) demonstrated that in this framework foreign direct investment can distort policy-making in the host country as the level of investment depends on what policy investors think will give them the highest return. The host country government might then rationally choose a policy that is inferior given the private information it has if the resulting surge in inflows more than compensates for the lower expected impact on GDP from

¹⁰ As already noted, Bal Gündüz and Crystalinn (2014) find that the Fund catalyse aid flows to low-income countries. Steinwand and Stone (2008) claim that the literature shows mixed result when it comes to the effects on the supply of private capital, which seem to vary with both member and flow type.

¹¹ Due to the international financial crisis, some of them have had to return to funded arrangements.

¹² According to Reinhart et al. (2003) the market for sovereign debt has three tiers of borrowers. The first one consists of those with permanent access, mainly industrialised countries. Emerging markets with intermittent access make up the second tier. Aid-dependent countries in general belong to the third of the three groups, those with no market access. The PSI-countries may or may not have graduated from the third to the second group. Foreign direct investment of course flows mostly to emerging markets or countries with abundant natural resources such as oil and gas.

each unit of investment. In Hagen (2008, 2015) I changed this scenario to one in which the suppliers of foreign funds are donors and show that similar distortions arise then. This provides a coherent explanation for the large number of case studies arguing that aid recipients anticipate what actions donor will reward with more generous transfers.

Mukand (2006) also investigated the impact of third-party information provision and showed that the effects were complex. However, even though he labelled the third-party “IMF” the discussion of the gatekeeping role of the Fund shows that it is even more pertinent to analyse its influence on policy-making in aid-recipients, most of which do not receive substantial amounts of FDI. Moreover, Mukand (2006) did not allow the third-party to be a player in the game. In contrast, I allow both the IMF and the recipient country government to have information of potential value to donors.¹³ This seem a natural extension to make, for even though a lot of what the IMF knows about a member comes from the government of that country the Fund has separate sources of information such as other members, which in particular should give it independent insights into external conditions relevant for the member in question. Intuitively, an important issue is therefore the relative precision of the private information of the IMF. Another is, as already alluded to, the credibility of the IMF as an information provider that has its own interests. Instead of assuming that the Fund has some exogenous private benefit from being perceived to be a good monitor of members, as Marchesi and Sabani (2007) do, I analyse the credibility issue by specifying an objective function based on the preferences of both an aid donor and a recipient, since according to its mandate the IMF should be a steward of the welfare of all member countries. This makes the relative weight put on the objectives of the other two players a key parameter for outcomes, as in any cheap-talk game.

My focus here is on the effects of information provision only. It is true that the IMF’s engagement in low income countries that do not qualify for the PSI always take the form of a financial arrangement. However, currently low-income members of the Fund borrow at zero interest.¹⁴ Thus, the financial implications for the IMF itself are not that important. Moreover, the opportunity cost of lending to one low-income member - that these funds are temporarily not available for other members eligible under the Poverty Reduction and Growth Trust - is most appropriately modelled by studying this trade-off explicitly. Given the complexities involved in modelling information provision by two parties, this must await future research.

Finally, note that I analyse a scenario where the IMF is an active player moving before a game between an aid donor and a recipient, with the Fund

¹³This means that I am also expanding on the analysis in Hagen (2012), where only the IMF and not the member country could signal private information. Marchesi et al. (2011) analyse the question of the optimal assignment of responsibility for policies between a multilateral agency and a country, assuming both parties have relevant information. However, there are no suppliers of financial resources in the setting they investigate.

¹⁴See IMF Executive Board Approves Extension of Temporary Interest Waiver for Low-Income Countries, IMF Press Release No. 12/505.

providing a public statement based on what a surveillance operation has revealed about the appropriateness of recipient policy. An alternative, perhaps more literate interpretation of what gatekeeping means would be for the IMF to be an “interpreter” monitoring the government before making a “comment” to donors. However, to me this seems too close to assuming that the Fund plays such a role, as it would preclude donors from making any kind of inference from the recipient’s own actions. While I have argued that donors are less well equipped to monitor recipients than the IMF is, it is probably too extreme to assert that they never watch them for clues as to the appropriateness of their policies. If this is the case, we should expect recipients to take donors’ responses into account. By assuming the IMF moves first, I allow for gatekeeping to be an endogenous equilibrium feature of the game depending on the Fund’s incentives.

I first outline the aid game (in section 2) before I add the IMF (in section 3). The analysis reveals interesting results, such as recipient policy being highly non-monotonic in the quality of the IMF’s surveillance operation. Section 4, containing a summary and discussion of the results, concludes the paper.

2 The Donor-Recipient Game

2.1 Model Set-Up

There is a single donor giving aid to a low-income country. The relationship between the transfer from abroad (T) and recipient country consumption (C) is given by

$$C(G, T; S) = Y + \eta(G; S)T, \tag{1}$$

where Y is domestic income and $\eta(G; S)$ is the marginal impact of aid on consumption. The recipient country government’s policy G affects the impact aid has, but which policy is optimal from this perspective depends on the state of the world S . More specifically, I assume

$$\eta(G; S) = \begin{cases} \bar{\eta}, G = S = a, \\ \bar{\eta}, G = S = b, \\ 0, G \neq S. \end{cases} \tag{2}$$

This function is common knowledge to donor and recipient. Without loss of generality, let $\bar{\eta} = k\eta$, $k > 1$. k measures the common bias in the actors’ assessment of $\eta(G; S)$, i.e., the extent to which it is desirable to be in state a instead of state b given that the government chooses the correct policy. As will become apparent, this bias plays a crucial role since it makes the donor prefer to be in a particular state. If the government then can manipulate the donor’s beliefs - present it with “good news” - it might succeed in having more aid. That is, the Good News Bias means it could be tempting for the government to choose policy a even if its own information suggests policy b is more appropriate. In contrast, assuming aid has no impact if the government chooses the “wrong” policy ($\eta(a; b) = \eta(b; a) = 0$) is just a convenient normalisation.

The idea is that a particular policy is appropriate only in some circumstances. For example, an economic crisis calls for different macroeconomic policies than an economic boom and whether the government actually chooses the right policies will also affect the impact that aid has. More generally, we know from the theory of the second best that optimal policies are highly context specific (Rodrik 2005). Obviously, I here abstract from the details of the economic structure in order to focus on the strategic interaction between recipients and donors as well as how the IMF influences this game. In particular, assuming Y is exogenous rules out the possibility that aid policy is dynamically inconsistent. However, in Hagen (2015) I demonstrate that the qualitative conclusions that can be drawn from this aid game to a large extent survive the endogenisation of Y .

The donor and the recipient share a common prior over the distribution of S : $S = a$ with probability $p = 0.5$. In the absence of the IMF, they update this prior after observing the government's policy and a private signal of S , respectively. However, I will later demonstrate that if the IMF provides credible high-quality information, the result is to skew the balanced prior p . This introduces another potential source of bias in policy-making. If donors have skewed priors about what the state of the world - and thus the appropriate policy - is (e.g., $p > 0.5$), recipients could be tempted into conforming to this belief since this will tend to increase the size of aid flows. In Mukand (2006) and Hagen (2008), the Conformity Bias and the Good News Bias are studied separately. Here, the role of the IMF as an information provider implies that there are circumstances where Conformity Bias arises endogenously in a situation where only the Good News Bias exists at the outset.

It seems uncontroversial to assert that recipients know more than donors about their own economy. Hence, I assume that the government receives a private signal $\sigma \in \{\alpha, \beta\}$ about the true state of the world before making its policy choice. The signal may be thought of as information gathered by the bureaucracy. The reliability of σ is $1 > \rho > 0.5$. That is, $\rho = \text{prob}(\sigma = \alpha | S = a) = \text{prob}(\sigma = \beta | S = b)$. The assumption $\rho > p$ is crucial in the sense that it opens up a role for signalling of the government's private information. If $\rho = p$, the recipient would disregard σ due to its lack of reliability and go by the common prior instead. The donor would then know that the government's policy choice has no informational content and base its decision on p too. However, as will later become apparent the IMF could in some circumstances induce a new "prior" that is larger than ρ if the IMF has information about S that is more accurate than the government.

A final point to note is that with a balanced prior the government's posterior is $\text{prob}(S = a | \sigma = \alpha) = \text{prob}(S = b | \sigma = \beta) = \rho$. In other words, it is better informed after having received the informative signal. Obviously, this too will change if the IMF provides the players in the aid game with more information than they had at the outset. This means that the basic Good News Bias could be aggravated. As will later be shown, if state a is more likely given the IMF's statement, the posterior probability distribution will make the donor even more willing to reward a credible signal that the government's private information is

α . On the other hand, this effect will counteract the Good News Bias if the IMF sends a credible, informative message to the effect that its surveillance revealed that state b is more likely. In this case, if the Conformity Bias is large enough, it could actually dominate and make donors more willing to reward policy b than policy a .

For now, the timing is that the government first observes σ , then chooses G . Finally, the donor selects T .¹⁵ Because the donor takes the policy as given, I restrict my attention to an unconditional kind of transfer. For concreteness, let this be unconditional budget support. η could then be thought of as the marginal effect of public spending.

As the signal σ is not 100% reliable, the government of the developing country is not certain about the true state of the world when it makes its policy choice. It therefore maximises the expected value of consumption given its *beliefs* about S after having observed σ , i.e.,

$$E[U|\sigma] = E[C(G, T; S) | \sigma] = Y + E[\eta(G; S) | \sigma] T \quad (3)$$

The donor's objective function incorporates its altruistic concern for the recipient as well as the cost of aid.¹⁶ It is thus assumed to maximise the expected value of C given the observed policy and its beliefs about the recipient's incentives to reveal its private information, taking into account how costly it is to make the transfer:

$$E[V|G] = E[C(T; G, S) | G] - \frac{\theta}{2} T^2 \quad (4)$$

Here $\theta > 0$ is a parameter scaling the cost to the donor of making the transfer. Note that the cost of aid is the only factor that separates these objective functions. This puts the focus squarely on the potential asymmetry of information between recipient and donor, and thus paves the way for a cleaner analysis of the role that IMF surveillance and signalling can play.

2.2 Equilibria of the Donor-Recipient Game

The donor forms an updated opinion about the true state of the world based on G and its evaluation of the recipient government's incentives. In Perfect Bayesian Equilibria (PBE), this process of updating is governed by Bayes' Rule

¹⁵The empirical literature on the failures of aid conditionality (e.g. Dollar and Svensson 1998, Easterly 2005, Ivanova et al. 2003) shows that this is a realistic description of the strategic interaction between donors and recipients in general, as it supports the results in the theoretical literature on the Samaritan's Dilemma (Hagen 2006a, Pedersen 1996, 2001, and Svensson 2000), showing donors behave as if they are followers in the aid game.

¹⁶Empirical studies of aid allocation in general indicate that donors care about both recipient needs and merit, as well as their own foreign policy interests, c.f. Alesina and Dollar (2000), Berthélemy (2006), and Hoeffler and Outram (2011). The latter seem of lesser importance here as the archetypical low-income country traditionally has had little to offer in terms of geo-politics or commerce. Dollar and Levin (2006) and Claessens et al. (2009) find that donors have become more selective in recent years with respect to both recipient income and policies, whereas Easterly and Williamson (2011) do not.

along the equilibrium path. As even the government does not know the true state of the world when making its move, ex ante the donor is only certain to learn the policy before deciding on the transfer. The main issue is the extent to which the recipient is willing and able to transmit its private information to the donor.

It should be apparent that the combination of the common bias in the aid impact function and the information asymmetry implies that aid could distort policy-making in the following sense. Because the donor will give more aid if it believes the marginal impact of the gift is high, the recipient could have an incentive to induce the donor to have this belief even if its own signal suggests that this is unlikely to be true. That is, when $\sigma = \beta$ it could be willing to trade a lower expected impact of aid due to misaligning policy and signal for the more generous transfer that will be forthcoming if the donor thinks $\sigma = \alpha$. What holds the government back sometimes is thus that it expects each aid dollar to produce less bang if it does not choose G in accordance with σ .

Misleading the donor is obviously not attractive if $\sigma = \alpha$. The donor will give less if it thinks $\sigma = \beta$, and the government's own assessment of expected aid impact deteriorates from $\rho\bar{\eta}$ to $(1 - \rho)\bar{\eta}$ if it chooses $R = b$ instead of $R = a$. Proposition 1 summarises the results more formally.¹⁷

Proposition 1

If donor and recipient share a common bias k in their judgment of the gains from matching policy with the environment, the following equilibria satisfy the Intuitive Criterion of Cho and Kreps (1987):

a) $\forall k \in (1, \underline{k}]$, there is a separating PBE where the government's policy reflects its private information: $G^S(\alpha) = a$ and $G^S(\beta) = b$. The donor gives aid as if it had directly observed σ : $T^S(a) = \rho\bar{\eta}/\theta$ and $T^S(b) = \rho\bar{\eta}/\theta$.

b) $\forall k \in (\underline{k}, \bar{k})$ there is a hybrid (semi-separating) PBE where the government's policy is only partially informative with respect to its private information: $G^H(\alpha) = a$, whereas $G^H(\beta) = b$ with probability $1 - \mu(k) \in (0, 1)$. The donor gives aid according to the rule $T^H(a) = \pi^H(a)\bar{\eta}/\theta$, where $\pi^H(a) = \frac{\rho + (1-\rho)\mu}{1+\mu}$ is the probability that η is positive when $G = a$, and $T^H(b) = \rho\bar{\eta}/\theta$;

c) $\forall k \in [\bar{k}, \infty)$ the PBE is pooling, i.e., the government's policy is not informative: $G^P(\sigma) = a$; $\sigma = \alpha, \beta$; the donor gives aid according to the rule $T^P(a) = 0.5\bar{\eta}/\theta$, $T^P(b) = \rho\bar{\eta}/\theta$.

Figure 1, where I for simplicity expresses the government's strategy when $\sigma = \alpha$ in terms of the probability that it plays $G = a$, illustrates how the equilibrium varies with the bias in the aid impact function that makes the actors want to be in state a instead of state b even when policy is optimal in both cases.

[Figure 1 about here]

Note that due to the skewness of the aid function the donor responds more favourably to a policy that confirms its ex ante bias, even at fairly low levels of this bias: $T^S(a) > T^S(b)$. This reaction is what makes mimicking tempting for large enough k when $\sigma = \beta$. As $\eta(G; S)$ gets more biased, inducing the

¹⁷The formal proof of these and all later results are in the appendix.

government to choose $G = a$ when $\sigma = \beta$ with higher probability, the donor's generosity when observing a diminishes. However, it is still true that $T^P(a) > T^P(b)$. That is, the donor in fact gives more aid when learning nothing than when learning that $\sigma = \beta$. This shows the extent to which the transfer can be driven by strongly skewed initial beliefs.

3 IMF Bilateral Surveillance

3.1 Preliminaries

As noted in the introduction, it is often argued that donors have delegated the task of monitoring the macroeconomic policies of aid recipients to the IMF. Bilateral surveillance - monitoring each member - is part of the organization's mandate. The Fund is also tasked with keeping an eye on the world economy at more aggregate levels, so-called multilateral surveillance. It is thus certainly plausible that it has more reliable information than a single donor and that the IMF therefore is in a position to influence donor-recipient relationships. However, the IMF is to take the interests of all members into account.¹⁸ Moreover, as argued in the introduction it is influenced by the dominant member (the US) and presumably has its own organisational goals. Hence, it is necessary to analyse its incentives to provide accurate information.

While much of what the IMF knows about a member comes from the government of that country, it is still reasonable to assume that the information sets of the two parties are distinct at the outset. The IMF monitors other countries too, and so could know more about matters such as the prospects of country's exports and potential spillovers from neighbouring countries. In addition, members do not always honour their obligation to provide the Fund with timely and accurate data (Stone 2011). I consider both the case where the government has the most reliable information and the case where that distinction goes to the IMF. One way to think of this is that in some circumstances what matters the most is the domestic economy, giving the government an informational advantage, whereas the IMF has superior information if external circumstances play a crucial role with respect to policy-making.¹⁹

More specifically, I assume that at the outset the IMF has the same prior p as the donor and the recipient, but that its surveillance operation provides it with a private signal $\Sigma \in \{\alpha, \beta\}$ of the state of the world. The reliability of the surveillance exercise is $r = \text{prob}(\Sigma = \alpha | S = a) = \text{prob}(\Sigma = \beta | S = b)$. With balanced priors, the posterior equals r : $\text{prob}(S = a | \Sigma = \alpha) = \text{prob}(S = b | \Sigma = \beta) = r$. I assume that r , like ρ , is common knowledge.

After having gathered this private information, the Fund decides what to say in a public statement $m \in M = \{\alpha, \beta, N\}$. As the signal can only take

¹⁸See, for example, the Articles of Agreement, I(v).

¹⁹An alternative interpretation is that the IMF sometimes interact with member governments with well-functioning bureaucracies and sometimes with members where administrative quality is low.

on two possible values, three potential statements are enough. In addition to the messages α and β , the IMF can “decline” to reveal what it has found. I denote this by N for “no comment.” However, this message has a much wider interpretation than the literal one. As I will explain in more detail when I discuss the equilibrium concept applicable here it stands for all possible unconvincing statements the IMF can make regarding what its surveillance revealed.

In this section, then, the timing is as depicted in Figure 2.

[Figure 2 about here]

As the Fund has a near universal membership, I assume that both the donor and the recipient are members. Moreover, I take this to imply that the IMF takes the interests of both the other actors into account.²⁰ Given that the conflict of interests between them is at a minimum this should be uncontroversial. What I assume more specifically is that the IMF’s objective function is a weighted average of (3) and (4), resulting in

$$E[W|\Sigma] = E \left[C(G, T; S) - \omega \frac{\theta}{2} T^2 \mid \Sigma \right]. \quad (5)$$

$\omega \in (0, 1)$ is the weight attached to the donor’s objective function. Thus, in deciding what to say given what it has learned the IMF will take into account any effect on C induced by changes in G and T as well as on the cost of aid given. Note that as the Fund completes the surveillance operation before the government receives its signal, the IMF is in general uncertain as to what policy will be chosen. This implies that it is not sure what the size of the transfer will be either. However, it can foresee what the equilibrium in the aid game will be, conditional on any influence it has on the beliefs of the donor and the recipient.

As may be seen, the IMF’s statement m does not directly influence the payoff of any of the actors. The surveillance operation can thus be thought of as giving rise to a game of “cheap-talk” where the players are the IMF, the donor, and the recipient, and the latter two update their beliefs about the state of the world after considering two factors. First of all, they must evaluate whether the IMF has information that is sufficiently reliable to be worth taking into account. The second issue is the Fund’s incentives to make truthful statements. If the IMF appears to be both credible and reliable the donor and the recipient will be induced to change their actions. However, the very potential of IMF influence can be self-destructive as it might try to exert it to the detriment of one of the players. If the temptation is powerful its message will thus be ignored. Hence, N could also describe the outcome of a botched attempt by the IMF to willfully mislead, causing it to lose credibility with the other actors.

The applicable equilibrium concept for this type of game is still PBE. As was the case for the game of costly signalling between recipient and donor, there are usually more than one PBE. Following Farrell (1993) I assume i) all agents share a common language and ii) this language is “rich”. The common language

²⁰See Hagen (2009) for a more detailed discussion of this assumption and Mayer and Mourmouras (2005) for a similar approach in a setting where a multilateral like the IMF only provides grants and there are no information asymmetries.

assumption implies that the literal meaning of any message is clear, so that pure misunderstandings are never barriers to communication.

The rich language assumption rules out the “babbling” equilibrium that is a standard feature of cheap-talk games. In such an equilibrium the donor and the recipient treat all IMF statements as containing no information and therefore go by their priors, in turn making it equilibrium behaviour for the Fund to send all possible messages with the same positive probability. As there are no unused messages, there would be no way we could check the plausibility of this equilibrium by studying what would happen if something that goes unsaid in equilibrium suddenly was stated (an out-of equilibrium message was sent), which is the standard way of refining PBE. However, 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.” The rich language assumption does away with this uninteresting candidate equilibrium by always allowing for some other way of stating anything.

This paves the way for another approach to refining the set of equilibria. I apply Farrell’s (1993) concept of neologism-proofness when this is necessary to sharpen the predictions. This works as follows. Suppose there is an out-of-equilibrium message (a neologism) with the interpretation “surveillance revealed $\Sigma = \alpha$.” This neologism is “self-signalling” if and only if the IMF would like the players in the aid game to believe this statement only when it is true. Then, an equilibrium in which this message is not sent is not neologism-proof if the IMF has an incentive to use it (i.e., is better off than in the purported equilibrium if the message is sent and believed). Consequently, there are essentially only three meanings that the IMF can communicate to third-parties in pure-strategy equilibria. I therefore assume that M consists of α , β , and N , and that in all pooling PBE the IMF statement is N . The latter assumption implies that there are always neologisms available even though I restrict the size of the message space.²¹ Note that confining the IMF to pure strategies is without loss of interesting generality as any influence the IMF has depends on the probability r . That is, what matters is whether the IMF induces a new “prior” for the donor and the recipient. If it does, any effect can be generated by varying r .

3.2 Equilibria in the Aid Game with IMF Surveillance

If $r = p = 0.5$, the IMF would disregard its own signal. The donor and recipient would then not pay any attention to its statements. This kind of uninformative signalling is obviously not very interesting. I therefore assume $r > 0.5$ in the following. This assumption does not rule out IMF surveillance being inconsequential. The Fund could have strategic incentives that conflicts with providing

²¹If pooling at α or β was allowed for, I would have to change the message space when investigating whether such PBE are neologism-proof to maintain the possibility of the IMF literally stating, say, that surveillance revealed $i = \alpha$ (as a pooling equilibrium statement α would then convey no information). As noted, Farrell (1993) also assumes that neologisms are always available.

a forthright and truthful assessment. For example, if $\Sigma = \beta$, it could fear that clearly stating this information will induce an equilibrium in the aid game in which little aid will be forthcoming. In such cases, the donor and the recipient will ignore the Fund and play the game in the manner described in Proposition 1. The IMF statement that is consistent with such an equilibrium is $m = N$.

If on the other hand the IMF manages to be informative in equilibrium, its statement will generate new “priors” for the two other players. As the latter then become as knowledgeable as the Fund, these will equal its posterior, r . Note that due to the signals being independent, the recipient’s private signal has residual informational value. Hence, the Fund will not be able to completely erase the advantage that recipients have relative to donors. In other words, the recipient government could still be tempted to choose policies that elicit a favourable response from donors even if it expects aid impact to be lower. In fact, as I will now demonstrate even credible IMF statements can lead to less efficient equilibria in the aid game.

[Figure 3 about here]

Denote the government’s posteriors by $q(\sigma; m)$ and $q(\beta; m)$, respectively. Since the prior is no longer balanced, the two are not identical anymore. For a credible statement by the IMF that $\Sigma = \alpha$, the exact expressions are

$$q(\alpha; \alpha) = \text{prob}(S = a | \sigma = \alpha, m = \alpha) = \frac{r\rho}{r\rho + (1-r)(1-\rho)}; \quad (6a)$$

$$q(\beta; \alpha) = \text{prob}(S = b | \sigma = \beta, m = \alpha) = \frac{(1-r)\rho}{(1-r)\rho + r(1-\rho)}. \quad (6b)$$

Figure 3 shows how $q(\alpha; \alpha)$ and $q(\beta; \alpha)$ vary with r . It visualises how the Fund can magnify the effects of the Good News Bias. If $\Sigma = \alpha$ and the IMF is able to credibly signal this, the government’s private information can either confirm or contradict this. Intuitively, $q(\alpha; \alpha) > \rho > q(\beta; \alpha)$: the government is more certain in its beliefs after receiving a signal in accordance with the IMF’s credible statement than it is if σ and Σ are in conflict. If it can convince the donor that $\sigma = \alpha$, the latter becomes much more generous. Not only is state a more beneficial in terms of aid impact if the right policy is chosen, it now appears to be the most likely state too. This could tempt the recipient into disregarding a contradictory signal even at relatively low levels of k . More precisely, the critical value of the common bias beyond which no separating equilibrium exists in the aid game is now $\underline{\kappa}(r) < \underline{k}$. The space for fully informative policymaking is thus reduced. Furthermore, the result carries over to the borderline between the semi-separating and the pooling equilibria: $\bar{\kappa}(r) < \bar{k}$. In other words, the space for pooling is increased. In fact, in the appendix I demonstrate that there are two critical values of r beyond which first the separating equilibria and then the hybrid equilibria vanish. If the IMF has precise enough information and is seen as credible it can thus completely destroy the value of the government’s signal, leaving donors with only the Fund to rely on. In this case Conformity Bias adds to the Good News Bias and this has a detrimental impact on outcomes in

the aid game. These results are summarised in Proposition 2 and illustrated in Figure 4.²²

Proposition 2

If the IMF can credibly state $m = \Sigma = \alpha$, outcomes in the aid game are as follows:

a) $\forall (k, r) \in (1, \underline{\kappa}(r)] \times (0.5, \widehat{r}]$, there is a separating PBE where the government's policy reflects its private information: $G^S(\alpha; \alpha) = a$ and $G^S(\beta; \alpha) = b$. The donor gives aid as if it too observes σ : $T^S(a; \alpha) = q(\alpha; \alpha) \bar{\eta}/\theta$ and $T^S(b; \alpha) = q(\beta; \alpha) \bar{\eta}/\theta$.

b) $\forall (k, r) \in (\underline{\kappa}(r), \bar{\kappa}(r)) \times (0.5, \widehat{r}]$ there is a semi-separating PBE where the government's policy is only partially informative with respect to its private information: $G^H(\alpha; \alpha) = a$, whereas $G^H(\beta; \alpha) = b$ with probability $1 - \mu \in (0, 1)$. The donor gives aid according to the rule $T^H(a; \alpha) = \pi^H(a) \bar{\eta}/\theta$, where $\pi^H(a) = \frac{r[\rho+(1-\rho)\mu]}{\nu+(1-\nu)\mu}$ is the probability that η is positive when $G = a$, and $T^H(b; \alpha) = q(\beta; \alpha) \bar{\eta}/\theta$.

c) $\forall k \in [\bar{\kappa}(r), \infty) \times (0.5, 1)$ the PBE is pooling, i.e., the government's policy is not informative: $G^P(\sigma; \alpha) = a, \sigma = \alpha, \beta$; aid policy is $T^P(a; \alpha) = r \bar{\eta}/\theta$, $T^P(b; \alpha) = q(\beta; \alpha) \bar{\eta}/\theta$.

[Figure 4 about here]

Of course, the flip-side of these results is that if $\Sigma = \beta$ a credible statement of IMF surveillance findings weakens the Good News Bias in recipient country policy-making over some range. Now $q(\alpha; \beta)$ is expressed by (6b) and $q(\beta; \beta)$ by (6a). Loosely speaking, switching the labels on the curves Figure 3 illustrates this case too. The new priors of the donor and recipient are then lower, worsening the government's trade-off of aid quantity for aid quality. It sees a larger potential cost in terms of lower expected aid impact from misaligning policy and signal, and the donor is less inclined to be differentially generous when seeing $G = a$ instead of $G = b$. Accordingly, the parameter values for which the government's policy fully reflects its private information is enlarged and the space for which G has no informational content is reduced. For these parameter values, Conformity Bias dampens the Good News Bias and this increases the likelihood that the equilibrium in the aid game is efficient.

However, if the Good News Bias is rather weak (k low) the truthful revelation of high-quality information by the Fund can distort recipient country policies in the opposite direction in this case. The recipient will attach a higher probability to the possibility that choosing b is the right course of action. Moreover, it knows that so will the donor. When the IMF's information becomes "too reliable," i.e., exceeds a critical value \widehat{r} shown in Figure 5, the government will be tempted to heed the Fund's advice some of the time even if it has contrarian information. And if r is higher than a second threshold, b becomes optimal for the government regardless of the value of σ . Now the Conformity Bias actually outweighs the Good News Bias, generating a pattern that is the mirror image of the one

²²For simplicity, all the critical value functions in figures 4 and 5 are graphed as straight lines. They are all actually non-linear in r , however.

without IMF involvement, when the temptation aid created for the government was to choose policy a even if it was not appropriate given σ .

Proposition 3 summarises the consequences for the aid game of the IMF credibly revealing .

Proposition 3

If the IMF credibly reveals $m = \Sigma = \beta$, the equilibria of the aid game are the following.

a) $\forall (k, r) \in (1, \underline{\kappa}(r)] \times (\widehat{r}, \rho)$, the PBE are pooling with $G^P(\sigma; \beta) = b; \sigma = \alpha, \beta$; and $T^P(a; \beta) = q(\alpha; \beta) \bar{\eta}/\theta$, $T^P(b; \beta) = r\bar{\eta}/\theta$.

b) $\forall (k, r) \in (\underline{\kappa}(r), \bar{\kappa}(r)] \times (\widehat{r}, \rho)$, the PBE are semi-separating in which $G^H(\alpha; \beta) = a$ with probability μ , $G^H(\beta; \beta) = b$; $T^H(a; \beta) = q(\alpha; \beta) \bar{\eta}/\theta$ and $T^H(b; \beta) = \pi^H(b) \bar{\eta}/\theta$, where $\pi^H(b) = \frac{r[1-(1-\mu)\rho]}{\nu+(1-\nu)(1-\mu)}$ is the probability that η is positive when $G = b$.

c) $\forall (k, r) \in (\bar{\kappa}(r), \infty) \times (1, \rho)$, there is separation in the PBE, i.e., $G^S(\alpha; \beta) = a$ and $G^S(\beta; \beta) = b$; and thus $T^S(a; \beta) = q(\alpha; \beta) \bar{\eta}/\theta$ and $T^S(b; \beta) = q(\beta; \beta) \bar{\eta}/\theta$.

d) $\forall (k, r) \in (\bar{\kappa}(r), \infty) \times (1, \rho)$, the PBE are semi-separating, where $G^H(\alpha; \beta) = a$, but $G^H(\beta; \beta) = b$ with probability $1 - \mu \in (0, 1)$. The aid rule is $T^H(a; \beta) = \pi^H(a) \bar{\eta}/\theta$, where $\pi^H(a) = \frac{(1-r)[\rho+(1-\rho)\mu]}{\nu\mu+(1-\nu)}$ is the probability that η is positive when $G = a$, and $T^H(b; \beta) = q(\beta; \beta) \bar{\eta}/\theta$.

e) $\forall (k, r) \in (\bar{\kappa}(r), \infty) \times (1, \rho)$, the government pools on b : $G^P(\sigma; \beta) = b; \sigma = \alpha, \beta$; the donor gives according to $T^P(a; \beta) = (1-r) \bar{\eta}/\theta$, $T^P(b; \beta) = q(\beta; \beta) \bar{\eta}/\theta$.

Figure 5 displays the results described in Proposition 3.

[Figure 5 about here]

Figure 6 demonstrates the intuition behind propositions 2 and 3. In both cases, a higher k (a larger Good News Bias) increases the difference between the aid induced by the two possible policies in the separating equilibrium. When the gap becomes large enough, separation cannot be sustained as it becomes too tempting for the government to choose $G = a$ even if $\sigma = \beta$. When $m = \Sigma = \alpha$, $T^S(a; \alpha) - T^S(b; \alpha)$ also goes up with r as then $G = a$ is not only the policy that makes it possible to attain maximum aid impact, it is also more likely that this maximum will in fact be attained.

On the other hand, when $m = \Sigma = \beta$, the effect of IMF information being more reliable (a higher r) is to reduce the difference in what the donor is willing to pay in a separating equilibrium after seeing the two policies. In this case, the Fund provides contrarian information. It is still the case that $G = a$ yields a shot at the highest possible aid impact, but it is now less likely that this is the correct policy and more likely that it results in no bang-for-the-aid-buck. This makes donors less inclined to transfer more funds when seeing a instead of b , and so the government's incentive to follow its signal is stronger. However, the IMF's influence can become too strong, reversing the gap in separating equilibrium aid flows. This might induce the recipient to select $G = b$ regardless of its own signal as it realises that the donor follows the highly reliable Fund advice saying that state b , in which this policy is the correct one, is the most likely possibility.

Before turning to the investigation of the IMF's incentives for making truthful statements, which will determine its credibility, note that from propositions 2 and 3 Corollary 1 follows:

Corollary 1

As long as the Fund is credible it is a gatekeeper.

Simply inspecting the propositions provide the proof. In all equilibria described in propositions 2 and 3, the IMF influences aid flows because the donor's posterior probabilities that aid impact is positive are functions of r .

3.3 Existence of Equilibria with IMF Surveillance

To be completed.

4 Conclusion

The IMF interacts with its members in many ways. Moreover, the interaction seems to vary with the income level. In poor member countries where foreign aid is the main international financial flow, the Fund engages in both funded arrangements and surveillance. Qualitative studies as well as recent econometric evidence suggest most aid donors take their cues from the IMF when it comes to the quality of the macroeconomic policies of recipients. In this paper I have investigated this "gatekeeping" function. In particular, I have looked at how the Fund's signalling of what its surveillance has revealed about a particular member country influences aid flows to and policy-choice in that country. While here Fund messages are "cheap talk," I find that if the IMF is able to credibly state the policy-relevant information it obtains through surveillance it will affect member country policymaking in complex ways. Sometimes the Fund may aggravate the basic Good News Bias that tempts the recipient government into distorting its policy choice in the hope of obtaining more aid. In such cases, surprisingly, the IMF tends to induce the government's policy-choice to be less informative the better the Fund's information is.

On the other hand, there are other cases where the IMF can counteract this bias by credibly and truthfully revealing information about the state of the world that suggest the policy that is less favoured ex ante is actually the right one. Equilibria of the aid game are then more likely to reflect the combined knowledge of the IMF and the recipient government and the better the information of the former the higher is the probability that the latter acts on its own information. Finally, in yet other instances the IMF's contrarian message can be too powerful, inducing the recipient to follow the Fund because it knows that donors' decisions are heavily influenced by its advice.

The most important finding is that as long as the IMF is credible, it is a gatekeeper of aid flows through its influence on donors' beliefs about what policy maximises aid impact. It is only when the IMF is unable to credibly state what its surveillance has revealed about the state the recipient is in that it is without

influence on the volume of aid. The next step will be to investigate what these results entail for the credibility of the IMF's statement in equilibrium.

5 Appendix (incomplete)

Proof of Proposition 1

First note that the donor's problem is $Max_T E[W|G] = E[C(T; G, S)] - \frac{\theta}{2}T^2 = Y + E[\eta(G; S)]T - \frac{\theta}{2}T^2$. The first derivative condition for an optimum is thus $E[\eta(G; S)] - \theta T = 0 \Leftrightarrow T = E[\eta(G; S)]/\theta$. Define $\varphi(G) = prob(\sigma = \alpha | G)$. In a separating equilibrium $\varphi(a) = 1$ and $\varphi(b) = 0$ since the donor becomes as knowledgeable as the government. That is, $prob(\eta > 0 | G = a) = \pi^S(a) = \rho = \pi^S(b) = prob(\eta > 0 | G = b)$. Then $T^S(a) = \frac{E[\eta(a; S)]}{\theta} = \frac{\rho\bar{\eta}}{\theta} > T^S(b) = \frac{E[\eta(b; S)]}{\theta} = \frac{\rho\bar{\eta}}{\theta}$.

The conditions that have to be fulfilled if a separating PBE where $G^S(\alpha) = a$ and $G^S(\beta) = b$ is to exist are:

$$E[C(a, T^S(a)) | \alpha] \geq E[C(b, T^S(b)) | \alpha]; \quad (A1a)$$

$$E[C(b, T^S(b)) | \beta] \geq E[C(a, T^S(a)) | \beta]. \quad (A1b)$$

That is, given the donor's response to the two policies, it must be better for each type to let its choice reflect its private information. (A1a) obviously holds as a strict inequality; α prefers correctly matching policy to signal as this strengthens both its own and the donor's assessment that aid impact is likely to be high. Hence, we only need to check whether and when (A1b) is satisfied. β faces a trade-off as mimicking α yields more aid, but lowers its own expectations of η . To investigate this trade-off, it is helpful to rewrite (A1b) in terms of β 's proportional loss (L) and gain (Γ) from mimicking:

$$L(k) \equiv \frac{E[\eta(b) | \beta]}{E[\eta(a) | \beta]} = \left(\frac{\rho}{1-\rho} \right) \frac{1}{k} \geq \frac{T^S(a)}{T^S(b)} = k \equiv \Gamma(k), \quad (A1b')$$

We have

$$\begin{aligned} \frac{\partial L}{\partial k} &= - \left(\frac{\rho}{1-\rho} \right) \frac{1}{k^2} < 0; \\ \lim_{k \rightarrow 1} L &= \frac{\rho}{1-\rho} > 1; \\ \lim_{k \rightarrow \infty} L &= 0; \end{aligned}$$

and

$$\begin{aligned} \frac{\partial \Gamma}{\partial k} &= 1; \\ \lim_{k \rightarrow 1} \Gamma &= 1; \\ \lim_{k \rightarrow \infty} \Gamma &= \infty. \end{aligned}$$

Moreover,

$$L(\underline{k}) \equiv \Gamma(\underline{k}) \Leftrightarrow \underline{k} = \sqrt{\frac{\rho}{1-\rho}}.$$

Given these facts, $L(p) \geq \Gamma(p) \Leftrightarrow k \leq \underline{k}$.

To make a mixed strategy optimal for β , it must be indifferent between the two pure strategies. The conditions required for a hybrid (semi-separating) equilibrium are therefore

$$E[C(a, T^H(a)) | \alpha] \geq E[C(b, T^H(b)) | \alpha]; \quad (A2a)$$

$$E[C(b, T^H(b)) | \beta] = E[C(a, T^H(a)) | \beta]. \quad (A2b)$$

Rewriting (A2b) using that $T^H(b) = T^S(b)$ and $T^H(a) = \frac{\pi^H(a; \mu) \bar{\eta}}{\theta}$ yields

$$L(k) = \frac{E[\eta(b) | \beta]}{E[\eta(a) | \beta]} = \left(\frac{\rho}{1-\rho} \right) \frac{1}{k} \equiv \frac{T^H(a)}{T^H(b)} = \frac{\pi^H(a) k}{\rho} \equiv \Gamma(k; \mu). \quad (A2b')$$

β 's loss from mimicking α is the same as when contemplating which of the two pure strategies to choose. However, the gain is now a function of μ as the donor's generosity decreases as the extent to which β is dissembling goes up. Using $\pi^H(a; \mu) = \frac{\rho + (1-\rho)\mu}{1+\mu}$ allows us to derive the increasing function

$$\mu(k) = \frac{\rho[(1-\rho)k^2 - \rho]}{[\rho^2 - k^2(1-\rho)^2]}.$$

It may be checked that $\mu(\underline{k}) = 0$. From $\mu(\bar{k}) \equiv 1$, we find that

$$\bar{k} = \sqrt{\frac{2\rho^2}{1-\rho}} = \underline{k} \sqrt{2\rho}.$$

As the assumption $\rho > 0.5$ applies, $\bar{k} > \underline{k}$.

To complete this part of the proof, we need to demonstrate that (A2a) holds. Rewriting it using (A2b)', we have

$$\frac{E[\eta(a) | \alpha]}{E[\eta(b) | \alpha]} = \left(\frac{\rho}{1-\rho} \right) k \geq \frac{T^H(a)}{T^H(b)} = \frac{E[\eta(b) | \beta]}{E[\eta(a) | \beta]} = \left(\frac{\rho}{1-\rho} \right) \frac{1}{k}. \quad (A2a')$$

As $k > 1$, this condition is obviously strictly satisfied for all $k \in [\underline{k}, \bar{k}]$.

It is straightforward to prove that the strategies listed in part c) of the proposition constitute a pooling PBE. I therefore concentrate on demonstrating that candidate pooling equilibria exist for $k < \bar{k}$, but does not survive the application of the Intuitive Criterion. Suppose $\varphi^P(b) = 1$, implying $\pi^P(b) = 1 - \rho$. In this case the donor thinks that the government is of type α if it plays

b so that there is for certain a mismatch between signal and policy. This is the worst potential mismatch, generating the lowest possible aid flow in response. The following candidate equilibrium aid function reflects this fact:

$$\tilde{T}^P(G) = \begin{cases} \frac{0.5\bar{\eta}}{\theta}, G = a; \\ \frac{(1-\rho)\bar{\eta}}{\theta}, G = b. \end{cases}$$

The equilibrium conditions are then

$$E \left[C \left(a, \tilde{T}^P(a) \right) | \alpha \right] \geq E \left[C \left(b, \tilde{T}^P(b) \right) | \alpha \right], \quad (\text{A3a})$$

$$E \left[C \left(b, \tilde{T}^P(b) \right) | \beta \right] \leq E \left[C \left(a, \tilde{T}^P(a) \right) | \beta \right]; \quad (\text{A3b})$$

Proving that the Intuitive Criterion rules out such equilibria amounts to showing that deviating to b is equilibrium-dominated for α but not for β if this deviation convinces the donor of their respective types. Starting with the latter, a “convincing” deviation results in an expected level of consumption of $E \left[C \left(b, T^H(b) \right) | \beta \right] = E \left[C \left(a, T^H(a) \right) | \beta \right] > E \left[C \left(a, \tilde{T}^P(a) \right) | \beta \right]$, where the equality follows from (A2b) and the inequality from the definition of $\pi^H(a; \mu)$, showing that $\pi^H(a; p) > p = 0.5$ for $k < \bar{k}$ (and hence $T^H(a) > \tilde{T}^P(a)$). As regards α , choosing b will result in the lowest possible pay-off if the donor is convinced of its type by this signal: it will get $\tilde{T}^P(b)$ and its own assessment of expect aid impact is $(1-\rho)\bar{\eta}$ too. In other words, (A3a) holds as a strict inequality and there is no way a deviation can raise expected consumption.

Pooling at b is not a PBE even for $\varphi(a) = 0$, as the relative loss from mimicking for α , $\frac{E[\eta(a)|\alpha]}{E[\eta(b)|\alpha]} = \frac{\rho\bar{\eta}}{(1-\rho)\bar{\eta}}$, exceeds the relative potential gain, $\frac{T(b)}{T(a)} = \frac{0.5\bar{\eta}}{(1-\rho)\bar{\eta}}$. QED.

The following lemma concerns the properties of the recipient government’s posterior beliefs when the IMF provides credible information about its surveillance operation and its own signal retains its informational value.

Lemma A1

- a) $1 > q(\alpha; \alpha) > \rho > q(\beta; \alpha)$.
- b) $q(\alpha; \alpha) > r$ and $q(\beta; \alpha) > 1 - r$.
- c) $q(\alpha; \alpha)$ is an increasing, concave function of r , while $q(\beta; \alpha)$ is a decreasing, convex function of the same parameter.

Proof of Lemma A1:

The first inequality in a) follows from the fact that the signal is not 100% reliable. The next two follow from the fact that in this case the government’s private signal is informative and provides confirmatory and contradictory evidence, respectively. Due to the signal being informative b) is also true. By (6a) in the main text, when the IMF sends a credible and truthful message that $\Sigma = \alpha$ $q(\alpha; \alpha) = r\rho/\nu$, where $\nu = r\rho + (1-r)(1-\rho)$ is the “interim” probability that the government receives the signal α . The properties of $q(\alpha; \alpha)$ are as follows

$$\begin{aligned}
\frac{\partial q(\alpha; \alpha)}{\partial r} &= \frac{\rho(1-\rho)}{\nu^2} = \frac{q(\alpha)[1-q(\alpha)]}{r(1-r)} > 0; \\
\frac{\partial^2 q(\alpha; \alpha)}{\partial r^2} &= -2\frac{(2\rho-1)}{\nu} \frac{\partial q(\alpha)}{\partial r} < 0; \\
\text{Lim}_{r \rightarrow p=\frac{1}{2}} q(\alpha; \alpha) &= \rho; \\
\text{Lim}_{r \rightarrow 1} q(\alpha; \alpha) &= 1.
\end{aligned}$$

By (6b) in the main text, we have $q(\beta; \alpha) = (1-r)\rho/(1-\nu)$, where $1-\nu = r(1-\rho) + (1-r)\rho$ is the interim probability that $\sigma = \beta$. $q(\beta; \alpha)$ has the following properties:

$$\begin{aligned}
\frac{\partial q(\beta; \alpha)}{\partial r} &= -\frac{\rho(1-\rho)}{(1-\nu)^2} = -\frac{q(\beta; \alpha)[1-q(\beta; \alpha)]}{r(1-r)} < 0; \\
\frac{\partial^2 q(\beta; \alpha)}{\partial r^2} &= 2\frac{(2\rho-1)}{(1-\nu)} \frac{\partial q(\beta; \alpha)}{\partial r} < 0; \\
\text{Lim}_{r \rightarrow p=\frac{1}{2}} q(\beta; \alpha) &= \rho; \\
\text{Lim}_{r \rightarrow \rho} q(\beta; \alpha) &= 0.
\end{aligned}$$

When $\Sigma = \beta$, the expressions are interchanged, i.e., $q(\alpha; \beta) = \frac{(1-r)\rho}{(1-r)\rho+r(1-\rho)} = \frac{(1-r)\rho}{1-\nu}$ and $q(\beta; \beta) = \frac{r\rho}{r\rho+(1-r)(1-\rho)} = \frac{r\rho}{\nu}$. The results are illustrated in Figure 3 for $\Sigma = \alpha$. QED.

Proof of Proposition 2

When $m = \Sigma = \alpha$ is credible, the loss and the gain to the recipient of mimicking when the donor gives transfers based on separation become

$$L(k) = \frac{E[\eta(b)|\beta; \alpha]}{E[\eta(a)|\beta; \alpha]} = \left[\frac{q(\beta; \alpha)}{1-q(\beta; \alpha)} \right] \frac{1}{k} \quad (\text{A4a})$$

$$\Gamma(k) = \frac{T^S(a; \alpha)}{T^S(b; \alpha)} = \left[\frac{q(\alpha; \alpha)}{q(\beta; \alpha)} \right] k. \quad (\text{A4b})$$

Using Lemma A1, one finds that $L(k)$ has the following properties for $k \leq \underline{k}$:

$$\begin{aligned}
\frac{\partial L(k)}{\partial r} &= \frac{\frac{\partial q(\beta; \alpha)}{\partial r}}{[1-q(\beta; \alpha)]^2} \frac{1}{k} = -\frac{q(\beta; \alpha)}{r(1-r)[1-q(\beta; \alpha)]} \frac{1}{k} < 0; \\
\text{Lim}_{r \rightarrow p=\frac{1}{2}} L(k) &= \left(\frac{\rho}{1-\rho} \right) \frac{1}{k} > \underline{k}; \\
\text{Lim}_{r \rightarrow 1} L(k) &= 0.
\end{aligned}$$

Similarly, the properties of $\Gamma(k)$ are

$$\begin{aligned}\frac{\partial \Gamma(k)}{\partial r} &= \frac{\frac{\partial q(\alpha; \alpha)}{\partial r} q(\beta; \alpha) - q(\alpha; \alpha) \frac{\partial q(\beta; \alpha)}{\partial r}}{[q(\beta; \alpha)]^2} k > 0; \\ \text{Lim}_{r \rightarrow p = \frac{1}{2}} \Gamma(k) &= k \leq \underline{k}; \\ \text{Lim}_{r \rightarrow 1} \Gamma(k) &= \infty.\end{aligned}$$

As here $k \in (1, \underline{k}]$, there exists a critical value of k equating $L(k)$ and $\Gamma(k)$. The new critical value between the separating and the hybrid equilibria is:

$$\underline{\kappa}(r) = \sqrt{\frac{[q(\beta; \alpha)]^2}{[1 - q(\beta; \alpha)] q(\alpha; \alpha)}}.$$

Since $q(\beta; \alpha)$ is monotonically decreasing and $q(\alpha; \alpha)$ monotonically increasing in the new prior r (c.f. Lemma A1), $\underline{\kappa}(r)$ must be monotonically decreasing. Using Lemma A1 again the limit of $\underline{\kappa}(r)$ as r goes to $p = 0.5$ can be shown to be \underline{k} , whereas the limit as r goes to 1 is $0 < \underline{k}$. Thus, $\underline{\kappa}(r) \leq \underline{k}$.

Using the same procedure on the border between the hybrid and pooling equilibria, one finds that whereas $L(k)$ is unchanged $\Gamma(k)$ is now

$$\Gamma(k) = \left[\frac{\pi^H(a)}{q(\beta; \alpha)} \right] k$$

where

$$\pi^H(a) = \frac{r[\rho + (1 - \rho)\mu]}{\nu + (1 - \nu)\mu} \leq q(\alpha; \alpha)$$

is the probability that aid impact is high given $G = a$ and the fact that the recipient government chooses a when $\sigma = \beta$ with probability μ . Equating $\Gamma(k)$ and $L(k)$ allows us to derive the increasing function $\mu(k)$:

$$\mu(k) = \frac{r\rho[1 - q(\beta; \alpha)]k^2 - \nu[q(\beta; \alpha)]^2}{(1 - \nu)[q(\beta; \alpha)]^2 - r(1 - \rho)k^2}.$$

By definition, $\mu(\bar{k}) \equiv 1$. Hence,

$$\bar{\kappa}(r) = \sqrt{\frac{[q(\beta; \alpha)]^2}{[1 - q(\beta; \alpha)]r}} = \underline{\kappa}(r) \sqrt{\frac{q(\alpha; \alpha)}{r}} > \underline{\kappa}(r).$$

The inequality follows from Lemma A1. We know that $\underline{\kappa}(r)$ is monotonically decreasing in r and it is easily seen that so is $\frac{q(\alpha; \alpha)}{r}$. Furthermore, the limit of this critical value as r goes to 0.5 and 1, respectively, are \bar{k} and 0.

The lower limits of $\underline{\kappa}(r)$ and $\bar{\kappa}(r)$ are thus below 1. Since $k > 1$ by assumption, this result and monotonicity in r prove that there are critical values $\hat{r}, \hat{\hat{r}} \in (p, 1)$ such that $\underline{\kappa}(\hat{r}) \equiv 1$ and $\bar{\kappa}(\hat{\hat{r}}) \equiv 1$. It is easily shown that $\hat{\hat{r}} > \hat{r}$.

Hence, first the separating equilibrium region disappears, then the region with semi-separating equilibria. QED.

Proof of Proposition 3

The proof of part a) of Proposition 3 proceeds as follows. First suppose there is an equilibrium in the aid game where the recipient pools on b . Assume $\varphi(a) = 1$. In such an equilibrium

$$T^P(G; \beta) = \begin{cases} \frac{q(\alpha; \beta)\bar{\eta}}{\theta}, G = a; \\ \frac{r\bar{\eta}}{\theta}, G = b. \end{cases}$$

The binding constraint is having the government choose $G = b$ when $\sigma = \alpha$. We have $E[C(a, T^P(a; \beta)) | \alpha; \beta] = Y + \frac{[q(\alpha; \beta)\bar{\eta}]^2}{\theta}$ and $E[C(b, T^P(b; \beta)) | \alpha; \beta] = Y + \frac{[1-q(\alpha; \beta)]r\bar{\eta}^2}{\theta}$. The latter is at least as great as the former when

$$\underline{\kappa}(r) \equiv \left(\frac{r}{1-r} \right) \left(\frac{1-\rho}{\rho} \right) \sqrt{\frac{1-\nu}{1-\rho}} \geq k.$$

Taking the limit of $\underline{\kappa}(r)$ as r goes to 0.5 and 1, respectively, in combination with the fact that $\underline{\kappa}(r)$ is monotonically increasing in r confirms that $\exists \hat{r} \in (0.5, 1)$ such that $\underline{\kappa}(\hat{r}) \equiv 1$.

In the next region we still have $G(\beta; \beta) = b$, but now $G(\alpha; \beta) = a$ with probability μ . In this hybrid equilibrium, the aid function is

$$T^H(G; \beta) = \begin{cases} \frac{q(\alpha; \beta)\bar{\eta}}{\theta}, G = a; \\ \frac{\pi^H(b)\bar{\eta}}{\theta}, G = b; \end{cases}$$

where $\pi^H(b) = \frac{r[1-\mu(1-\rho)]}{\nu+(1-\nu)(1-\mu)}$. If the government is to randomise when $\sigma = \alpha$, $E[C(a, T^H(a; \beta)) | \alpha; \beta]$ and $E[C(b, T^H(b; \beta)) | \alpha; \beta]$ must be equal. We have $E[C(a, T^H(a; \beta)) | \beta; \alpha] = Y + \frac{[q(\alpha; \beta)\bar{\eta}]^2}{\theta}$ and $E[C(b, T^H(b; \beta)) | \beta; \alpha] = Y + \frac{[1-q(\alpha; \beta)]\pi^H(b)\bar{\eta}^2}{\theta}$. Equating these the following function can be derived:

$$\mu(k) = \frac{(1-r)^2 \rho^2 k^2 - r^2 (1-\rho)(1-\nu)}{(1-\nu) \left[(1-r)^2 \rho^2 k^2 - r^2 (1-\rho)^2 \right]}.$$

This expression is zero at $\underline{\kappa}(r)$. Define $\underline{\kappa}(r)$ by $\mu(\underline{\kappa}(r)) \equiv 1$, i.e.,

$$\underline{\kappa}(r) = \left(\frac{r}{1-r} \right) \sqrt{\frac{1-\rho}{\rho}} \sqrt{\frac{1-\nu}{\nu}} = \underline{\kappa}(r) \sqrt{\frac{\rho}{\nu}} > \underline{\kappa}(r).$$

The inequality follows from $\rho > \nu$. $\underline{\kappa}(r)$ can be shown to be monotonically increasing in r . Taking the limits as r goes to 0.5 and 1 shows that $\exists \hat{r} < \hat{\hat{r}}$ such that $\underline{\kappa}(\hat{r}) \equiv 1$.

The rest of the proof of Proposition 3 essentially follows the one for the case where the IMF credibly states $\Sigma = \alpha$ - except for the relabelling of the borders between the equilibrium regions - and so is left to the interested reader. QED.

6 References

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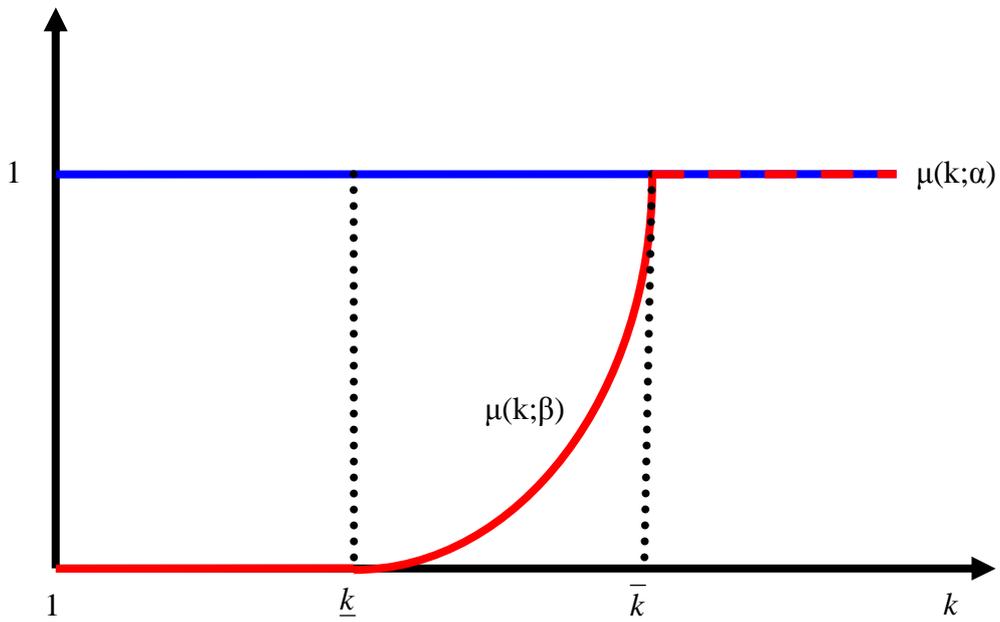


Figure 1: Mixed strategies as functions of the common bias

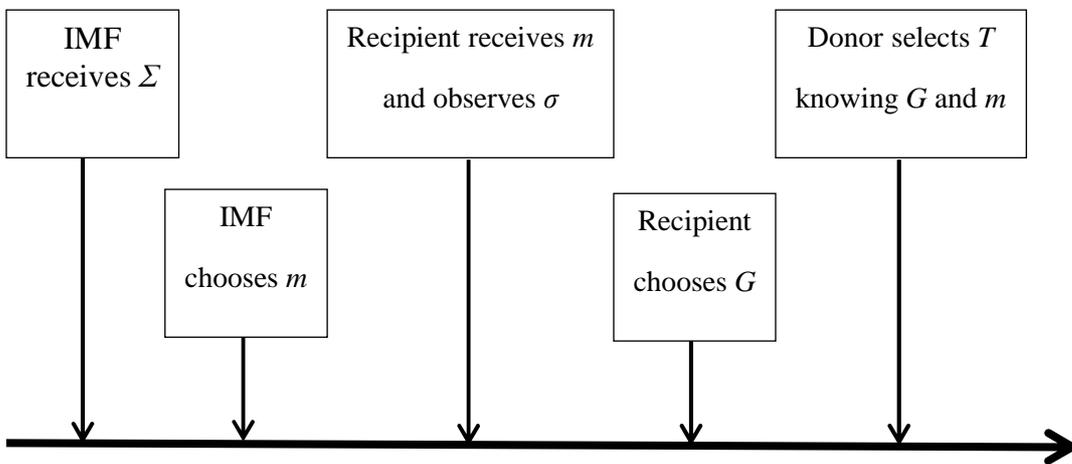


Figure 2: Timing IMF surveillance game

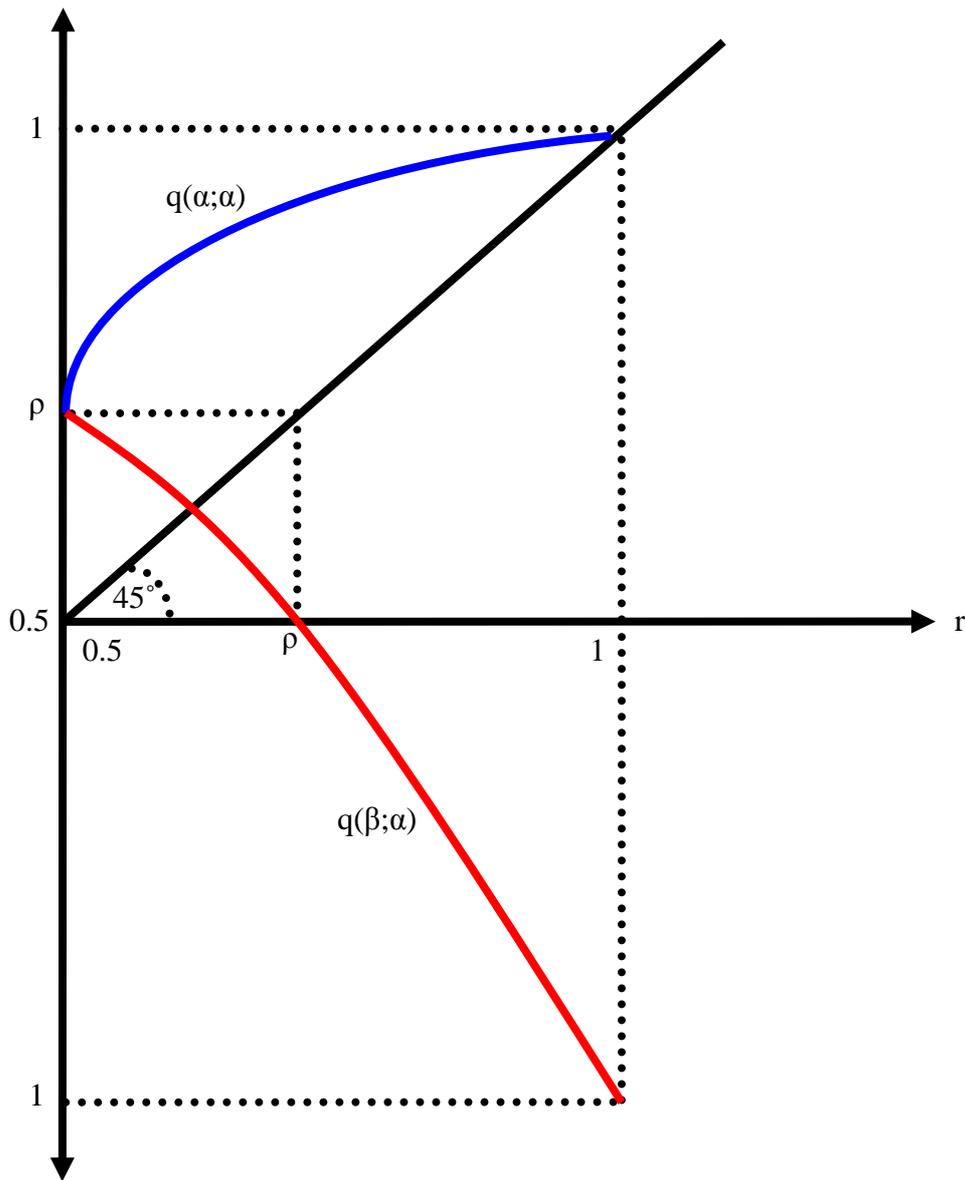


Figure 3: Posterior probabilities in the aid game with IMF surveillance

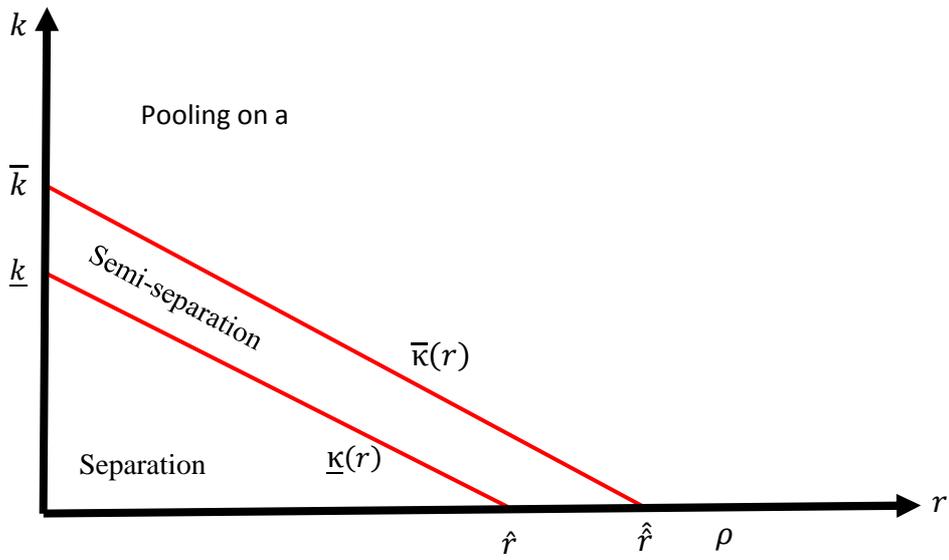


Figure 4: Equilibrium regions in the aid game when the IMF credibly states signal was alpha

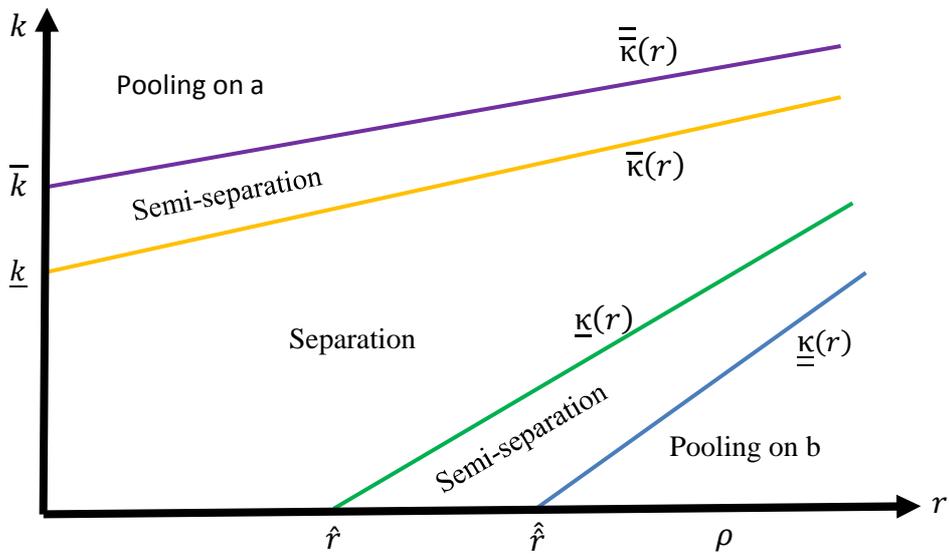


Figure 5: Equilibrium regions in the aid game when the IMF credibly states signal was beta

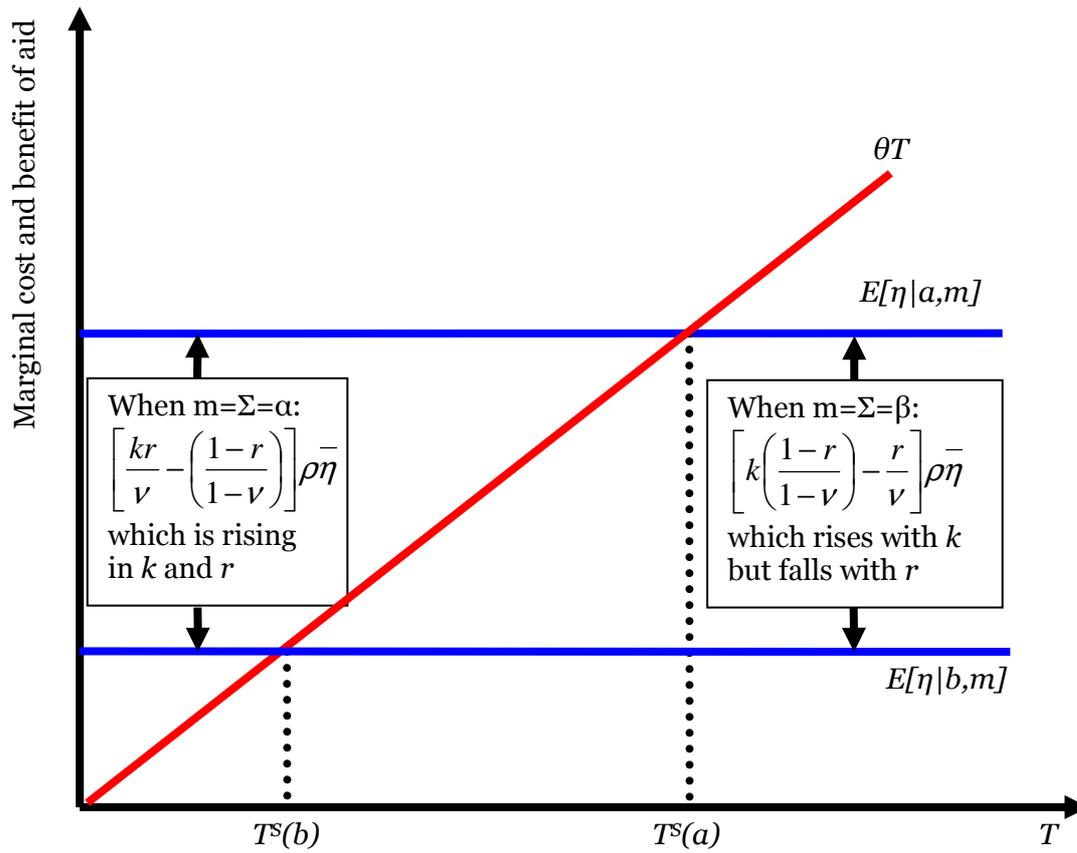


Figure 6: Gaps in Separating Equilibrium Aid Levels as Functions of k and r