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Agency and communication in IMF conditional lending: theory and empirical evidence

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Agency and communication in IMF conditional lending: theory and empirical evidence[*]

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Abstract

The combination of special interest politics (agency problems) and informational asymmetries presents serious problems as the implementation of 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 efficient "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. Controlling for economic and political factors, we find that the number of IMF conditions declines in countries with a greater social complexity and increases with the bias of the countries' authorities and in more open and transparent countries, which is consistent with the theoretical results.

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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 how to implement reforms crucially depends on the details of a country's situation. In the debate on the reform of IMF conditionality it has been often argued that both conditionality and ownership are central to assistance programs but it is far from obvious how they should interact (Drazen, 2001). As long as ownership 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. Indeed, conditionality can be justified only by the existence of a conflict of interest between the lender and the borrower about policy.

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, 2000; Mayer and Mourmouras, 2002), where this is especially true in programs with a structural orientation (Mussa and Savastano, 1999).[1] 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 (Rajan, 2008).[2]

This difference 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). In this paper we aim to interpret the notion of ownership and the way in which conditionality and ownership can be made mutually consistent. More specifically,

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[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).

[2] It is worth noting that the government can alternatively be seen as a unitary actor subject to some pressures by special interest groups or it must contend with domestic veto players (e.g., Drazen, 2001). The latter are constitutional and institutional actors influencing policy making from within government.

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] In order to do this, we should adopt a narrower definition of both ownership and conditionality.

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). The concept of "ownership", instead, 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 then represent a situation in which control rights over policies are allocated to the borrowing government (delegation). To the contrary, conventional conditionality, which specifies the 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 different 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. This will be the case for conventional conditionality.

In the agency relationship established between the Fund and the recipient country,

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

however, there is poor observability of both actions and outcomes: governments' actions are imperfectly observable, outcomes are not fully determined by actions but are also affected 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.[4]

The key insight of our model is that the choice among these two alternative incentive schemes should 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 information transmission is crucial in clarifying the importance of programs' ownership in the debate on the reform of conditionality and, more generally in reforms design and implementation. For this reason, in this paper we focus on the effects of the two different 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 officials 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.[5] However, whenever the Fund and the recipient government's objectives differ, the IMF will expect the recipient country to transmit its information distorted by a "bias" and it will try to correct the information

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[4]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.

[5]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).

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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 (Crawford and Sobel, 1982). Thus, agency problems have indirect negative effects on communication (i.e., transmission of private information between the IMF and the borrowing country) and strategic behavior by the agent (the borrowing government) prevents full communication of private information to the decision maker (the Fund).

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. Thus, the analytical setting of the agency relationship between the IMF and the borrowing governments is one of two-sided incomplete information.

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). To the contrary, when local knowledge is more important than the agency bias (for example if a country has a particularly complex socio-economic structure but a sound institutional capacity) we would expect delegation (ownership) to be the optimal incentive scheme.

An immediate empirical implication of the model 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. We will define conditionality to be "narrower" when the number of programs' conditions are relatively small.

More specifically, we investigate the determinants of the number of conditions in IMF programs over the period 1992-2005. Our sample comprises a maximum of 281 programs from 97 countries, depending on the control variables we include. Controlling for economic and political factors, we find that the number of IMF conditions declines in countries with a greater social complexity and increases with the bias of the countries' authorities and in more open and transparent countries. The empirical evidence is thus consistent with the main prediction of the theory.

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 describes the empirical model while the results are presented in Section 6. Section 7 presents a test for robustness and Section 8 finally concludes the paper.

1.1 Related Literature

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 (i.e., delegate) to an agent who is better informed but has different objectives.

Specifically, Dessein (2002), studying the optimal allocation of decision making authority between a principal and an agent inside a firm, shows that, to the extent that a principal cannot verify the claims of a better informed agent, he is in general better off delegating decision rights to the agent, in order to avoid the noisy communication and hence the associated loss of information. In his model, in the trade-off between the loss of control under delegation, and the loss of information under communication (i.e., centralization), delegation always dominates centralization unless the agency bias is so

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large to make communication uninformative.[6] This means that whenever the decision is centralized there won't be any informative communication between the principal and the agent, and the principal will decide without any participation of the agent.

Harris and Raviv (2005, 2008) build on Dessein (2002) but assume that both the principal and the agent own some private information relevant for the decision. This assumption allows the authors to derive quite different results. Specifically, they show that even under centralization the agent plays a role by communicating some of her private information to the principal. Thus, they provide a rationale for centralization also in terms of information transmission.

Our paper's contribution is twofold. First, we analyze theoretically transmission of information in the design of IMF-supported programs. Specifically, we focus on the effects of conditionality versus ownership in fostering communication. Although there is a large agency literature in corporate finance dealing with communication issues, it is the first time that such issues are studied in the context of conditional programs.

Our theoretical model builds on Harris and Raviv (2005) insomuch as it considers the existence of a two-sided incomplete information agency relationship between the Fund and the borrowing government. It follows that the main theoretical results are similar to those derived by Harris and Raviv although they apply to a different context. In particular, we find that, despite the agency problems, it is sometimes optimal to delegate the choice of the adjustment program to the recipient country. Specifically, for each given bias, delegation (ownership) is preferred by the Fund when its informational advantage is smaller than the country's. However, even when centralization (conventional conditionality) will be the optimal choice, the recipient country still plays some non trivial role by communicating

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

some of his local knowledge to the Fund.[7]

The idea that conditionality should take into account the domestic political realities in countries making use of its resources is not new. Dixit (2008), Easterly (2008) and Rajan (2008) claim that how to design viable reform 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. In turn, Rajan (2008) argues that not only should multilateral institutions advise on what would be good in an ideal world, but they should also offer second-best solutions that utilize the knowledge of the authorities in that country in formulating feasible reforms. Finally, Drazen (2001), Khan and Sharma (2001), Mayer and Mourmouras (2007), Ivanova (2006) have analyzed "ownership" as applied to the specific context of IMF conditionality. None of them, however, has addressed the problem of information transmission between the Fund and recipient countries. Our model thus represents a first attempt to formalize these issues by explicitly modelling motivations to provide low quality information in the context of a standard agency relationship.

Finally, we contribute to the literature in the empirical part as well. On the one hand, to our knowledge, it is the first time that the choice between centralization and delegation is empirically tested. On the other hand, as conditionality is specifically concerned, despite the degree of "stringency" of conditionality has been investigated in a number of previous studies (see, for example, Ivanova et al., 2003; Gould, 2003; Dreher and Jensen, 2007; and Stone, 2007), it is the first time that, variables related to the transmission of information between the Fund and the borrowing country are included in the analysis. We do believe the transmision of information is a crucial aspect which should be taken into account more carefully in reforms design.

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[7]The amount of time and effort which is devoted to the negotiations between the borrowing country and the Fund actually confirms the complexity of the interaction between the two.

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 s.

The borrowing country's welfare is measured by $Y(s)$ (i.e., a country's national income), which is a function of the adjustment program s. The adjustment program which maximizes $Y(s)$, denoted by s^*, is assumed to be determined by two stochastic factors $\widetilde{a}$ and $\widetilde{p}$. We also assume that the Fund and the borrowing government privately observe $\widetilde{p}$ and $\widetilde{a}$ respectively, and that :

$$s^* = a + p \tag{1}$$

thus (1) is determined by the sum of the two signals a and p, namely for a program to be optimally designed, the two agents need to truthfully communicate. We interpret s^* as the number and/or the depth of the adjustment policies required to cover the output gap. $Y(s)$ is assumed to monotonically decrease with the distance between the adjustment program s, which is actually implemented, and the program s^*. More specifically, we assume: $Y(s) = Yo - (s - s^*)^2$, where Yo is potential output.

2.1 Information

The stochastic variable $\widetilde{a}$, whose support is in $(0, A)$, is observed only by the government. $\widetilde{a}$ represents the local knowledge, including both 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 $\widetilde{a}$ is important to measure what is called a country's "institutional capacity" to perform reforms (Drazen and Isard, 2004). The government superior information over $\widetilde{a}$ can be seen as deriving from its greater proximity to the "business environment," relatively to

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the IMF officials. Such type of information is assumed to be soft, that is it cannot be certified or "proved."

The Fund privately observes the random variable $\widetilde{p}$, whose support is in $(0, P)$. Its informational advantage, relative to the government, derives from cross-country knowledge it accumulates during its activities (surveillance, technical assistance, lending). Such knowledge allows it to better understand the links between policies and economic outcomes, building on the analysis of what has worked elsewhere. Moreover, through its multilateral surveillance activity, the IMF is able to take into account the global economic conditions in the choice of the recipient country's adjustment program.

In order to determine the program which maximizes the recipient country's output, the IMF and the borrowing government need to combine their private knowledge. We assume that the variables $\widetilde{a}$ and $\widetilde{p}$ are independent, with $\widetilde{a}$ uniformly distributed on $[0, A]$ and $\widetilde{p}$ uniformly distributed on $[0, P]$.[8] The larger A is, the larger the informational advantage of the borrowing government over the IMF with respect to $\widetilde{a}$. Likewise, the larger P is, the larger the informational advantage of the IMF over the government with respect to $\widetilde{p}$.[9]

2.2 Objective functions

2.2.1 IMF

The IMF (the principal) is assumed to be a benevolent multilateral institution.[10] It aims at reducing economic policy distortions in the recipient country (the agent) by offering economic assistance contingent on the adoption of distortion-lowering policies. Such ob-

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[8] Uniform distributions are assumed for analytical tractability.

[9] 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 s^* to be a linear combination of a and p, e.g. $s^* = \pi a + \partial p$, all the results obtained in the original specification will hold by repacing A and P with πA and ∂P.

[10] 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*).

jective is strengthened and complemented by the desire to reduce the negative effects of domestic policies on global output, due to potential negative spillovers[11]. Formally, the IMF preferred program maximizes the following objective function, that is:

$$\underset{s}{Max} U^{IMF} = Y(s) + \gamma Y^{RW}(s) \tag{2}$$

where Y and Y^{RW} measure the borrowing country and the Rest of the World output, respectively. Which both depends on the country's adjustment program s.[12] The parameter γ $(0 < \gamma < 1)$ denotes the importance of spillover effects. Specifically, if the recipient country is big, γ will tend to 1, while for very small countries γ will be close to 0, denoting the absence of any adverse spillover effect.

Let s^*_{IMF} denote the program which maximizes (2). We assume that the IMF optimal program differs from the program which maximizes a country's national output by a constant γe, which captures the relevance of spillover effects. Formally:

$$s^*_{IMF} = a + p + \gamma e = s^* + \gamma e$$

Note that when $\gamma = 0$, $s^*_{IMF} = s^*$.

U^{IMF} monotonically decrease with the distance between the adjustment program s, which is actually implemented, and the IMF's preferred program s^*_{IMF}, that is:

$$U^{IMF} = U_0^{IMF} - (s - s^*_{IMF})^2 \tag{3}$$

where $U_0^{IMF} = U^{IMF}(s^*_{IMF})$.[13]

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[11] 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).

[12] Here the policies in the rest of the world are taken as given, namely we do not consider strategic interactions among countries.

[13] We assume quadratic loss functions for tractability.

2.2.2 Government

The borrowing government is concerned about its national income, but its choice is constrained by the influence of some interest groups, which may benefit from structural distortions (e.g., Drazen 2001).[14] To formalize this argument, we assume that the government maximizes the following objective function, that is:

$$\underset{s}{Max} U^G = Y(s) + \theta C(s) \tag{4}$$

where C are contributions from special interests groups. We assume that C decreases with s, that is with the number and/or the depth of the distortion lowering policies. The parameter θ $(0 < \theta < 1)$ denotes the importance of lobbies. Specifically, if lobbies are very powerful θ will tend to 1, while if they are weak θ will be close to 0. Let s_G^* denote the adjustment program which is preferred by the government. We assume $s_G^* = s^* - \theta b$.

By interpreting s^* as the number and/or the depth of the adjustment policies required to cover the output gap, the government is assumed to have a bias, other things equal, for the maintenance of the *status quo.* The higher θ is, the stronger the bias will be.

The borrowing government utility U^G monotonically decreases with the distance between the adjustment program s, which is actually implemented, and its preferred program s_G^* . This implies that:

$$U^G = U_0^G - (s - s_G^*)^2 \tag{5}$$

where $U_0^G = U^G(s_G^*)$.[15]

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[14]More generally, conflicts of interest over desired policy may reflect various causes. There may simply be ideological differences over what is the best way to achieve the same goal. Alternatively, simple uncertainty regarding the distribution of gains and losses from reforms may make governments fail to adopt policies considered to be efficiency-enhancing (Fernandez and Rodrik, 1991).

[15]Again, we assume quadratic loss functions for tractability.

2.3 The agency problem

The difference between s^*_{IMF} and s^*_G represents the extent of the agency problem between the Fund and the borrowing government. Specifically:

$$s^*_{IMF} - s^*_G = \gamma e + \theta b = B$$

where θb captures the government's "status quo" bias, due to domestic lobbies pressures. Whereas γe captures the extent of the divergence between the Fund and the government objectives related to the existence of some externalities in the government's policy choices.[16]

We should note that in our setting, unlike in the standard Principal-Agent model, the preferences of the countries' authorities and of the IMF are, to some extent, aligned. In fact, both the government and the IMF do care about the effects of the adjustment program on national output and when $\theta = \gamma = 0$ they actually coincide.

Finally it is worth noting that in the model we do not question the borrowing country's ability to repay the IMF loan and we do not model the choice of the loan size. These assumptions are indeed strong but they allow us to focus on the issue of information transmission 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 by designing appropriate economic reforms.

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[16]National governments do not generally internalize the impact of their policy actions on their neighboring countries (like, for example, tariffs, subsidies, and other trade protection policies). Therefore, the IMF multilateratel orientation may generate some conflicts of interest with the recipient governments (Mayer and Mourmouras, 2005)

2.4   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 $\widetilde{a}$ and the IMF learns $\widetilde{p}$. 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]

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]

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[17]Following Dessein (2002) and Harris and Raviv (2005) we assume that the two parties cannot commit to a decision rule that is not ex-post optimal for the decision maker. This implies that they cannot commit to an incentive compatible decision rule in which the Revelation Principle applies. Hence, the principal (the Fund) cannot use a standard mechanism to elicit the private information of the agent. However, she can commit to transfer decision making authority to the agent.

[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 eliminate completely the agency problem. There are many reasons why the IMF threat of programme interruption cannot be credible. For a discussion on

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.

4   Ownership

We start by examining the ownership case. First, we introduce some notation. Let $t \in [0, P]$ denote the message that the IMF sends to the government when asked to give technical advice. Let $q(t|p)$ denote the density function that the IMF sends message t when it has observed p. This is the reporting rule chosen by the IMF. Further, let $g(p|t)$ denote the density function that the IMF's private information is p, when the government observes message t. Finally, let $s(a, t)$ be the government's action rule depending on the IMF's message t and on its private information a. 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 $q(t|p)$ and an action rule for the government $s(a, t)$ such that: 1) for each $p \in [0, P]$, $\int_R q(t|p) \, dt = 1$, where the Borel set R is the set of all*

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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 efficient, 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.

possible signals t. If t∗ is in the support of $q(t|p)$, t∗ is such that:

$$t* = \arg\min \int_0^A [s(a,t) - s^*_{IMF}]^2 f(a) da$$

2) for each t, $s(a,t)$ solves:

$$\min \int_0^P [s(a,t) - s^*_G]^2 g(p|t) dp$$

where $g(p|t) = \frac{q(t|p)f(p)}{\int_0^P q(t|\theta)f(\theta)d\theta}$

Condition (1) says that the reporting rule $q(t|p)$ chosen by the IMF, yields an expected loss minimizing adjustment program s, given the government's choice rule $s(a,t)$. In other words, the equilibrium reporting rule $q(t|p)$ induces the government to choose an adjustment program $s(a,t)$, which minimizes the expected loss of the IMF. Condition (2) says that the government responds optimally to each IMF's report t. The government uses Bayes' rule to update its prior on p, given the IMF's reporting strategy and the signal received. Namely, given the IMF's report t and the posterior density function of p given t $(g(p|t))$, $s(a,t)$ 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 different states of nature it is capable to distinguish.[20] More precisely, it is possible to show that there is a finite upper bound $N(B, P)$ 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 $N = N(B, P)$ (most informative equilibrium).

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

Let $p(N) = p_0(N), p_1(N), \ldots\ldots, p_N(N)$ denote a partition of $[0, P]$, where $0 = p_0(N) < p_1(N) <, \ldots\ldots < p_N(N)$. The following proposition characterizes the relevant equilibrium for the communication game.

Proposition 2 *Suppose B $(= \gamma e + \theta b)$ is such that U^{IMF} is different from U^G for all p. Then there exists a positive integer $N(B, P)$ such that for each N with $1 \leq N \leq N(B, P)$, there exists at least one equilibrium $(q(t|p); s(a,t))$, where $q(t|p)$ is uniform, supported on $[p_i, p_{i+1}]$, and $s(a,t) = a + \frac{p_i + p_{i+1}}{2} - B$ if $p \in [p_i, p_{i+1}]$. Moreover*

(i) $\int_0^A \left[a + (\frac{p_i + p_{i+1}}{2}) - (a + p_i) - B\right]^2 f(a)da = \int_0^A \left[a + (\frac{p_{i-1} + p_i}{2}) - (a + p_i) - B\right]^2 f(a)da$

(ii) $p_0 = 0; p_N = P$

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

(i) is an "arbitrage" condition which says that for states of nature that fall on the boundaries of two intervals the IMF must be indifferent between the actions $(s(a,t))$ on these two intervals.[21] (i) defines a second order linear differential equation on p_i, while (ii) specifies its initial and terminal conditions. Since the IMF is not informed on the true value of a, when choosing t, it will take the expected value of a, that is $\frac{A}{2}$. The arbitrage condition (i) then specializes to:

$$A/2 + (\frac{p_{i+1} + p_i}{2}) - (A/2 + p_i) - B = A/2 + p_i - \left[A/2 + (\frac{p_{i-1} + p_i}{2})\right] + B$$
$$(i = 1, \ldots, N-1), \tag{6}$$

from which it is easily obtained

$$p_{i+1} = 2p_i - p_{i-1} + 4B \tag{7}$$

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

This second order linear difference equation has a class of solutions parametrized by p_1 (given $p_0 = 0$):

$$p_i = ip_1 + 2i(i-1)B, \qquad (i = 1, ..., N-1).$$

Given that $p_N = P$ we have:

$$p_1 = \frac{P - 2N(N-1)B}{N}$$

from which, using (7) and substituting for the value of p_1, it is easily obtained:

$$p_i = \frac{iP}{N} - 2i(N-i)B, \qquad (i = 1, ..., N), \tag{8}$$

By imposing the condition $p_1 \geq 0$, $N(B, P)$ is the largest positive integer N such that:

$$P - 2N(N-1)B \geq 0$$

which is given by:

$$N(B, P) = \left\langle -\frac{1}{2} + \frac{1}{2}\left[1 + \frac{2P}{B}\right]^{\frac{1}{2}} \right\rangle$$

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

$N(B, P)$ denotes the (maximum) precision of the information transmitted by the Fund, which is decreasing with the government's bias B and is increasing with the length of the support of p (i.e., the IMF's informational advantage).[23] Specifically, for any given P, the precision of the information transmitted by the Fund decreases with the relevance of the bias B. On the contrary, for any given B, the IMF's incentive in not excessively distorting the information rises with the IMF's informational advantage P. That is, it increases with the relevance of the IMF private information in designing the program. The intuition for the last result basically depends on the fact that when the IMF information

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[22]Note that $-\frac{1}{2} + \frac{1}{2}\left[1 + \frac{P}{Bb}\right]^{\frac{1}{2}}$ is the positive root of $2N(N-1)B - A = 0$ minus one.

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

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is especially relevant, the costs of a non informative report might outweigh the benefits of a not fully revealing information, even taking into account the government's bias.

From (8) it is easily obtained :

$$p_i - p_{i-1} = \frac{P}{N} + 2(2i - N - 1)B. \tag{9}$$

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

In the ownership (delegation) game, using (9), the IMF's ex ante expected loss (L^O) for the equilibrium of size N is given by:

$$
\begin{aligned}
L^O(N, B, P) &= \frac{1}{P} \sum_{i=1}^{N} \int_{p_{i-1}}^{p_i} \left[\left(\frac{p_{i-1} + p_i}{2} - p - B \right) \right]^2 dp = B^2 + \sum_{i=1}^{N} \frac{(p_i - p_{i-1})^2}{12} = \\
&= B^2 + \frac{1}{12} \sum_{i=1}^{N} \left[\frac{P}{N} + 2(2i - N - 1)B \right]^2 = B^2 + \sigma_p^2
\end{aligned}
$$

Where σ_p^2 denotes the residual variance of p the government expects to have before being reported the equilibrium signal t by the Fund. Crawford and Sobel show that this is equal to:

$$\sigma_p^2 = \frac{P^2}{12N^2} + \frac{B^2(N^2 - 1)}{3} \tag{10}$$

where σ_p^2 is decreasing with N. More precisely, if $N = 1$, there is no communication and σ_p^2 is at a maximum, while if $N = N(B, P)$, σ_p^2 is at a minimum.[24]

Since both players' ex ante expected loss is decreasing with the residual variance of p, Crawford and Sobel assume that both agents coordinate on $N(B, P)$, which is thus a

_____

[24]It is easy to verify that when $N = 1$ (uninformative partition) the residual variance σ_p^2 is equal to the total variance $\frac{P^2}{12}$. To the contrary, for a given N, the residual variance increases with b. Indeed, when $b = 0$, the residual variance is equal to $\frac{P^2}{12N^2}$, which is smaller than the total variance, for $N > 1$.

focal equilibrium.[25]

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

Proof. See the Appendix ∎

Lemma 3 shows that since (under delegation) the IMF's information is under-utilized, the Fund's expected loss increases with P that is with the relevance of its private information.

4.1 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 s, knowing p and after having negotiated with the government the design of the program. In the negotiation phase IMF officials must persuade the government to share country specific information (data on both economic and sociopolitical issues) in order to better screen among possible adjustment programs. As before, the government's report r is determined by a partition $\{a_i\}$ of $[0, \ A]$. Given the government's report r, it is possible to define a reporting rule $q\,(r|\,a)$ and a posterior belief $g\,(a|\,r) = \frac{q(r|a)f(a)}{\int_0^A q(r|\theta)f(\theta)d(\theta)}$ such that, given the report $r \in [a_i, \ a_{i+1}]$, the IMF expected value of a is $\frac{a_i+a_{i+1}}{2}$ (posterior mean of the random variable $\widetilde{a}$, given r). The IMF will thus eventually implement the following program:

$$\frac{a_i + a_{i+1}}{2} + p$$

The arbitrage condition (i) then specializes to:

$$P/2 + (\frac{a_{i+1} + a_i}{2}) - (P/2 + a_i) + B \ = \ [P/2 + a_i] - \left[P/2 + (\frac{a_{i-1} + a_i}{2})\right] - B$$

$$(i \ = \ 1,...,N-1), \tag{11}$$

where, solving for a_{i+1}, we obtain:

$$a_{i+1} = 2a_i - a_{i-1} - 4B, \qquad (i = 1, ..., N-1). \qquad (12)$$

This second order linear difference equation has a class of solutions parametrized by a_1 (given $a_0 = 0$):

$$a_i = ia_1 - 2i(i-1)B \qquad (i = 1, ..., N). \qquad (13)$$

Since $a_N = A$ we have:

$$a_1 = \frac{A + 2N(N-1)b}{N} \qquad (14)$$

where a_1 reaches a minimum for $N(b, A)$ equal to:

$$\left\langle -1 + (\frac{A}{2B})^{\frac{1}{2}} \right\rangle$$

where $\langle v \rangle$ denotes the smallest integer greater or equal to v. It is easily verified that v is a continuous and decreasing function of B and a continuous and increasing function of A. $N(B, A)$ denotes the maximum precision of the government's information transmission. It is increasing with the length of the support of a (government's informational advantage) and decreasing with the government's bias B.

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 B, 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 $0 = a_0(N) < a_1(N) < ,...... < a_N(N) = A$, using (13) and substituting for the value of a_1 in (14) (determined by $a_N = A$) yields:

$$a_i = \frac{iA}{N} + 2i(N-i)B \qquad (i = 1, ..., N), \qquad (15)$$

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from which, it is easy to derive:

$$a_i - a_{i-1} = \frac{A}{N} - 2(2i - N - 1)B.$$

Note that the width of the interval decreases by $4B$ for each increase in i. Namely, the larger the observed value of a is, the more information is actually communicated by the government. Intuitively, anticipating that the government is biased towards smaller values of s, relatively to the IMF, the IMF considers the government more reliable when it reports large r. Then, we can write:

$$
\begin{aligned}
L^C &= L(N, B, A) = \sum_{i=1}^{N} \int_{a_{i-1}}^{a_i} \left[\frac{a_{i-1} + a_i}{2} - a \right]^2 da = \sum_{i=1}^{N} \frac{(a_i - a_{i-1})^2}{12} \\
&= \frac{1}{12} \sum_{i=1}^{N} \left[\frac{A}{N} - 2(2i - N - 1)B \right]^2 = \sigma_a^2
\end{aligned}
$$

where σ_a^2 denotes the residual variance of a the IMF expects to have ex-ante, before being reported the equilibrium value of r by the government. Crawford and Sobel show that this is equal to:

$$\sigma_a^2 = \frac{A^2}{12N^2} + \frac{B^2(N^2 - 1)}{3} \tag{16}$$

σ_a^2 is decreasing with N. More precisely, if $N = 1$ there is no communication and σ_a^2 is at a maximum, while if $N = N(B, A)$, σ_a^2 is at a minimum.[26] Since both players' ex ante expected loss is decreasing with the residual variance of a (σ_a^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. See the appendix ■

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[26]It is easy to verify that when $N = 1$ (uninformative partition) the residual variance σ_a^2 is equal to the total variance $\frac{A^2}{12}$. To the contrary, for a given N, the residual variance increases with b. Indeed, when $b = 0$, the residual variance is equal to $\frac{A^2}{12N^2}$, which is smaller than the total variance, for $N > 1$.

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 A.

5   Choice between ownership and conditionality: a comparative analysis

Proposition 5 *The IMF prefers conditional lending (no ownership) iff $P \geq P(A,B)$, where $P(A,B)$ is continuous and increasing in A and for any b, $P(A,B) < A$*

Proof. See the appendix ∎

Proposition 5 shows that the IMF will prefer conditional lending (no delegation) when its informational advantage is greater than a threshold level $P(A,B)$, which, for any B, 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 $P > A$. Furthermore, the IMF will still opt for conditionality even when $P(A,B) \leq P < A$. 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). 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 $P(A,B)$.

FIGURE 1 HERE

6　Empirical model

What do we observe in reality? In order to test the predictions of our theoretical model, the basic idea is testing the role that information plays in the design of IMF programs. According to our theoretical results, we expect that a delegation scheme (ownership) would prevail when the importance of the country's local knowledge dominates either the size of the bias in the objective function of the country's government or the importance of the IMF's knowledge. To the contrary, we expect a centralization scheme (conventional conditionality) to prevail when either the importance of the IMF's knowledge or the size of the bias dominates the role of the country's knowledge.

More specifically, we want to empirically investigate the "scope" (i.e. the degree of "intrusiveness") of conditionality in relation to information transmission problems. In this context, a "narrower" (or less intrusive) conditionality could be considered as a proxy for a greater degree of ownership. We will define conditionality to be "narrower" when the number of conditions included in a program – as listed in the letter of intent – is comparably small. In fact, a smaller number of conditions could be considered to be a proxy for delegation since conditions decrease the degrees of freedom of the borrowing country's authorities.[27] The number of conditions has been used as a proxy for stringency of conditionality in a number of previous studies. E.g., Mosley (1991) studied the tightness of World Bank Structural Adjustment Loans using this measure. Ivanova et al. (2003), Gould (2003), Dreher and Vaubel (2007) and Dreher and Jensen (2007) utilized them to measure the extent of conditionality; the IMF (2001) has used similar data in empirical analysis as well.

Rather then employing the number of conditions, Stone (2007) suggests to use the number of areas those conditions refer to. In particular, Stone employs data on the num-

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[27]It could be considered only as a proxy since the actual autonomy of a country's authorities would also depend on the quality of such conditions.

ber of categories of conditions applied under all IMF programs between 1992 and 2002. According to his results, conditionality is the outcome of a bargaining process between the Fund and the borrowing country, where such bargaining power is "used" asymmetrically. Specifically, conditionality has been narrower where the borrowing country was an important recipient of US aid (and also faced external vulnerability) but the Fund has refrained from stronger levels of conditionality when countries were "vulnerable." In other words, conditionality has been narrower for countries actively seeking Fund support and thus already facing strong incentives to reform.

Controlling for countries' characteristics, their economic performance and for the IMF's political motivations, we empirically investigate the determinants of the scope of conditionality over the years and across countries, focusing on its potential effects for information transmission. More specifically, we expect to find a narrower conditionality in countries whose local knowledge is more important than the IMF's knowledge and the agency bias.

As a robustness check, in Section 8, we will replicate the empirical analysis taking the number of areas covered by a Fund program as the dependent variable.

6.1 Data

6.1.1 IMF conditionality

The IMF's Monitoring of Fund Arrangements (MONA) database contains more than 22,000 conditions in almost 300 programs approved over the period March 31, 1992 – June 4, 2008, as used in Dreher, Sturm and Vreeland (2009). This amounts to about 3,100 conditions in 27 Extended Fund Facility Arrangements (EFF), almost 12,000 under 139 Poverty Reduction and Growth Facility Arrangements, and 7,500 in 129 Stand-by Arrangements. 14,500 of those conditions are performance criteria, 2,500 are prior actions,

and 5,200 are structural benchmarks. Not all of these conditions enter the arrangements when the respective program is initiated, of course, but are added over the course of the program. Usually, compliance with these conditions is monitored on a quarterly basis.

Ideally, we would want to count only those conditions that were included at the initiation of the program. However, the structure of the MONA database (as we have access to) does not provide this information for many of the programs. While we do know which conditions have been included in the program, the time at which the condition did enter is not indicated.. For our analysis, we calculate the sum of all the conditions. As the resulting number is obviously larger the longer a program is in effect, we control for the number of quarters that it is effective in the empirical analysis below. Table 1 reports the number of conditions per program and type. In the lower panel of the Table, the total number of conditions is divided by the number of quarters the programs are in effect. When a condition is included at all testdates throughout the program, it is thus counted as "one." While the average number of conditions listed in the table is a good proxy for the number of performance criteria, it represents a lower bound for structural benchmarks and prior actions. This is because a specific performance criterion is usually included throughout the program, while prior actions and benchmarks "come and go." For more details see Dreher, Sturm and Vreeland (2009).

TABLE 1 HERE

6.1.2 Control variables

Our choice of control variables follows the literature on the determinants of IMF credit supply and participation in IMF programs.[28] Economic variables include the current account balance (relative to GDP), per capita income, the rate of inflation, GDP growth,

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[28]See Steinwand and Stone (2008) for a recent survey.

and the amount of international reserves (relative to imports).[29] Political variables include temporary membership in the United Nations Security Council (UNSC) and voting in line with the US in the United Nations General Assembly (UNGA). According to the recent results of Dreher et al. (2006, 2009) and Dreher and Jensen (2007) countries voting in line with the US in the UNGA and temporary members of the UNSC receive IMF programs with fewer conditions.

Our variables of interests are the so called "informational variables." Such variables are meant to capture the impact of a country's bias on the number (and scope) of conditions, of its local knowledge, and of the IMF's knowledge. First of all, the objective function of the country's authorities may not fully coincide with domestic welfare maximization either for political economy reasons or because policies in one country may impose negative externalities on its neighbors (especially trade and exchange rate policies).

According to the political economy literature, measures of political instability and of polarization and social division (e.g., Tabellini and Alesina, 1990; Alesina and Drazen, 1991) and whether the government is democratically elected (Besley and Case, 1995) should account for country's "resistance" towards reforms.[30] Therefore, in order to "capture" the country's bias in the empirical model we considered measures of "institutional capacity" and "socioeconomic complexity." On that respect we included some of the International Country Risk Guide's (ICRG) indicators: government stability, law and order,

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[29]We have also included the domestic (fixed) investment (to GDP), the growth of government consumption (to GDP), total debt service (to exports) and total external debt (to GDP). While these additional variables have not been significant at conventional levels of significance, our main results are not affected by the inclusion of these variables.

[30]In Tabellini and Alesina (1990), under political instability and polarization, a balanced budget is not a political equilibrium, since the current majority does not internalize the costs of budget deficits and the more so the greater is the difference between its preferences and the expected preferences of the future majority. Alesina and Drazen (1991) find that, when stabilization has significant distributional implications, a "war of attrition" among different socioeconomic groups may delay stabilization. Finally, Besley and Case (1995), testing a reputation-building model of political behaviour, find that (gubernatorial) term limits (consistent only with democracy) have a significant effect on economic policy choices.

bureaucracy quality, and ethnic tensions. These (subjective) indices range from zero to 12, with higher values showing "better" environments. High scores on the bureaucratic quality variable indicate "autonomy from political pressure" and "established mechanisms for recruiting and training." Government stability is "a measure of the government's ability to carry out its declared program(s) and its ability to stay in office;" Law and order refers to the impartiality of the legal system and the assessment of popular observance of the law, while ethnic tensions measure "the degree of tension within a country attributable to racial, nationality or language divisions" (PRS Group 1998).[31] We also included an index of democracy as defined in the Polity IV dataset (ranging from -10 to 10).

Moreover, we also considered measures of both economic and financial openness since the bias between the country and the IMF may also depend on the existence of some externalities generated by the government's policy choices, which in turn will be more influential the greater the trade and cross-border capital flows.[32] Specifically, we included the sum of a country's imports and exports (relative to GDP). We have also included the KOF Index of Globalization and its subcomponent on economic restrictions (Dreher 2006). The Chinn-Ito (2007) measure of financial openness is also employed.[33]

We assume that the importance of a country's local knowledge is supposed to be crucial for less transparent countries and for countries with a more complex socioeconomic structure (but with a sound institutional capacity, i.e. with a small bias). In order to measure the importance of a country's local knowledge we use indexes of transparency, such as democracy and press freedom (the latter taken from Freedom House 2006). Our

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[31] We tried to control for some of the other ICRG indicators, such as corruption, investment profile and social conditions and our results are unchanged. We also tried to include the variable "strength of special interests" (referring to the share of seats in the parliament held by "special interests" parties) but missing data reduced the sample substantially, so we do not report the results below. Different specifications are available upon request.

[32] In recent years the rapid increase in trade and cross-border capital flows has tied countries more closely together.

[33] This index is the first principal component of four categories of restrictions: The existence of multiple exchange rates, restrictions on current account transactions, restrictions on capital account transactions, and requirement of the surrender of export proceeds.

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main index follows Rosendorff and Vreeland (2008) who suggest missing data on standard economic indicators (like inflation, e.g.) as indicators of transparency. Rather than choosing any arbitrary data series, however, we evaluate all 250 data series classified as "economics" in the World Bank's World Development Indicators (2008). Our resulting transparency indicator shows the share of series for which there is no data available in a given country and year. In addition, as indicators of socioeconomic complexity we use two variables: "social conditions" and "ethnic tensions" from the ICRG introduced above.

A poor quality of governmental staff could also be a reason why a country may be in need of the Fund's technical advice. In order to capture that, we included the index of "bureaucratic quality". Finally, the role of the IMF's specific knowledge will be more relevant for more open countries since the IMF, as a multilateral institution, could be an ideal place to internalize spillovers (Rajan, 2008). We employ the indicators of openness introduced above to test this hypothesis.

Of course some of the indicators refer, at the same time, to the influence of the bias or to the importance of the local or IMF knowledge. Since the impact of such indicators could have opposite effects, in these cases the sign of the coefficient will tell us the net effect, i.e., the impact that dominates.

Table 2 contains all the details on our variable definitions and sources. Descriptive statistics are provided in the Appendix.

TABLE 2 HERE

6.1.3 Some descriptive evidence

Figure 2 relates the average number of conditions per program to selected potential determinants. As discussed above, the recent literature suggests voting in line with a respective other country in the United Nations General Assembly and temporary membership in the

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United Nations Security Council as important determinants of the number of IMF conditions. We therefore split the sample according to UNSC membership and, respectively, according to whether or not a country's voting coincidence in the UNGA is below or rather above the median of 0.38. The dummy for UNSC membership is one in the two years a country is elected to or is a member of the UNSC. In coding our index of UNGA voting, we follow Thacker (1999), who codes votes in agreement with the US as 1, votes in disagreement as 0, and abstentions or absences as 0.5. Figure 2 also shows the average number of conditions included in an IMF program separated according to the median of the Transparency index and the ICRG's index of law and order.

As can be seen, the descriptive evidence is in line with our expectations. The overall number of conditions included in an IMF program (i.e., not controlled for the duration of the program) increases with more transparency, at the five percent level of significance (according to a t-test). It decreases with better law and order, and voting inline with the US in the UNGA. It is lower for countries who have been temporary UNSC member at the time the program was initiated. However, not controlled for additional determinants of the number of conditions, these differences are not significant at conventional levels.

FIGURE 2 HERE

7 Method and Results

We examine the determinants of the number of conditions in IMF programs over the period 1992-2005. Our sample comprises a maximum of 281 programs from 97 countries, depending on the control variables we include. As count data often show non-normal distributions we first test for the normality of our dependent variable. The variable shows a nicely bell-shaped distribution and the null-hypothesis of normality is not rejected at conventional levels of significance. We therefore adopt a GLS fixed effects estimator in

order to control for country unobservables and to correct for AR(1) autocorrelation within panels and cross-sectional heteroskedasticity across countries (rather then referring to count models like Poisson or Negative Binomial Regression).[34]

Specifically, we test:

$$C_{it} = \alpha + \beta_1 Z_{it} + q_{it} + \eta_i + u_{it} \tag{17}$$

where C_{it} represents the number of conditions in IMF programs in country i at year t, q measures the number of quarters a specific program has been in effect, and Z is a vector containing the variables introduced above. Finally, η_i are country fixed effects.

The results of the full model of equation (17) are presented in Table 3, column 3. In column 1 we report the coefficients of the variables that are meant to capture the "informational component" only, while column 2 is restricted to the values of the coefficients of the variables related to economic and political factors. First of all, we can observe that the impact of most variables is robust to the inclusion of the economic and political variables and of the informational variables. There are two exceptions. The first is bureaucratic quality which is not significant at conventional level in the full model; the second is openness to trade, which is only significant (at the five percent level) once controlled for other economic and political variables.

As column 3 shows, the results support our hypotheses regarding the effect of the informational variables on the number of IMF conditions. Consistent with our theoretical model, more open countries obtain more conditions, at the five percent level of significance. Since more conditions imply a greater degree of centralization, for countries which are more open, the role of the multilateral institution as a place to internalize spillovers

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[34]The FGLS estimator has been shown to perform efficiently under heteroskedasticity and autocorrelation as compared to standard panel estimators. Note that the FGLS correction for a single AR(1) term is unlikely to cause the standard errors to be flawed as would be the case employing the Parks correction with individual AR(1) terms for each country (Beck and Katz 1995: 637). In all specifications a likelihood ratio test rejects the hypothesis of no AR(1) at conventional levels of significance. The procedure of estimation employed here is standard in the recent literature (see, e.g., Kilby 2006).

increases. According to our theoretical results, centralization dominates delegation when the importance of the Fund's knowledge increases and also because for more open countries the bias of the countries' authorities is greater, which also goes in the direction of centralization.

The number of conditions rises with the absence of "ethnic tensions," at the one percent level of significance. Since for all ICRG indexes higher scores indicate "better" environments, the higher the degree of tension within a country attributable to racial, nationality or language divisions, the lower the number of conditions. In other words, there is more room for delegation when a country is more complex from a social point of view (provided its institutions are sound enough). Also at the one percent level, the number of conditions decreases with "law and order," implying that a lower strength and impartiality of the legal system (i.e., weaker institutions or a larger bias) increases the number of IMF conditions. This confirms our theoretical prediction according to which centralization should dominate delegation when the bias of the countries' authorities is too large. To the contrary, the coefficient of the variable "government stability" is positive and highly significant. Here, the smaller the bias, the greater the number of condition would be. This actually contradicts our theoretical conclusions as we would aspect more delegation (fewer conditions) for more stable (less biased countries). This result, however, is in line with the previous literature according to which the IMF might not want to further destabilize already weak governments by imposing numerous conditions which the government would be politically held accountable for.[35]

Our index for the lack of transparency is significant at the one percent level and has the expected negative coefficient. Controlled for institutional quality, the lack of transparency justifies the importance of the country authority's knowledge as compared

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[35]Stone (2007), for example, finds that the number of conditions rises significantly with number of seats in parliament supporting the government, while it decreases with the number of coalition members participating in government. Both variables are clearly related to government stability.

to the IMF's knowledge. In line with our theoretical model, more transparent countries receive more conditions.

As expected, the number of conditions is positively affected by the duration of a program (i.e. by the number of quarters that a program is effective), at the one percent level of significance. Turning to the economic and political control variables, countries with lower values in their per capita GDP and higher deficits in their current account receive a greater number of conditions, both significant at the one percent level. This is consistent with the idea that more conditions are needed when the economic conditions that countries face are more difficult. Finally, consistently with previous studies (e.g., see Dreher et al., 2006, 2009 and Dreher and Jensen, 2007), we find that countries voting in line with the US in the UN General Assembly and countries which are temporary members of the UN Security Council obtain fewer conditions in their IMF programs (significant at the one and, respectively, ten percent level). Democracy, freedom of the press, GDP growth, international reserves and inflation are not significantly related to the number of conditions (according to the full model of column 3).

Regarding the quantitative impact of our variables of interest, the results of column 3 imply that an increase by one point on the 12-scale index of government stability increases the number of conditions by more than 3. An increase (decrease) by one point on the law and order (ethnic tensions) index reduces (increases) the number of conditions by 8.4 (15.4). A one percentage point increase in trade openness increases the number of conditions by 0.3; one additional category (out of 250) for which no data is reported reduces it by 1.2 (=(1/250)*287). With each additional quarter an IMF program remains in effect, almost 7 additional conditions enter.

INSERT TABLE 3

The next section tests for the robustness of these findings.

8 Test for robustness

As a check for robustness we replicate the analysis considering as the dependent variable the number of areas covered by an IMF program, rather than the number of conditions.[36]

To capture the scope of IMF conditionality, we built 20 categories and allocated all conditions to one of them, with the 20st category containing the residual. These categories refer to: Arrears, Balance of Payments/Reserves, the Capital Account more broadly, Central Bank Reform, Credit to Government, Debt, Exchange system, Financial sector, Governance, Government Budget, Monetary Ceiling, Pricing, Private Sector Reforms, Privatization, Public Sector, Social, Systemic, Trade, Wages & Pensions. Clearly, these categories are to some extent arbitrary and some of them represent sub-categories of others.

The lower panel of Table 1 gives an overview about the number of areas covered by the average IMF program, overall, and split according to type of condition. As can be seen, the average IMF program covers 10 areas; 7 areas are covered by performance criteria, on average, 2 by prior actions, and 4 by structural benchmarks. The minimum number of areas covered by conditions is one; the maximum 17, and the median 10 (not shown in the table).

Table 4 reports the empirical results. As can be seen, they are very similar. Among our variables of interest, the exception is democracy which increases the number of areas covered by conditionality at the ten percent level according to the full model of column 3. This is again in line with our hypothesis implying that higher transparency leads to tougher conditionality.[37] Among the covariates, the scope of the conditions now increases with higher GDP growth, at the one percent level of significance. Temporary UNSC

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[36] Again, the null hypothesis of normality is not rejected for conventional levels of significance.

[37] At least this effect dominates the other one, according to which a smaller bias (due to higher democracy) would justify more delegation (i.e. fewer conditions).

membership and UNGA voting in line with the U.S. are marginally insignificant.

The coefficients imply that an increase by one point on the government stability index increases the number of areas covered by conditions by more than 0.3. An increase (decrease) by one point on the law and order (ethnic tensions) index reduces (increases) the number of areas by 0.14 (0.6). A one percentage point increase in trade openness increases the number of areas covered by conditions by 0.03; one additional category for which no data is reported reduces it by 0.02 (=(1/250)*5.28). With each additional quarter an IMF program remains in effect, 0.2 additional areas are covered. Finally, an increase in the index of democracy by one point reduces the number of areas covered by almost 0.1.

INSERT TABLE 4 HERE

9   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 efficient "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 particularly 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? As a natural extension of the paper we have empirically investigated the "scope" (i.e. the degree of "intrusiveness") of conditionality in relation to information transmission problems. In this context, a "narrower" conditionality has been considered to be a proxy for a greater degree of ownership. We have defined conditionality to be "narrower" when the number of programs' conditions is relatively small. Alternatively, conditionality has been defined to be "narrower" when it includes only a relatively small number of categories of conditions (e.g. Stone, 2007).

Controlling for countries' characteristics, their economic performance and for the IMF's political motivations, we find that the empirical results support our hypotheses regarding the effect of the informational variables on the number of IMF conditions. More specifically, we find that the number of conditions increases with the bias of the countries' authorities and for more open countries. More open countries obtain more conditions also because multilaterals become the ideal place to internalize spillovers. In line with the theoretical model, more transparent countries receive more condition as in this case the importance of the country's knowledge decreases. To the contrary, the number of conditions decreases with a country's social complexity.

Finally, we find very similar results when we take the number of areas covered by an IMF program, rather than the number of conditions, as the dependent variable.

It is worthwhile to note that the argument we make in this paper is not restricted to the relationship between the Fund and a recipient country but could also be applied to each type of conditional reform program (e.g., foreign aid, EU conditionality).

Appendix

Proof. Lemma 3 The proof follows directly from Lemma 1 in Harris and Raviv (2005)

$L(N, B, P)$ is continuous and increasing in P. Define P_n to be the value of P such that $N(B, P_n)$ jumps from $n-1$ to n. Noting that $N(B, P_n) = n-1$. At such point from (8) we obtain:

$$0 = P_n - 2Bn(n-1)$$

solving for P_n :

$$P_n = 2Bn(n-1) \tag{A.1}$$

and we obtain:

$$L(n-1, B, 2bn(n-1)) = \frac{(2Bn(n-1))^2}{12(n-1)^2} + \frac{B^2((n-1)^2-1)}{3} = \frac{2B^2n(n-1)}{3}$$

and

$$L(n, B, 2Bn(n-1)) = \frac{4B^2n^2(n-1)^2}{12n^2} + \frac{B^2(n^2-1)}{3} = \frac{B^2(n-1)^2}{3} + \frac{B^2(n^2-1)}{3} = \frac{2B^2n(n-1)}{3} \tag{A.2}$$

Therefore:

$$L(n-1, B, P_n) = L(n, B, P_n) \text{ for } P \in [P_n, P_{n+1}] .$$

This implies that $L(N, B, P)$ is continuous in P_n although $N(B, P_n)$ is not continuous in P_n. Furthermore, since $L(n, B, P_n)$ is increasing in P_n, for a fixed n, and $L(N(B, P_n), B, P_n)$ is continuous in P_n, it follows that $L(N(B, P_n), b, P_n)$ is increasing in P_n. ∎

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

Proof. Proposition 5 The proof follows directly from Theorem 1 in Harris and Raviv (2005).

The IMF prefers conditional lending (no ownership) iff $P \geq P(A, B)$, where $P(A, B)$ is given by:

$$P(A, B) = \left\{ \begin{array}{l} \sqrt{(8B^2n^3 - 16B^2n^2 + A^2)\frac{n-1}{n}}, \text{ if } A \in \left[P_n, \widehat{A}_n\right] \\ [A^2 - 12n^2B^2]^{\frac{1}{2}} \text{ , if } A \in \left[\widehat{A}_n, P_{n+1}\right] \end{array} \right\}$$

P_n is defined by (A.1), $\widehat{A}_n$ is defined by (A.3) below and $n = N(B, A)$. Furthermore, $P(A, B)$ is increasing and continuous in A, and for any B, $P(A, B) \leq [\max\{-12B^2 + A^2, 0\}]^{\frac{1}{2}}$,then $P(A, B) < A$, for all B.

Define $A = \widehat{A}_n$ such that the IMF is indifferent between ownership (with $P = P_n$) and conditionality (with $A = \widehat{A}_n$).

$$b^2 + L(n-1, B, P_n) = L(n, B, \widehat{A}_n)$$

and

$$B^2 + \frac{2B^2n(n-1)}{3} = \frac{\widehat{A}_n^2}{12n^2} + \frac{B^2(n^2-1)}{3}$$

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Solving for $\widehat{A}_n$, we obtain:

$$\widehat{A}_n = 2Bn(n^2 - 2n + 4)^{\frac{1}{2}} \tag{A.3}$$

It can be verified that:

$$P_n \leq \widehat{A}_n \leq P_{n+1}$$

Suppose that $A \in \left[P_n, \widehat{A}_n\right]$ and P is such that the IMF is indifferent between conditionality and ownership. Then P must satisfy

$$B^2 + L(n - 1, B, P) = L(n, B, A)$$

and

$$\frac{P^2}{12(n-1)^2} + \frac{B^2((n-1)^2 - 1)}{3} + B^2 = \frac{A^2}{12(n)^2} + \frac{B^2(n^2 - 1)}{3}$$

Thus, it follows that

$$P = \sqrt{(8B^2n^3 - 16B^2n^2 + A^2)}\frac{n-1}{n} \tag{A.4}$$

Now suppose that $A \in \left[\widehat{A}_n, P_{n+1}\right]$ and P is such that the IMF is indifferent between conditionality and ownership. In this case:

$$B^2 + L(n, B, P_n) = L(n, B, A)$$

and:

$$\frac{P^2}{12(n)^2} + \frac{B^2((n)^2 - 1)}{3} + B^2 = \frac{A^2}{12(n)^2} + \frac{B^2(n^2 - 1)}{3}$$

Thus, it follows:

$$P = \sqrt{(-12B^2n^2 + A^2)} \tag{A.5}$$

Combining (A.4) and (A.5) yields $P(A, B)$ given in the statement of the proposition. It is easy to check that the function is continuous in A. The IMF prefers conditional lending iff

$$B^2 + L(N(B, P), B, P) \geq L(N(B, A), B, A)$$

By definition of $P(A, B)$:

$$B^2 + L(N(B, P(A, B)), B, P(A, B)) = L(N(B, A), B, A)$$

which implies that the IMF prefers conditional lending iff

$$L(N(B, P), B, P) \geq L(N(B, P(A, B)), B, P(A, B))$$

Using Lemma 3, the IMF prefers conditional lending iff $P \geq P(A, B)$.

Now suppose $A \in \left[0, \widehat{A}_1\right]$, from (A.4) $P(A, B) = 0$; for all $A \geq \widehat{A}_1$ from (A.5) $P(A, B) \leq \max\left\{\sqrt{(-12B^2 + A^2)}, 0\right\} < A$. For $A \in \left[P_n, \widehat{A}_n\right]$ for some $n \geq 2$ we want to show that:

$$P(A, B) = \sqrt{(8B^2n^3 - 16B^2n^2 + A^2)}\frac{n-1}{n} \leq A$$

It will suffice to show that this is true for $A = P_n$. Using (A.1) and substituting we obtain:

$$2Bn\sqrt{n^2 - 3} < 2Bn^2$$

which is always true for $n \geq 2$. ∎

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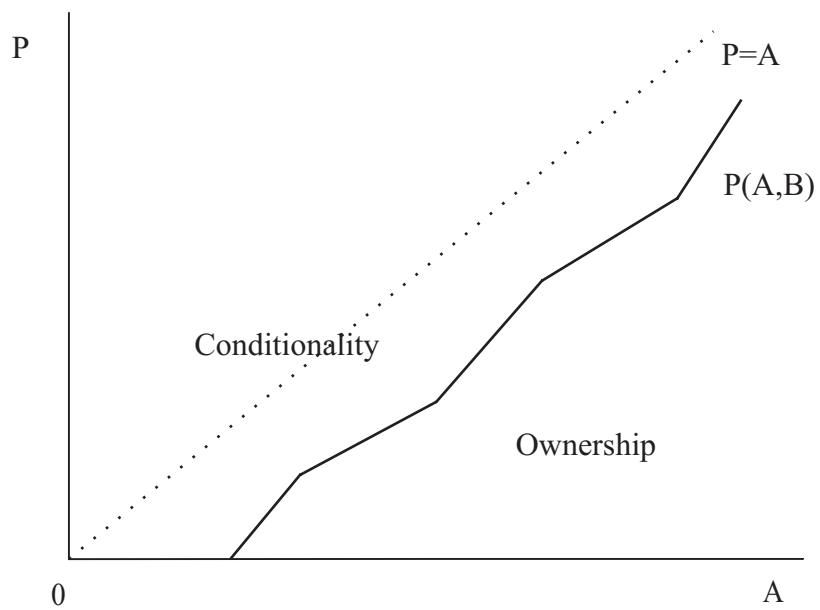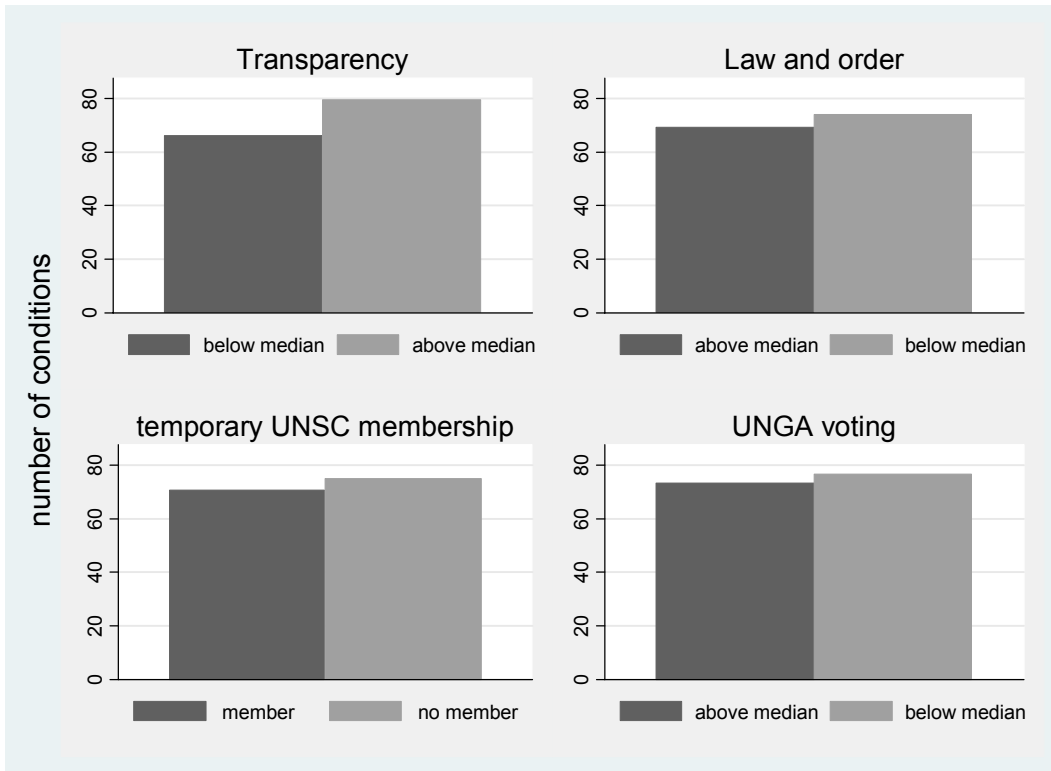
Figure 2: Selected indicators and number of conditions in IMF programs

Table 1: Descriptive Statistics

	EFF	SBA	SAF	ESAF	PRGF	all
Number of programs	27	129	3	66	73	298
Avg. number of quarters	9	5	7	10	10	8,2

Total

	EFF	SBA	SAF	ESAF	PRGF	all
Number of conditions	3142	7448	108	5527	5956	22181
Performance criteria	2225	5309	67	3171	3737	14509
Prior actions	453	792	0	581	689	2515
Structural benchmarks	464	1347	41	1775	1530	5157

Average

	EFF	SBA	SAF	ESAF	PRGF	all
Number of conditions	13	12	5	8	8	9
Performance criteria	9	8	3	5	5	6
Prior actions	2	1	0	1	1	1
Structural benchmarks	2	2	2	3	2	2

Number of areas covered by conditionality ("scope")

	EFF	SBA	SAF	ESAF	PRGF	all
Total	10	9	9	13	11	10
Performance criteria	6	6	6	10	8	7
Prior actions	3	2	0	2	3	2
Structural benchmarks	4	3	4	6	5	4

Note: "Average" indicates the average number of conditions per quarter a program is in effect.

Table 2: Sources and Definitions

	Variables	Definition	Source
ECONOMIC			
	Log of per capita income	GDP per capita (constant 2000 US$)	WDI, WB (2008)
	GDP growth	GDP growth (annual %)	WDI, WB (2008)
	Rate of inflation	Inflation, consumer prices (annual %)	WDI, WB (2008)
	International reserves (to imports)	Total reserves in months of imports	WDI, WB (2008)
	Current account balance	Current account balance (% of GDP)	WDI, WB (2008)
	Domestic (fixed) investments	Gross capital formation (% of GDP)	WDI, WB (2008)
	Growth of government consumption	Government consumption expenditure (annual % growth)	WDI, WB (2008)
POLITICAL			
	Voting in line with the US in the UNGA	Percentage of votes within a year inline with the US	Based on Voeten (2004)
	Temporary member of the UN Security Council	Dummy for temporary UNSC membership	Dreher et al. (2008, 2009)
BIAS			
Inst. Capacity and	**Complexity**		
	Government stability	Government Stability, annual averages	ICRG (1984-2005)
	Corruption	Corruption, annual averages	ICRG (1984-2005)
	Law and order	Law and Order, annual averages	ICRG (1984-2005)
	Investment profile	Investment Profile, annual averages	ICRG (1984-2005)
	Bureaucracy quality	Bureaucracy Quality, annual averages	
	Social conditions	Socioeconomic Conditions, annual averages	ICRG (1984-2005)
	Ethnic tension	Ethnic Tensions, annual averages	ICRG (1984-2005)
	Strength of special interests	Share of seats in the parliament held by "special interests" parties (religious, nationalistic, regional, rural)	Database of Political Institutions, WB
	Democracy	Polity2 score taken from the Polity IV dataset	Marshall and Jaggers
Externalities			
	Economic globalization	Actual flows and restrictions both on finance and trade	Dreher (2006)
	Overall globalization index	Overall globalization index	Dreher (2006)
	Trade	Exports plus imports (% of GDP)	WDI, WB (2008)
	Financial globalization	First principal component of the existence of multiple exchange rates, restrictions on current account transactions, restrictions on capital account transactions, and requirement of the surrender of export proceeds	Chinn and Ito (2007)

	Variables	Definition	Source
LOCAL K			
Transparency			
	Democracy	Polity2 score taken from the Polity IV dataset	Marshall and Jaggers
	Press freedom	Freedom of the press index	Freedom House (2006)
	Missing data	Share in 250 Economics data series for which no data reported	WDI, WB (2008)
Complexity			
	Social conditions/ Ethnic tension	Annual averages	ICRG (1984-2005)
IMF K			
Gov. officials			
	Bureaucracy quality	Bureaucracy Quality, annual averages	ICRG (1984-2005)
	Education	School enrolment, primary (% net)	WDI, WB (2008)
		School enrolment, secondary (% net)	WDI, WB (2008)
		School enrolment, tertiary (% gross)	WDI, WB (2008)
Externalities	See above		

Table 3: Number of IMF Conditions, GLS, 1992-2005

	(1)	(2)	(3)
Government Stability	3.888		3.343
	(4.60)***		(4.01)***
Law and Order	-7.010		-8.357
	(4.16)***		(4.57)***
Bureaucratic Quality	-2.547		-0.251
	(2.09)**		(0.22)
Ethnic Tensions	13.482		15.374
	(7.44)***		(6.80)***
Democracy	0.368		0.223
	(0.47)		(0.28)
Press Freedom	3.747		6.945
	(0.86)		(1.57)
Trade (percent of GDP)	-0.174		0.295
	(1.16)		(2.06)**
Lack of Transparency	-209.828		-287.039
	(8.71)***		(12.46)***
Number of Quarters	6.097	6.345	6.672
	(10.69)***	(18.75)***	(17.84)***
(log) GDP p.c.		-58.483	-127.208
		(3.86)***	(11.17)***
GDP growth		-0.563	-0.664
		(2.18)**	(1.51)
Current Account Balance (percent of GDP)		-0.428	-0.689
		(2.77)***	(3.06)***
Reserves (percent of imports)		2.829	-1.367
		(2.42)**	(1.02)
Inflation		-72.443	-30.637
		(5.75)***	(1.33)
UNSC member		-41.085	-19.766
		(4.67)***	(1.76)*
UNGA voting		-37.724	-77.009
		(1.97)**	(3.31)***
Number of observations	170	219	142
Number of countries	55	66	46

Notes: Estimation is with GLS fixed effects and correction for AR(1) autocorrelation within panels and cross-sectional heteroskedasticity across countries; absolute value of z statistics in parentheses; * significant at 10%; ** significant at 5%; *** significant at 1%

Table 4: Scope of IMF Conditions, GLS, 1992-2005

	(1)	(2)	(3)
Government Stability	0.275		0.342
	(6.49)***		(5.81)***
Law and Order	-0.342		-0.138
	(5.84)***		(1.69)*
Bureaucratic Quality	-0.245		-0.085
	(5.87)***		(1.48)
Ethnic Tensions	0.787		0.589
	(10.85)***		(5.29)***
Democracy	-0.042		-0.091
	(0.97)		(1.75)*
Press Freedom	0.267		0.257
	(1.57)		(1.08)
Trade (percent of GDP)	0.011		0.033
	(1.52)		(4.06)***
Lack of Transparency	-4.972		-5.284
	(4.05)***		(2.79)***
Number of Quarters	0.210	0.155	0.205
	(9.72)***	(8.07)***	(7.60)***
(log) GDP p.c.		-1.856	-6.796
		(2.22)**	(6.46)***
GDP growth		0.051	0.072
		(3.76)***	(3.32)***
Current Account Balance (percent of GDP)		-0.042	-0.059
		(4.22)***	(2.63)***
Reserves (percent of imports)		0.138	0.168
		(1.80)*	(1.39)
Inflation		-0.614	0.777
		(0.92)	(0.65)
UNSC member		-1.981	-0.340
		(13.02)***	(1.62)
UNGA voting		-1.818	-2.345
		(1.72)*	(1.55)
Number of observations	170	219	142
Number of countries	55	66	46

Notes: Estimation is with GLS fixed effects and correction for AR(1) autocorrelation within panels and cross-sectional heteroskedasticity across countries; absolute value of z statistics in parentheses; * significant at 10%; ** significant at 5%; *** significant at 1%

Appendix: Descriptive Statistics (Estimation sample of column 3, Table 1)

Variable	Min	Max	Mean	St.Dev.
Number of Conditions	14.00	349.00	74.47	49.68
Scope of Conditions	4.00	16.00	9.78	2.90
Number of Quarters	3.00	18.00	9.77	4.30
Log of per capita income	4.82	9.01	7.00	1.07
GDP growth	-11.03	16.73	3.21	4.40
Rate of inflation	-0.01	0.91	0.15	0.16
International reserves (to imports)	0.04	11.08	3.64	2.33
Current account balance	-44.84	19.75	-2.65	7.26
Domestic (fixed) investments	8.12	34.67	20.16	5.24
Growth of government consumption	-32.91	46.34	2.12	10.77
Voting in line with the US in the UNGA	0.16	0.63	0.37	0.11
Temporary member of the UN Security Council	0.00	1.00	0.05	0.22
Government stability	3.67	12.00	7.86	1.97
Corruption	2.00	10.00	5.60	1.86
Law and order	2.00	12.00	6.64	2.12
Investment profile	2.00	11.50	6.86	2.14
Bureaucracy quality	3.00	10.63	5.60	2.10
Social conditions	1.33	8.08	4.69	1.39
Ethnic tension	2.00	12.00	8.15	2.53
Strength of special interests	0.00	0.95	0.08	0.19
Democracy	-7.00	10.00	4.54	5.12
Economic globalization	26.14	89.01	50.95	13.35
Overall globalization index	22.95	75.32	47.73	10.58
Trade	14.73	203.84	72.88	36.88
Financial globalization	-1.80	2.54	0.27	1.46
Press freedom	0.00	3.00	2.02	0.68
Missing data	0.01	0.46	0.13	0.09
Education	27.17	99.66	84.27	15.74