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Agency and communication problems in IMF conditional lending

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Abstract

The combination of special interest politics (agency problems) and informational asymmetries presents serious problems as the implementation of Fund conditionality is concerned. In this paper we focus on the role that the transmission of information between the IMF and the borrowing government has for the design of the most e>cient "incentive contract." Specifically, we find that when agency problems are especially severe, and/or IMF information is very valuable, a centralized control is indeed optimal (conventional conditionality). To the contrary, when local knowledge is more important than the agency bias we expect delegation (ownership) to be the optimal incentive scheme.

Keywords: IMF conditionality, delegation, communication

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1 Introduction

The success of any development assistance program depends, to a large extent, on recipients preferences and priorities, which implies that conditionality should take into account the domestic political realities in countries making use of its resources (e.g., Khan and Sharma, 2001; Mayer and Mourmouras, 2007). In very recent papers both Rajan (2008) and Dixit (2008) claim that how to implement reforms crucially depends on the details of a country's situation. According to Dixit (2008) case studies and theory give some general principles which should be combined with context-specific knowledge to get workable reforms. Rajan (2008) argues that multilateral institutions should not only advise on what would be good in an ideal world, they should also o;er a second-best solution that utilizes the knowledge of the political authorities in that country in formulating feasible reforms.

In the debate on the reform of IMF conditionality it has been often argued that both conditionality and ownership are central to assistance programs. However, as long as ownership of a program may be defined as the extent to which a country is interested in pursuing reforms independently of any incentives provided by the IMF, ownership seems to negate the need for conditionality (Drazen, 2001). Indeed, conditionality can be justified only by the existence of a conflict of interest between the lender and the borrower.

Conflicts of interest over desired policy may reflect various causes. Political economy mechanisms, such as lobbying by special interest groups, may explain why some governments may choose to follow policies deviating from the first best (e.g., Svensson, 2000a; Mayer and Mourmouras, 2002), where this is especially true in programs with a structural orientation (Mussa and Savastano, 1999).[1] It is worth noting that the government can alternatively be seen as a unitary actor subject to some pressures by special interest groups

[1]The empirical evidence indicates that the implementation of structural conditionality is inferior to macroeconomic conditionality, especially in countries with strong interests groups (e.g., Ivanova et al., 2003 and Nsouli et al. 2005).

or it must contend with domestic veto players (e.g., Drazen, 2001).[2] On that respect, the true value of a multilateral institution would lie in its ability to use its independence from local interests to steer the policies to a better place (see Rajan, 2008).

This di;erence in objectives and the existence of informational asymmetries between the lender and the borrower justifies the use of a principal-agent model to represent the relationship that the Fund (the principal) establishes with the recipient government (the agent) (IMF, 2001). In this framework we aim to interpret the notion of ownership and the way in which conditionality and ownership can be made mutually consistent.

In this paper we try to reconcile these two terms by looking at ownership and conditionality as two distinct and alternative incentive schemes that should induce the recipient government to act optimally. In other words, we want to emphasize an incentive based rationale for ownership.[3] However, in order to do this, we should adopt a narrower definition of "ownership".

The term "conditionality" has traditionally encompassed two categories: the policy actions a member country needs to take to continue the arrangement and the economic outcomes which the country is required to achieve (Mussa and Savastano, 1999).[4] The concept of "ownership" and the recent debate about it, suggests to distinguish the case in which conditionality strictly specifies policy actions from the case in which ownership of a program by the borrowing country would leave the country considerable freedom to devise its own details of actions, to be ultimately judged by their outcomes. Ownership would represent a situation in which control rights over policies are allocated to the borrowing government (delegation). To the contrary, conventional conditionality, which specifies the

[2]The latter are constitutional and institutional actors influencing policy making from within government. The number and power of veto players depends on a country's political and constitutional organization (see Tsebelis, 2001a, 2001b).

[3]For a similar approach see Ivanova (2006).

[4]According to Dixit (2000), the distinction between structural benchmarks (SB) and performance criteria (PC) has some of the same feature. SB are quite detailed specifications of policy actions the country must undertake, while PC pertain to outcomes.

action undertakings for program continuation, represents the case in which control rights are allocated to the IMF (centralization).

In the principal-agent literature, the choice between basing the incentives on the actions or the outcomes depends on the degrees of accuracy with which the di;erent actions and outcomes can be monitored (e.g., Dixit, 2000). If outcomes are fully observable, it would be optimal to choose an incentive scheme based on outcomes, thus leaving the agent free to devise how to achieve the objectives (ownership). Conversely, if outcomes are not observable (or observable only with large errors), while actions can be monitored with more precision, agents have to be monitored for their actions.[5] This will be the case for conventional conditionality.

In the agency relationship established between the Fund and the recipient country there is poor observability of both actions and outcomes: governments' actions are imperfectly observable, outcomes are not fully determined by actions but are also a;ected by luck, and, moreover, governments' competence cannot be readily distinguished ex ante (Drazen and Fischer, 1997). Under these circumstances, whether action-based, outcome-based (or mixed), all incentive schemes are imperfect in the sense that they cannot achieve a first-best.[6]

The key insight of our model is that the choice among these two alternative incentive schemes should also address the problem of enhancing communication between the IMF and recipient countries. This issue has so far been overlooked in the literature, while we believe that the problem of information transmission is crucial in clarifying the importance

[5]For example, Wilson (1989) considers the choice of incentive schemes for government bureaucracies, providing a classification based on the observability or the non observability of outcomes and actions.

[6]Furthermore, in the context of IMF adjustment programs, even the distinction between policy actions and outcomes gets often blurred. Indeed, sometimes the IMF can be directly concerned about the means as well as the ends, then the actions logically fall into the outcomes category (Dixit, 2000). For example, a given improvement in the government budget balance can be achieved in various ways: by reducing public expenditure (transfers, government consumption, public investment), by raising taxes or by asset sales.

of programs' ownership in the debate on the reform of conditionality. For this reason, in this paper we focus on the e;ects of the two di;erent incentive schemes (ownership vs. conditionality) in fostering communication (i.e., transmission of private information) between the IMF and the borrowing country.

In order to be able to screen among a range of programs the one which is best tailored to the type of recipient government, the Fund needs to have some country specific information which is privately owned by the government (i.e., its local knowledge). In preparing the loan arrangement, IMF o>cials must thus persuade the government to share some confidential data on both economic and sociopolitical issues and to enter into detailed negotiations on a wide range of areas However, whenever the Fund and the recipient government's objectives di;er, the IMF will expect the recipient country to transmit its information distorted by a "bias" and it will try to correct the information transmitted by the government for such a bias. If the country's authorities are not naive, they will anticipate this and they will use communication strategically. Thus, agency problems have indirect negative e;ects on communication and strategic behavior by the agent (the borrowing government) prevents full communication of private information to the decision maker (the Fund).[7]

In the literature on strategic information transmission, built on the seminal paper by Crawford and Sobel (1982), it is claimed that an (uninformed) principal may rationally decide to grant formal decision rights to an agent who is better informed but has di;erent objectives. Specifically, Dessein (2002) shows that, to the extent that a principal cannot verify the claims of a better informed agent, he is in general better o; delegating decision rights to the agent, in order to avoid the noisy communication and hence the associated loss of information. In the trade-o; between the loss of control, under delegation, and the loss of information, under communication (i.e., centralization), delegation dominates

[7]For example, during the East Asian crisis, the Thai authorities refused to share their confidential data on the banks showing the extent of nonperforming loans (see Blustein, 2003).

communication unless the bias is so large to make communication uninformative.[8]

In our model the issue of *delegation* (ownership) versus *centralization* (conventional conditionality) is enriched by the (new) circumstance that the principal (the IMF) owns some private information as well. Mutual communication is important because the IMF owns skills and information (i.e., its analytical and cross-country knowledge) which are useful to process the country's local information.[9] Thus, the analytical setting of the agency relationship between the IMF and the borrowing governments is one of two-sided incomplete information.[10]

The main result of our model is that whenever agency problems are especially severe, and/or IMF private information is relatively more valuable than local knowledge, a centralized control may be optimal. In this case we would expect no delegation (conventional conditionality with policy actions monitoring). To the contrary, when local knowledge is more important than the agency bias (for example if the country has a particularly complex economic or institutional structure but a strong institutional capacity) we would expect delegation (ownership with monitoring of outcomes) to be the optimal incentive scheme.

The paper is organized as follows. The model is developed in Section 2. Section 3 discusses the equilibrium in the conditionality and the ownership case, while Section 4 analyses the optimal allocation of control rights by comparing the comparative statics of ownership and conditionality. Section 5 finally discusses some extensions and concludes the paper.

[8] Aghion and Tirole (1997) modelled an incentive based rationale for delegation. However, while their focus is on the impact of authority on the information structure, Dessein (2002) (and our paper as well) take the information structure as given and investigates how the allocation of authority a;ects the use of this private information.

[9] The mutual communication aspect has been overlooked in the literature, with the exception of Spatt (2004) and Harris and Raviv (2005, 2008), who provide applications to corporate governance.

[10] When both the principal and the agent own some private information, information may be transmitted both under delegation and under centralization. Communication then becomes informative (Harris and Raviv, 2005).

2 The model

The model presented is a three stage game between two agents: the IMF and a borrowing country's government. All agents are risk neutral. The IMF and a country's government must take a decision about an adjustment program denoted by ´.

The borrowing country's welfare is measured by y (i.e., a country's national income) which is a function of an adjustment program ´. The first best adjustment program (the one which maximizes y) is determined by two stochastic factors ₵ and ±̃. The Fund and the borrowing government privately observe ±̃ and ₵[respectively. We assume that the borrowing government learns its informational advantage ₵ in the course of its normal duties, while the Fund is presumed to have some cross-country expertise ±̃. We also assume that the first best decision about the adjustment program is given by:

$$´\# = ¢ + \pm \tag{1}$$

thus (1) is determined by the sum of the two signals ¢ and ±. In other words, in order to be "influential," the Fund's expertise needs to be combined with the country's local knowledge. We assume that the variables ₵ and ±̃ are independent, with ₵ uniformly distributed on [0[a] and ±̃ uniformly distributed on [0[p]. The larger a is, the larger the informational advantage of the borrowing government over the IMF with respect to ₵. Likewise, the larger p is, the larger the informational advantage of the IMF over the government with respect to ±̃.[11]

y is assumed to monotonically decrease with the distance between the adjustment program ´[which is actually implemented, and the first best program ´#ℓ More specifically, we assume: y = y ° (´ ´#)²[where y ° is the potential output. Thus, any di;erence

[11] Harris and Raviv (2005) underline that increasing the importance of a player's private information in determining the first best program is analytically equivalent to increasing the player's informational advantage. Thus, if we assume ´# to be a linear combination of ¢ and ±[e.g. ´# = 9¢ + 2±[all the results obtained in the original specification will hold by repacing A and P with 9 a and 2 p .

between ´ and ´#, (positive or negative), is simply due to some structural distortions.

2.1 Objective functions

The IMF (the principal) is assumed to be a benevolent institution (lender).[12] It aims to reduce economic policy distortions in the recipient country (the agent) by o;ering economic assistance contingent on the adoption of distortion-lowering policies. Namely, in choosing the adjustment program ´, it simply maximizes the recipient country's output, that is:

$$\max_{\acute{}} u^{imf} = -(\acute{} - \acute{}\#)^2 \tag{2}$$

The borrowing government is concerned about its national income, but its choice is constrained by the influence of some interest groups, which benefit from structural distortions. To formalize this argument, we assume that the government's ideal adjustment program is ´ # £. This implies that, when the government keeps control rights on its policy choices, it simply maximizes the following:

$$\max_{\acute{}} u^{g} = -(\acute{} - \acute{}\# + £)^2 \tag{3}$$

where £ represents the extent of the agency problem between the Fund and the borrowing country. By interpreting ´# as the number and/or the depth of the adjustment policies required to cover the output gap, the government is assumed to have a preference, other things equal, for the maintenance of the *status quo.*[13]

In a richer model, however, £ could also capture the conflict between the Fund and the government related to the existence of some externalities in the government's policy choices. For example, national governments may not internalize the impact of their policy

[12] We do not consider the IMF's concern for its private interests (*bureaucratic bias,* as in the public choice literature, Vaubel, 1986) nor for the interests of some "special" shareholder (*political pressures*).

[13] We assume uniform distributions and quadratic loss functions for tractability.

actions on their neighboring countries (like, for example, tari;s, subsidies, and other trade protection). Therefore, the traditional IMF mandate of being custodian of the world economic welfare and its inherent international orientation may generate some conflicts of interest with the recipient governments (Mayer and Mourmouras, 2005).[14]

In the model we do not question the borrowing country's ability to repay the IMF loan and moreover we do not model the choice of the loan size.[15] These assumptions are indeed strong but they allow us to focus on the issue of the transmission of information and on its implications for the choice of conditionality vs. ownership. In other words, we overlook the IMF's role as a lender to emphasize its role as an advisor. Indeed in the last decade the IMF has become more involved in promoting growth and economic stability and thereby preventing economic crisis by designing appropriate economic reforms.[16]

2.2 Information

The stochastic variable ₵, whose support is in (0[a)[is observed only by the government. The government superior information over ₵ can be seen as deriving from its greater proximity to the "business environment," relatively to the IMF o>cials. More specifically, ₵ represents the local knowledge, including both economic information about the state of the country's economy and sociopolitical information about the preferences and the agenda of the government and of the relevant national constituencies. Therefore, information on ₵ is important to measure what Drazen calls a country's "institutional capacity" to perform reforms (Drazen and Isard, 2004). Such type of information is assumed to be soft, that is

[14] The rapid increase in trade and cross-border capital flows in recent years has tied countries more closely together. Moreover, greater economic integration implies that a greater policy dialogue among countries will become necessary and multilateral institutions would be an ideal context for such a dialogue to take place (Rayan, 2008).

[15] Such assumption allows us not to take into account the IMF's concern for safeguarding its resources nor its financing constraints.

[16] We should also note that in our setting, unlike in the standard Principal-Agent model, the preferences of the countries' authorities and of the IMF's are, to some extent, aligned. In fact, both the government and the IMF do care about the e;ects of the adjustment program on national output.

it cannot be certified or "proved."

The Fund privately observes the random variable $\widetilde{\pm}[$ whose support is in $(0[\ \mathrm{p}\ )$. Its informational advantage, relative to the government, derives from cross-country and analytical knowledge that allows it to better understand the links between policies and economic outcomes.[17] Cross-country experience can be helpful in describing what has worked elsewhere and IMF sta; has the necessary expertise to o;er country specific analysis. Moreover, through its multilateral surveillance activity, the IMF is able to take into account the implications and spillovers of a country's policies for its partners.

The two pieces of information will then interact in designing the optimal adjustment program.

2.3 Timing

The sequence of events is assumed to be the following. First, the IMF decides whether or not to delegate to the government the control over the choice of the adjustment program. Next, the government learns $\mathfrak{C}$ and the IMF learns $\widetilde{\pm}$. If authority has been delegated, the government asks the IMF a technical advice and then chooses the program, while, if authority has not been delegated, the IMF asks the country's advice and then chooses the program. Finally, the government implements the program and outcomes realize.

3 Conditionality versus Ownership

In our model the IMF has two instruments to use the local knowledge of the recipient government: ownership (delegation) and conditionality (centralization).

[17] Following Dessein (2002) and Harris and Raviv (2005) we assume that the adjustment program (action) cannot be contracted upon and hence the principal cannot use a standard mechanism to elicit the private information of the agent. The principal, however, can contract on the authority over the program.

By ownership, we refer to a situation in which the IMF delegates the recipient government the choice of the adjustment program, which implies that the government can choose autonomously the policies to be implemented. We assume that in designing the program the government asks the IMF's advice at the negotiation stage, but then it decides the structure of the program without the IMF's approval. In this case, the IMF does not engage in monitoring a country's policy actions, rather it subordinates the continuation of the disbursements to the achievement of some pre-determined outcomes. We will show that ownership will result in an under-utilization of the Fund's information and in a suboptimal adjustment program due to the government's bias.[18]

By conditionality, instead, we refer to a situation in which the IMF fully controls the design of the adjustment program and tries to exploit the government's private information by asking its advice at the negotiation stage. Then, the Fund chooses the adjustment policies and the government implements them. The IMF monitors the economic reforms and it subordinates the continuation of the agreement to the country's compliance with the program. Conditional lending avoids the government bias but it will induce under-utilization of the government information.[19]

In this section, we will study both instruments separately.

[18] While in principle the IMF might control for the government bias by the threat of interrupting the disbursements in case of non compliance with the pre-determined outcomes, we are implicitly assuming that such incentive scheme does not manage to completely eliminate the agency problem. There are many reasons why the IMF threat of programme interruption cannot be credible. For a discussion on this see Marchesi and Sabani (2007a).

[19] This is a strong assumption. We are assuming that when the IMF chooses and monitors the adjustment policies, its monitoring technology is fully e>cient, which is at odds with reality (e.g., Marchesi and Sabani, 2007b). However, what is actually crucial for the model is the fact that monitoring the policy actions reduces the bias respect to the case in which the IMF simply monitors the final outcomes, which seems plausible.

3.1 Ownership

We start by examining the ownership case. First, we introduce some notation. Let μ R [0[p] denote the message that the IMF sends to the government when asked to give technical advice. Let ² (μ| ±) denote the density function that the IMF sends message μ when it has observed ±ℓ This is the reporting rule chosen by the IMF. Further, let ¨ (±| μ) denote the density function that the IMF's private information is ±, when the government observes message μℓ Finally, let ´(¢[μ) be the government's action rule depending on the IMF's message μ and on its private information ¢. A Perfect Bayesian Nash Equilibrium for this communication game is defined as follows:

Definition 1 *A Perfect Bayesian Nash Equilibrium of the communication game consists in a family of reporting rule* ² (μ| ±) *and an action rule for the government* ´(¢[μ) *such that: 1) for each* ± R [0[p] [$\int_r$ ² (μ| ±) ¥μ = 1[*where the Borel set R is the set of all possible signals* μ. *If* μ# *is in the support of* ² (μ| ±), μ# *is such that:*

$$\mu\# = \arg\min \int_0^a [(´(¢[\mu) \quad (± + ¢)]^2 § (¢) ¥¢$$

2) for each μ[´(¢[μ) *solves:*

$$\min \int_0^p [´(¢[\mu) \quad (± + ¢ \quad £]^2 ¨ (±| \mu) ¥±$$

where ¨ (±| μ) = $\frac{² (μ|±) § (±)}{\int_0^p ² (μ|2) § (2) ¥2}$

Condition (1) says that the reporting rule ² (μ| ±) chosen by the IMF, yields an expected loss minimizing adjustment program ´, given the government's choice rule ´(¢[μ)ℓ In other words, the equilibrium reporting rule ² (μ| ±) induces the government to choose an adjustment program ´(¢[μ)[which minimizes the expected loss of the IMF. Condition (2) says that the government responds optimally to each IMF's report μ. The government uses Bayes' rule to update its prior on ±[given the IMF's reporting strategy and the signal

received. Namely, given the IMF's report μ and the posterior density function of θ given μ $(\ddot{}(\theta|\mu))[\ \acute{}(\phi[\mu)$ minimizes the government's expected loss.

The government's equilibrium adjustment program choice creates some endogenous signalling costs for the IMF, which allow for equilibria with partial sorting. Indeed, the model has multiple equilibria which are all "partition" equilibria, in which the IMF introduces some noise in the information transmitted by simply not discriminating as finely as possible in the signal transmitted among the di;erent states of nature it is capable to distinguish.[20] More precisely, it is possible to show that there is a finite upper bound $n(\pounds[p)$ on the number of sub-intervals of the equilibrium partition and that there exists at least an equilibrium for each size from $n = 1$ (uninformative equilibrium) to $n = n(\pounds[p)$ (most informative equilibrium).

Let $\pm(n) = \pm_0(n)[\pm_1(n)[\mathbb{ZZZZ}[\pm_n(n)$ denote a partition of $[0[p][$ where $0 = \pm_0(n) \setminus \pm_1(n) \setminus [\mathbb{ZZZZ} \setminus \pm_n(n)\mathbb{Z}$ The following proposition characterizes the relevant equilibrium for the communication game.

Proposition 2 *Suppose* $\pounds$ *is such that* u^{imf} *is di;erent from* u^{g} *for all* $\pm\mathbb{Z}$ *Then there exists a positive integer* $n(\pounds[p)$ *such that for each* n *with* $1 \leq n \leq n(\pounds[p)$*, there exists at least one equilibrium* $(^{2}(\mu|\pm); \acute{}(\phi[\mu))[$ *where* $^{2}(\mu|\pm)$ *is uniform, supported on* $[\pm_a[\pm_{a+1}][$ *and* $\acute{}(\phi[\mu) = \phi + \frac{\pm_a+\pm_{a+1}}{2}$ $\pounds$ *if* $\pm \in [\pm_a[\pm_{a+1}]\mathbb{Z}$ *Moreover*

(A) $\int_0^a \left[\phi + (\frac{\pm_a+\pm_{a+1}}{2})\right. \pounds \left.[\phi + \pm_a]\right]^2 \S(\phi)¥\phi = \int_0^a \left[\phi + (\frac{\pm_a p_1+\pm_a}{2})\right. \pounds \left.[(\phi + \pm_a]\right]^2 \S(\phi)¥\phi$

(B) $\pm_0 = 0$; $\pm_n = p$

Proof. The proof follows directly from Theorem 1 in Crawford and Sobel (1982). ■

(A) is an "arbitrage" condition which says that for states of nature that fall on the boundaries of two intervals the IMF must be indi;erent between the actions $(\acute{}(\phi[\mu))$ on

[20] See Lemma 1 in Crawford and Sobel (1982).

these two intervals.[21] (A) defines a second order linear di;erential equation on ±ₐ, while (B) specifies its initial and terminal conditions. Since the IMF is not informed on the true value of ¢, when choosing µ, it will take the expected value of ¢, that is $\frac{a}{2}$ The arbitrage condition (A) then specializes to:

$$\begin{aligned} a\,]2+(\tfrac{\pm_{a}+1+\pm_{a}}{2}) \quad £ \quad [a\,]2+\pm_{a}] &= [a\,]2+\pm_{a}] \quad \left[a\,]2+(\tfrac{\pm_{a}P1+\pm_{a}}{2}) \quad £\right] \\ (^{a} &= 1[\,ZZZ[\,n \quad 1)[\end{aligned} \tag{4}$$

from which it is easily obtained

$$\pm_{a}+1 = 2\pm_{a} \quad \pm_{a}P1 + 4£ \tag{5}$$

This second order linear di;erence equation has a class of solutions parametrized by $\pm_1$ (given $\pm_0 = 0$):

$$\pm_{a} = {}^{a}\pm_1 + 2^{a}(^{a} \quad 1)£[\qquad (^{a} = 1[\,ZZZ[\,n \quad 1)Z$$

Given that $\pm_n = p$ we have:

$$\pm_1 = \frac{p \quad 2n\,(n \quad 1)£}{n}$$

from which, using (5) and substituting for the value of $\pm_1$[it is easily obtained:

$$\pm_{a} = \frac{^{a}p}{n} \quad 2^{a}(n \quad ^{a})£[\qquad (^{a} = 1[\,ZZZ[\,n\,)[\tag{6}$$

By imposing the condition $\pm_1 \;5\; 0$, $n\,(£[\,p\,)$ is the largest positive integer n such that:

$$p \quad 2n\,(n \quad 1)£ \;5\; 0$$

which is given by:

$$n\,(£[\,p\,) = \left\langle \; \frac{1}{2} + \frac{1}{2}\left[1 + \frac{2p}{£}\right]^{\frac{1}{2}} \right\rangle$$

[21] In the uniform quadratic case the arbitrage condition is a second order di;erence equation.

where $\langle \cdot \rangle$ denotes the smallest integer greater than or equal to $\cdot$.[22]

$n(£[p)$ denotes the (maximum) precision of the information transmitted by the Fund, which is decreasing with the government's bias £ and is increasing with the length of the support of ± (i.e. the IMF's informational advantage).[23] The intuition for this result basically depends on the IMF's incentive to avoid excessive distortions in the transmission of information. In fact, an excessively distorted report would lead to the choice of an adjustment program which is too distant from the first best, even taking into account the government's bias. Specifically, for a given £[the IMF's incentive in not excessively distorting the information clearly rises with the increase in the IMF's informational advantage p.

>From (6) it is easily obtained :

$$\pm_a \quad \pm_{a\,p\,1} = \frac{p}{n} + 2(2^a \quad n \quad 1)£ \tag{7}$$

The width of the interval increases by 4£ for each increase in ª. Intuitively, anticipating that the IMF is biased towards larger values of ´, relatively to the government, the government considers the IMF more reliable when it reports small values of µ. This implies that the smaller the value of ± is, the more the IMF is credible and thus the more information is transmitted.

In the ownership (delegation) game, using (7), the IMF's ex ante expected loss (l^o) for the equilibrium of size N is given by:

$$\begin{aligned} l^o(n[£[p) &= \sum_{a=1}^{n} \int_{\pm_{a\,p\,1}}^{\pm_a} \left[\left(\frac{\pm_{a\,p\,1} + \pm_a}{2} \quad £ \quad \pm \right) \right]^2 ¥\pm = £^2 + \sum_{a=1}^{n} \frac{(\pm_a \quad \pm_{a\,p\,1})^2}{12} = \\ &= £^2 + \frac{1}{12} \sum_{a=1}^{n} \left[\frac{p}{n} + 2(2^a \quad n \quad 1)£ \right]^2 = £^2 + ;_{\pm}^2 \end{aligned}$$

[22] Note that $\frac{1}{2} + \frac{1}{2}\left[1 + \frac{p}{£}\right]^{\frac{1}{2}}$ is the positive root of $2n(n \quad 1)£ \quad a = 0$ minus one.

[23] Specifically, the closer £ approaches zero, the more nearly agents' interests coincide, the "finer" partition equilibria can be.

Where $;^2_{\pm}$ denotes the residual variance of $\pm$ the government expects to have before being reported the equilibrium signal μ by the Fund. Crawford and Sobel show that this is equal to:

$$;^2_{\pm} = \frac{p^2}{12n^2} + \frac{£^2(n^2 \quad 1)}{3} \tag{8}$$

where $;^2_{\pm}$ is decreasing with n. More precisely, if $n = 1[$ there is no communication and $;^2_{\pm}$ is at a maximum, while if $n = n(£[p)$ $;^2_{\pm}$ is at a minimum.[24]

Since both players' ex ante expected loss is decreasing with the residual variance of $\pm[$ Crawford and Sobel assume that both agents coordinate on $n(£[p)$ which is thus a focal equilibrium. [25]

Lemma 3 *In the focal equilibrium the IMF's ex ante expected loss is continuous and increasing in* pl

Proof. The proof follows directly from Lemma 1 in Harris and Raviv (2005), see the Appendix ■

Lemma 3 shows that, under delegation, the IMF's information is under-utilized and so the Fund's expected loss increases with pl

3.2 Conditionality

In the centralization game the situation is entirely symmetric to the delegation game. In the case of conditionality, the IMF is supposed to choose the adjustment program $´[$ knowing $\pm$ and after having negotiated with the government the design of the program. In the negotiation phase IMF o>cials must persuade the government to share country

[24] It is easy to verify that when $n = 1$ (uninformative partition) the residual variance $;^2_{\pm}$ is equal to the total variance $\frac{p^2}{12}l$ To the contrary, for a given $n[$ the residual variance increases with $£l$ Indeed, when $£ = 0[$ the residual variance is equal to $\frac{p^2}{12n^2}$, which is smaller than the total variance, for $n \wedge 1$.

[25] This result depends on the hypothesis of quadratic objctive functions.

specific information (data on both economic and sociopolitical issues) in order to better screen among possible adjustment programs. As before, the government's report ³ is determined by a partition $\{¢_a\}$ of $[0[\ \ a]$ℓ Given the government's report ³[it is possible to define a reporting rule $²(³|¢)$ and a posterior belief $¨(¢|³) = \frac{²(³|¢)§(¢)}{\int_0^a ²(³|2)§(2)¥(2)}$ such that, given the report ³ R $[¢_a[\ \ ¢_{a+1}]$, the IMF expected value of ¢ is $\frac{¢_a+¢_{a+1}}{2}$ (posterior mean of the random variable $\tilde{¢}$, given ³). The IMF will thus eventually implement the following program:

$$\frac{¢_a + ¢_{a+1}}{2} + ±$$

The arbitrage condition (A) then specializes to:

$$\begin{aligned} p\,]2 + (\frac{¢_{a+1} + ¢_a}{2}) \quad [p\,]2 + ¢_a \quad £] &= [p\,]2 + ¢_a \quad £] \quad \left[p\,]2 + (\frac{¢_a p_1 + ¢_a}{2})\right] \\ (^a &= 1[\,ℤℤ[\ n \quad 1)[\end{aligned} \tag{9}$$

where, solving for $¢_{a+1}[$ we obtain:

$$¢_{a+1} = 2¢_a \quad ¢_a p_1 \quad 4£[\qquad (^a = 1[\,ℤℤ[\ n \quad 1)ℓ \tag{10}$$

This second order linear di;erence equation has a class of solutions parametrized by $¢_1$ (given $¢_0 = 0$):

$$¢_a = {}^a¢_1 \quad 2^a(^a \quad 1)£ \qquad (^a = 1[\,ℤℤ[\ n\ )ℓ \tag{11}$$

Since $¢_n = a$ we have:

$$¢_1 = \frac{a + 2n\,(n \quad 1)£}{n} \tag{12}$$

where $¢_1$ reaches a minimum for $n\,(£[\ a)$ equal to:

$$\left\langle \quad 1 + (\frac{a}{2£})^{\frac{1}{2}} \right\rangle$$

where $\langle\cdot\rangle$ denotes the smallest integer greater or equal to $\cdot$ℓ It is easily verified that $\cdot$ is a continuous and decreasing function of £ and a continuous and increasing function of a. $n\,(£[\ a)$ℓdenotes the maximum precision of the government's information transmission. It

is increasing with the length of the support of ¢ (government's informational advantage) and decreasing with the government's bias £Z

As before the intuition for this result basically depends on the government's incentive to avoid excessive distortions in the transmission of information. Specifically, for a given £[the government's incentive in not excessively distorting the information clearly rises with the increase in the government's informational advantage a.

Let l c denote the IMF's ex ante expected loss for an equilibrium of size n[where c stands for conditionality (centralization game). Given the partition 0 = ¢0(n) \ ¢1(n) \ [ZZZZZ \ ¢n(n) = a[using (11) and substituting for the value of ¢1 in (12) (determined by ¢n = a) yields:

$$¢_a = \frac{^a a}{n} + 2^a(n \quad ^a)£ \qquad (^a = 1[ZZ[\ n)[\tag{13}$$

from which, it is easy to derive:

$$¢_a \quad ¢_{a\,P1} = \frac{a}{n} \quad 2(2^a \quad n \quad 1)£Z$$

Note that the width of the interval decreases by 4£ for each increase in ^aZ Namely, the larger the observed value of ¢ is, the more information is actually communicated by the government. Intuitively, anticipating that the government is biased towards smaller values of ´, relatively to the IMF, the IMF considers the government more reliable when it reports large ³Z Then, we can write:

$$\begin{aligned} l^c &= l(n[£[\ a) = \sum_{^a=1}^{n} \int_{¢_{a\,P1}}^{¢_a} \left[\frac{¢_{a\,P1} + ¢_a}{2} \quad ¢\right]^2 ¥¢ = \sum_{^a=1}^{n} \frac{(¢_a \quad ¢_{a\,P1})^2}{12} \\ &= \frac{1}{12}\sum_{^a=1}^{n}\left[\frac{a}{n} \quad 2(2^a \quad n \quad 1)£\right]^2 = ;_¢^2 \end{aligned}$$

where $;_¢^2$ denotes the residual variance of ¢ the IMF expects to have ex-ante, before being reported the equilibrium value of ³ by the government. Crawford and Sobel show that

this is equal to:

$$;^2_¢ = \frac{a^2}{12n^2} + \frac{£^2(n^2 \quad 1)}{3} \tag{14}$$

$;^2_¢$ is decreasing with nℓ More precisely, if $n = 1$ there is no communication and $;^2_¢$ is at a maximum, while if $n = n(£[a)[\ ;^2_¢$ is at a minimum.[26] Since both players' ex ante expected loss is decreasing with the residual variance of ¢ $(;^2_¢)$[we can focus on the focal equilibrium. Then, the following Lemma is established:

Lemma 4 *In the focal equilibrium the IMF's ex ante expected loss is continuous and increasing in* a

Proof. The proof follows directly from Lemma 1 in Harris and Raviv (2005), see the appendix ■

Centralization avoids the bias but it results in under-utilization of a country's government information. Indeed, Lemma 4 shows that the IMF's ex ante expected loss under conditionality is increasing in the informational advantage of the government aℓ

4 Choice between ownership and conditionality: a comparative analysis

Proposition 5 *The IMF prefers conditional lending (no ownership) i*; $p \ 5 \ p(a[£)[$ *where* $p(a[£)$ *is continuous and increasing in* a *and for any* $£$, $p(a[£) \setminus a$

Proof. The proof follows directly from Theorem 1 in Harris and Raviv (2005), see the appendix ■

[26] It is easy to verify that when $n = 1$ (uninformative partition) the residual variance $;^2_¢$ is equal to the total variance $\frac{a^2}{12}$ℓ To the contrary, for a given n[the residual variance increases with £ℓ Indeed, when $£ = 0$[the residual variance is equal to $\frac{a^2}{12n^2}$, which is smaller than the total variance, for $n \wedge 1$.

Figure 1:

Proposition 5 shows that the IMF will prefer conditional lending (no delegation) when its informational advantage is greater than a threshold level $p(a[£)$, which, for any $£[$ is shown to be smaller than a. This means that the Fund will always choose not to delegate whenever its private information is more important that the agent's private information, that is $p \wedge a$. Furthermore, the IMF will still opt for conditionality even when $p(a[£) \; 4 \; p \; \backslash \; a$ℤ This means that, due to the country's own bias, the Fund can optimally choose not to delegate even if its informational advantage is strictly smaller than a (see Figure 1)ℤ In this case, the loss related to an under-utilization of the government's information is more than compensated by the elimination of the bias and by the full utilization of the IMF's private information. Finally, to choose ownership (delegation), IMF's private information p has to be smaller than $p(a[£)$ℤ

5 Conclusions

The approach to conditionality and ownership presented in this paper has focussed on the importance of the transmission of information between the IMF and the borrowing country in designing the most e>cient "incentive contract." More specifically, the combination of special interest politics (agency problems) and informational asymmetries presents serious problems as the implementation of Fund conditionality is concerned, especially in programs with a structural orientation. Given the imperfect observability of both actions and outcomes, we have focussed on the specific role that the transmission of information between the IMF and the borrowing government has for the choice between delegation (ownership) and centralization (conventional conditionality). We find that when agency problems are especially severe, and/or IMF information is very valuable, centralization is indeed optimal. To the contrary, when local knowledge is more important than the agency bias we expect delegation to be the optimal incentive scheme.

What do we observe in reality? A natural extension of our paper would be to empirically investigate the "scope" (i.e. the degree of "intrusiveness") of conditionality in relation to information transmission problems. In this context, a "narrower" conditionality could be considered as a proxy for a greater degree of ownership.

For example, Stone (2007), using data on the number of categories of conditions applied under all IMF programs between 1992 and 2002, finds that conditionality is more di;erentiated than its critics typically claim (see, for example, Stiglitz, 2002), varying in response to both domestic and international politics. He also finds that conditionality is the outcome of a bargaining process between the Fund and the borrowing country. Specifically, it has been narrower for countries actively seeking Fund support and thus already facing strong incentives to reform. This evidence is indeed consistent with our theoretical results as it confirms that when countries do "own" the reforms (i.e., countries

with a small bias) conditionality become "narrower."

Therefore, controlling for countries' characteristics, their economic performance and indeed for the IMF's political motivations, we plan to investigate the determinants of the scope of conditionality over the years and across countries, focussing on its potential e ; ects for information transmission. Specifically we want to relate the scope of conditionality to the variables that according to our theoretical findings should motivate the Fund's choice between delegation and centralization. We expect to find a narrower conditionality in countries whose local knowledge is more important than the agency bias: this could be the case, for example, of countries with a particularly complex socio-economic structure but with a strong institutional capacity .

Appendix

Proof. Lemma 3

$l(n[£[p)$ is continuous and increasing in p. Define p^- to be the value of p such that $n(£[p^-)$ jumps from $^- \quad 1$ to $^-$. Noting that $n(£[p^-) = ^- \quad 1$. At such point from (6) we obtain:

$$0 = p^- \quad 2£^-(^- \quad 1)$$

solving for p^- :

$$p^- = 2£^-(^- \quad 1) \tag{A.1}$$

and we obtain:

$$l(^- \quad 1[£[2£^-(^- \quad 1)) = \frac{(2£^-(^- \quad 1))^2}{12(^- \quad 1)^2} + \frac{£^2((^- \quad 1)^2 \quad 1)}{3} = \frac{2£^{2^-}(^- \quad 1)}{3}$$

and

$$l(^-[£[2£^-(^- \quad 1)) = \frac{4£^{2^-2}(^- \quad 1)^2}{12^{-2}} + \frac{£^2(^{-2} \quad 1)}{3} = \frac{£^2(^- \quad 1)^2}{3} + \frac{£^2(^{-2} \quad 1)}{3} = \frac{2£^{2^-}(^- \quad 1)}{3} \tag{A.2}$$

Therefore:

$$l(^- \quad 1[£[p^-) = l(^-[£[p^-)§^{\circ 3}p \ R \ [p^-_{[}p^-_{+1}]$$

This implies that $l(n[£[p)$ is continuous in p^- although $n(£[p^-)$ is not continuous in p^-. Furthermore, since $l(^-[£[p^-)$ is increasing in $p^-[$ for a fixed $^-[$ and $l(n(£[p^-)[£[p^-)$ is continuous in p^-, it follows that $l(n(£[p^-)[£[p^-)$ is increasing in p^-. ■

Proof. Lemma 4 It follows the same argument as Lemma 3. ■

Proof. Proposition 5 The IMF prefers conditional lending (no ownership) $i; \ p \ 5 \ p(a[£)[$ where $p(a[£)$ is given by:

$$p(a[£) = \left\{ \begin{array}{c} \sqrt{(8£^{2^-3} \quad 16£^{2^-2} + a^2)} \frac{^-p1}{=}[\ \text{if} \ \ a \ R \left[p^-[\widehat{a}^-\right] \\ [a^2 \quad 12^{-2}£^2]^{\frac{1}{2}} \ [\ \text{if} \ a \ R \left[\widehat{a}^-[p^-_{+1}\right] \end{array} \right\}$$

p^- is defined by (A.1), $\widehat{a}^-$ is defined by (A.3) below and $^- = n$ (£[a)ℓ Furthermore, p (a[£) is increasing and continuous in a, and for any £[p (a[£) 4 [max{ 12£^{2} + a ^{2}[0}]$^{\frac{1}{2}}$ [then p (a[£) \ a, for all £ℓ

Define a = $\widehat{a}^-$ such that the IMF is indi;erent between ownership (with p = p^-) and conditionality (with a = $\widehat{a}^-$)ℓ

$$£^2 + l\,(^- \quad 1[\,£[\,p^-) = l\,(^-[\,£[\,\widehat{a}^-)$$

and

$$£^2 + \frac{2£^{2-}(^- \quad 1)}{3} = \frac{\widehat{a}^{-2}}{12^{-2}} + \frac{£^2(^{-2} \quad 1)}{3}$$

Solving for $\widehat{a}^-$[we obtain:

$$\widehat{a}^- = 2£^-(^{-2} \quad 2^- + 4)^{\frac{1}{2}} \tag{A.3}$$

It can be verified that:

$$p^- \;4\; \widehat{a}^- \;4\; p^{-}{}_{+1}$$

Suppose that a R $\left[p^-[\,\widehat{a}^-\right]$ and p is such that the IMF is indi;erent between conditionality and ownership. Then p must satisfy

$$£^2 + l\,(^- \quad 1[\,£[\,p\,) = l\,(^-[\,£[\,a\,)$$

and

$$\frac{p^{\,2}}{12(^- \quad 1)^2} + \frac{£^2((^- \quad 1)^2 \quad 1)}{3} + £^2 = \frac{a^{\,2}}{12(^-)^2} + \frac{£^2(^{-2} \quad 1)}{3}$$

Thus, it follows that

$$p = \sqrt{(8£^{2-3} \quad 16£^{2-2} + a^{\,2})}\,\frac{^-}{-}\,\frac{1}{} \tag{A.4}$$

Now suppose that a R $\left[\widehat{a}^-[\,p^{-}{}_{+1}\right]$ and p is such that the IMF is indi;erent between conditionality and ownership. In this case:

$$£^2 + l\,(^-[\,£[\,p^-) = l\,(^-[\,£[\,a\,)$$

and:

$$\frac{p^2}{12(\bar{\ })^2} + \frac{£^2((\bar{\ })^2 \quad 1)}{3} + £^2 = \frac{a^2}{12(\bar{\ })^2} + \frac{£^2(\bar{\ }^2 \quad 1)}{3}$$

Thus, it follows:

$$p = \sqrt{(\quad 12£^2\bar{\ }^2 + a^2)} \tag{A.5}$$

Combining (A.4) and (A.5) yields $p(a[£)$ given in the statement of the proposition. It is easy to check that the function is continuous in a. The IMF prefers conditional lending i;

$$£^2 + l(n(£[p)[£[p) \;5\; l(n(£[a)[£[a)$$

By definition of $p(a[£)$:

$$£^2 + l(n(£[p(a[£))[£[p(a[£)) = l(n(£[a)[£[a)$$

which implies that the IMF prefers conditional lending i;

$$l(n(£[p)[£[p) \;5\; l(n(£[p(a[£))[£[p(a[£))$$

Using Lemma 3, the IMF prefers conditional lending i; $p \;5\; p(a[£)$.

Now suppose $a \;R\; \left[0[\,\widehat{a}_1\right[$ from (A.4) $p(a[£) = 0$; for all $a \;5\; \widehat{a}_1$ from (A.5) $p(a[£) \;4\; \max\left\{\sqrt{(\quad 12£^2 + a^2)}[0\right\} \;\backslash\; a$. For $a \;R\; \left[p\text{-}[\,\widehat{a}\text{-}\right]$ for some $\bar{\ } \;5\; 2$ we want to show that:

$$p(a[£) = \sqrt{(8£^{2\bar{\ }3} \quad 16£^{2\bar{\ }2} + a^2)}\frac{\bar{\ }}{=} \frac{1}{} \;4\; a$$

It will su>ce to show that this is true for $a = p\text{-}$. Using (A.1) and substituting we obtain:

$$2£^{\bar{\ }\frac{\pm}{=_2} \quad 3} \;\backslash\; 2£^{\bar{\ }2}$$

which is always true for $\bar{\ } \;5\; 2$. ■

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