Incentives for Conditional Aid Effectiveness

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Abstract: Can sanctions against foreign aid donors enhance the credibility of conditional aid policies? If such policies suffer from time inconsistency, the answer is positive. This paper proposes a mechanism to overcome the lack of credibility of conditional aid donations to developing countries. A scheme of policy-dependent transfers to the donor country is shown to achieve an optimal commitment outcome by improving the credibility of conditional aid programs. The scheme is devised to cover situations in which the cost of structural reforms is information privately owned by the recipient government.

1 Introduction

Good institutions and structural policies are important for the reduction of poverty. There is a widespread consensus that economic development is strongly related to the institutional setting of policy-making (i.e. the rule of law, secure property rights, enforceable contracts and a transparent government). The contributing role of foreign aid policies, though, has been seriously called into question since the pioneering work by Boone (1996).

In an influential paper, Burnside and Dollar (2000) argued that aid is more effective (in terms of growth)[1] in recipient countries that undertake sound economic policies. Easterly et al. (2004), using the same database, found no evidence that the quality of policies affects the relationship between aid and growth. The issue of whether good policies and institutions affect significantly the effects of aid on growth has been addressed in a number of studies, e.g., Burnside

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[1] In a recent paper by Arndt et al. (2010) aid is shown to have significant causal effect on growth over the long run.

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and Dollar (2004), Clemens et al. (2004), Easterly (2003), Easterly et al. (2004), Hansen and Tarp (2001), or Murphy and Tresp (2006). Unfortunately, the debate over the evidence has not led to clear conclusions.

Even so, the prevalent view adopted by the International Financial Institutions (IFIs), is that good policies and strong institutions promote the effectiveness of foreign aid. Attempting to guide the recipients' efforts in the right direction, the donor countries have adopted the practice of conditioning aid upon institutional reform and appropriate ("best practice") policies. This so-called policy conditionality, however, has not proven to be an effective means of improving economic policies in the recipient countries.

There is consistent evidence supporting the idea that the donors provide the pre-committed aid levels even when the conditions of disbursement are not fulfilled.[2] According to Collier (1997), Kapur and Webb (2000) and Killick (2004), it seems that conditionality through structural adjustment lending has proven to be a rather unsatisfactory process, in the sense that in many cases aid has not induced the prescribed reforms. Likewise, Knack (2001, 2004) and Bräutigam (2000) provide evidence that aid intensity is associated with erosion in the quality of governance.

The literature on aid conditionality offers a number of explanations for this empirical finding. We focus our attention on the problem of time inconsistency of conditional aid schemes.[3] Namely, a bias towards low reforms tends to emerge as the equilibrium outcome of a game that puts the donor country in the position of a Stackelberg follower. The recipients are aware that the donors are altruistic and use this information strategically. As a consequence, any threat of aid withdrawal lacks credibility. If the cost of carrying out structural reforms is sufficiently high, the recipient's government faces incentives to break the agreement. The donors are said to fall in a Samaritan's dilemma[4] when it is in their interest to disburse aid even when the recipient countries have failed to implement the pledged reforms. Therefore, a policy in which aid donations are linked to structural reforms proves time inconsistent.

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2 Empirical studies on the effectiveness of conditionality include Conway (2006), Crawford (1997), Devarajan et al. (2001), Dollar and Svensson (2000), Killick (1995), Killick et al. (1998), Mosley (1996), Mosley et al. (1995) and Oyejide et al. (1997), among others.
3 Other reasons why conditionality may fail are: (i) aid is given with the major purpose of furthering the commercial interests of the donor country (Alesina and Dollar 2000; Kanbur 2000; Villanger 2006); (ii) the budget-pressure problem, arising when allocation and disbursement decisions are separated, and whose major effect is to lower the opportunity cost of committed funds (Svensson 2003); (iii) imperfect monitoring and fungibility (Cordella and Dell'Ariccia 2002); and (iv) lack of enforceability if the conditions imposed put debt repayment at risk (Ramcharan 2003).
4 See Buchanan (1975) and Lindbeck and Weibull (1988).

Time inconsistency arises from the combination of donors' altruism with the temporal structure of conditional schemes. However, aid allocation decisions can be based on objectives different from poverty reduction (e.g. geopolitical influence). For instance, aid from US to Pakistan may be motivated by strategic considerations such as security cooperation in reducing terrorism. This suggests that, apart from altruism, one may think on the recipient's support of the donor interests (in the field of international politics, or trade policy) as an alternative reason why the donor might not be interested in enforcing aid conditionality.

The importance of altruistic motives in donors' behavior has been empirically assessed in Berthélemy (2006) and Berthélemy and Tichit (2004). For instance, Berthélemy (2006) tests empirically the donors' (altruistic or self-interested) motivations in aid allocation, using the following variables: (i) geopolitical influence; (ii) ethnic composition and the colonial past of the donors; (iii) the commercial and financial interests of the donors; and (iv) income per capita and quality of governance in the recipients. This author finds substantial differences among donors,[5] but altruism is to some extent present in every donor. In a similar fashion, Knack and Rahman (2007) argue that the share of aid that donors contribute to multilateral aid agencies (UN agencies and IFIs) can be used as a proxy for the degree of altruism of the donors operating in the recipient country.

The temporal structure of conditional schemes leads to credibility problems. Studies by Coate (1995), Svensson (2000a,b, 2003), Pedersen (1996, 2001), Federico (2004) and Hagen (2006) identify the donor's lack of credibility as the problem underlying limited aid effectiveness. As an illustration of this problem, Kanbur (2000) relates how Ghana violated the budgetary conditionality in the WB's Structural Adjustment Credit in 1992, and how, as a representative of the WB on the ground, he "came under pressure from several sources, some of them quite surprising, to release the tranche with minimal attention to conditionality." If there are pressures to disburse aid when conditionality is violated, and recipient governments are aware of the donors' altruistic motivations, then it is no surprise that conditional schemes lack credibility.

However, if conditional aid schemes suffer from time inconsistency, then it is not clear why donor countries might want to engage in such schemes. A plausible way to escape from this (apparent) contradiction is to assume a certain degree of uncertainty in the donor-recipient relationship. We adopt this view and specifically assume that there exists asymmetric information about the costs of structural policies for recipient countries. When the donors are unable to assess

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5 For instance, the aid allocations of Switzerland, Ireland and the Nordic countries reveal that these countries are so far much more altruistic than other donors.

the exact costs of such policies, they cannot make a precise inference as to the outcome of the conditional aid game.

This paper proposes a scheme of incentives to cope with the time inconsistency problem of conditional aid policy in a context in which the donor does not know the recipient's costs of structural reforms. For this purpose, we use the tools of mechanism design theory. The mechanism proposed offers a number of insights related to the design of aid institutions. Therefore, the mechanism's implications for aid policy, discussed in Section 7, constitute the main contribution of the paper.

We use an extremely stylized theoretical model in which reforms are assumed to increase the marginal impact of aid on consumption in the recipient country. As expected, the donor's inability to credibly commit to a certain aid level turns out to induce reforms below the optimum (Proposition 3). The recipient (correctly) deduces that a small amount of reform (and hence a poorer economy) will lead an altruistic donor towards higher aid disbursements. In this discretional scenario, the equilibrium includes aid donations, but a small amount of reform. The outcome is inefficient, as the donor's aid is less effective because of the low intensity of reform. This scenario approximately describes the failure of actual conditional aid programs.

To deal with such inefficiency we propose a sequential mechanism. The last stage of the mechanism includes a transfer scheme in which the donor is penalized when the recipient misbehaves. The rationale of the transfer is to impose on the donor an additional cost in case the recipient fails to fulfill their commitments. In equilibrium, the recipient is dissuaded from undertaking a small amount of reform. The reason is that the recipient knows (and internalizes) the fact that low levels of reform will now result in less aid.

We derive the specific functional form for the penalty function that induces the optimal aid policy. The shape of this function, though, depends on the cost of structural reforms, which is information private to the recipient. We overcome this difficulty by including a first stage in which the recipient is asked to reveal the cost of reforms. To prevent such a cost being misrepresented, the donor is simultaneously asked to announce a parameter of the transfer function that determines the severity of its own sanction. The interplay between these two announcements turns out to make truthful revelation an equilibrium strategy for the recipient. The proposed mechanism is then shown to implement in Subgame Perfect Equilibrium[6] the optimal aid policy. In addition, the mechanism is balanced (the equilibrium donor's sanction is zero) and individually rational (even

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6 For the issue of implementation using the Subgame Perfect Equilibrium concept, see Moore and Repullo (1988).

if they may be punished, it is in the donors' interest to commit to the rules of the mechanism).

The working of our scheme can be roughly outlined as follows: the donors "tie their hands" by committing to a penalization scheme if recipients deviate from the conditions stipulated to qualify for aid. For this scheme to work optimally, the intensity with which donors are penalized must depend on information that is privately owned by the recipients. The mechanism prevents the failure of information through an announcement stage that allows eliciting the true reform cost. In equilibrium, the donors are better off and the desired poverty reduction is achieved.

The practical relevance of the mechanism is based on a simple yet powerful idea: if we accept that time inconsistency can explain (at least) part of the failure of conditional aid programs, we must conclude that penalizing the donors when recipients misbehave improves the effectiveness of policy conditionality. The institutional environment in which the rules of the mechanism can be enforced includes donor coordination in the form of voluntary settlements (e.g. an international treaty), or delegation of part of the aid budget in a supranational agency endowed with the right incentives. The form of the transfer function in the mechanism suggests that a sensible reform of conditionality should give donors and recipients some policy-making decision power.

The rest of the paper is divided into the following sections. Section 2 includes a brief review of previous contributions closely related to the present paper. Section 3 sets up the model. Section 4 analyzes the commitment scenario. In Section 5, we characterize the (inefficient) equilibrium arising in a discretional scenario. Section 6 presents a mechanism that achieves implementation of the optimal aid policy in Subgame Perfect Equilibrium. In Section 7 we explore several ways in which aid policy structures give rise to incentives that mimic the effects of the proposed mechanism. Section 8 concludes. All proofs have been included in the Appendix.

2 Related Literature

The existing literature focuses on the donor's lack of credibility as a main cause of the failure of conditional policies (see, for instance, Coate 1995; Pedersen 1996, 2001; Selbervik 1999; Kanbur 2000; Svensson 2000a,b, 2003; Federico 2001; Hagen 2006). While we agree with the diagnosis of the problem, our treatment is more geared to changing the incentives for donors than to increasing the pressure exerted on recipients. At the same time, the practical implementation of our scheme requires either some type of multilateral commitment (international

agreement) or delegation in a third party enforcer (international organization). Both approaches have been recognized as relevant in the solution of the donors' credibility problem. For instance, in Selbervik's report on the aid relationship between Norway and Tanzania (Selbervik 1999), the author mentions the use of *cross-conditionality*, whereby Norwegian bilateral aid is conditional on Tanzania reaching agreements with the IMF and the World Bank. This type of conditionality is partially based on a delegation scheme. The importance of the Samaritan's dilemma in order to explain aid disbursements is also stressed in Selbervik (1999). For this purpose the author uses a static model with payoffs particularly chosen in order to obtain that disbursement is a dominant strategy. As a major difference, our paper analyzes this classical game-theoretic situation using a dynamic model to explicitly derive the inefficiencies that arise from the non-coincidence between the donor's ex-ante and ex-post incentives.

There are several papers dealing with institutional design to overcome the lack of credibility of conditional aid policies. In a closely related work, Svensson (2000a) develops a moral hazard model to address the time-inconsistency problems of conditional aid policy. Within this setting, he analyzes two institutional arrangements that improve the welfare of the poor. Namely (i) to delegate the aid budget to an agency with less aversion to poverty, and (ii) tied aid projects. Our paper follows Svensson's route. We base our analysis on the Samaritan's dilemma inefficiencies that are inherent to policy conditionality. Then we present a normative proposal. However, there are several important differences with Svensson's work: (1) We assume that the recipient's reform effort (or level) is perfectly observed, and we focus our attention on private information about the cost of reform; (2) we consider one single recipient instead of two, and hence we do not have the effect of recipients competing for aid, and (3) we do not analyze the role of existing arrangements, but study the incentives that would induce the optimal aid policy as an equilibrium.

The paper also relates to earlier work by Azam and Laffont (2003). These authors use contract theory to study the form of the optimal contracts emerging in a principal-agent framework where poverty reduction is an international public good. They consider asymmetric information about the degree of altruism of the recipient government and then obtain the form of the optimal contracts in both moral hazard and adverse selection setups. In their paper, though, the credibility of the contracts is only briefly mentioned and referred to within a dynamic adverse selection setting. By contrast, the credibility issue is central to our analysis.

The critical role played by the timing of the conditional aid game was firstly stated by Pedersen (1996, 2001). This author showed that the recipient's effort to promote investment and growth is critically influenced by the donor acting as

a Stackelberg leader or as a Stackelberg follower. Our analysis is developed in accordance with Pedersen's view that "the Stackelberg follower aid organization may be a not too unrealistic representation of reality" (Pedersen 1996).

With respect to the mechanism design issue, the paper relates to Varian (1994), in which a sequential compensation mechanism is proposed to deal with externalities problems. The part of our scheme devoted to elicit private information has a structure similar to Varian's mechanism, as it includes an announcement stage before some relevant choices are made (in our case, reform level and aid disbursements). However, the incentives needed to deal with time inconsistency are very different from the ones used by Varian to internalize externalities.

Finally, the normative proposal made here has a flavor of Walsh's contracts for central bankers in Walsh (1995). The rationale of such contracts is to appropriately distort the banker's objective function in order to achieve the optimal monetary policy as a Nash equilibrium outcome. A similar logic with respect to the donors' incentives is used in the design of our sanction scheme.

3 Model

We consider the relationship between a donor country and the government of an aid-recipient country.[7] We treat both as single optimizing decision units. Aid, denoted by y, is disbursed by the donor conditional upon the performance of structural and institutional reforms on the part of the government. We denote by z the level (or intensity) of such reforms, and assume that $z \in [0, 1]$. Both aid and reforms positively influence consumption in the recipient country. Specifically, we consider that under a reform of amount z, a proportion z of the population achieves consumption level ky and a proportion $(1-z)$ achieves y. Hence, parameter $k>1$ accounts for the degree of effectiveness of reform. Average consumption in the recipient country can be written as

$$C = zky + (1-z)y. \tag{1}$$

Observe that aid (reforms) increases the marginal impact of reforms (aid) on average consumption.[8]

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7 The terms "government" and "recipient" are interchangeable throughout the paper.
8 The assumption that aid is more effective in countries that have performed structural reforms is consistent with the empirical evidence provided in Burnside and Dollar (2000, 2004).

The donor country is partly concerned with the average consumption level in the aid-recipient country. Its objective is to minimize a social loss given by

$$L = \gamma (C - \overline{C})^2 + y, \qquad (2)$$

where $\gamma > 0$ stands for the degree of altruism of the donor and $\overline{C}$ is an exogenous consumption target.[9] The term $C - \overline{C}$ is a poverty gap. Aid disbursements improve C (and hence reduce poverty), but are also costly for the donor as they leave fewer resources available for domestic consumption. Parameter γ accounts for the relative importance of the donor's altruistic motivations with respect to the cost of aid provision.

The government in the recipient country is concerned with the average consumption level and the political cost of reforms. Its utility is equal to

$$G = C - \theta z, \qquad (3)$$

with $\theta \in [\theta_L, \theta_H]$ denoting the (constant) marginal cost of reforms. We assume that $0 \le \theta_L < \theta_H$. Institutional change always entails political costs, especially for governments of countries in which the power of established lobbies and corruption levels are high. Measures aimed at liberalizing markets are rarely welcome by special interest groups, and policy reform is typically unpopular and may lead to damaging protests.[10] The size of these political costs is represented by the value of parameter θ.

Let $G_\theta(y, z) = zky + (1-z)y - \theta z$ be the utility function of a government with type θ. It depends positively on the amount of aid received y. However, the sign of the dependence on z is conditioned on the effectiveness of reforms and the aid received compared to the cost of reforms. Specifically, if $(k-1)y - \theta > 0$, the dependence is positive and the contrary occurs if $(k-1)y - \theta < 0$.

The fact that z belongs to the interval [0, 1] imposes some constraints on the parameters of the model. Hence, we make the following assumptions:

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9 We are implicitly assuming that the preferences of the government in the donor country coincide with that of society. This assumption is plausible for democratic societies, where elections are periodically held. We may think of the electorate as consisting of a population of N heterogeneous voters, indexed by i, who are different in their altruism levels, and where each voter's preference is represented by a utility function $\gamma_i (C - \overline{C})^2 + y$. Parameter γ could then be regarded as the degree of altruism corresponding to the median voter. For a political economy explanation of aid donations based on the median voter, see Mayer and Raimondos-Møller (2003).

10 To note a difference with the utility function of the donor country, we are implicitly assuming here that the recipient country is ruled by a political elite, whose preferences do not necessarily reflect those of the country's population. For an analysis of the influence of interest groups on recipient governments, see Mayer and Mourmouras (2002).

Assumption 1: For any $k>1$ and $\gamma>0$, it holds that $\frac{1}{2\gamma}\left(\frac{k-1}{k}\right)<\theta<\frac{1}{2\gamma}(k-1)$.

Assumption 2: The parameters $k>1$, $\gamma>0$, and $\bar{C}$ are such that $\gamma\bar{C}\geq\frac{1}{2}\frac{k^2+1}{k}$.

Assumption 1 establishes upper and lower bounds on θ. This assumption restricts our attention to settings where the reform costs are not too high or too low, since otherwise the reform levels chosen by the recipient would be either $z=0$ or $z=1$ regardless of any aid decisions the donor may undertake.

Assumption 2 guarantees that if donor altruism is "high enough," aid donations are optimal strategies under certain circumstances. This assumption is a sufficient condition, not a necessary one.

We consider that the loss function in Eq. (2) is adequate to assess the social welfare impact of aid policies. The reason is that it accounts for the average consumption in the aid recipient country, C, and (implicitly) for the consumption in the donor country (reflected through the term y). The political cost of reforms is not included as part of the social welfare as it just represents a measure of the recipient government's concerns for holding office.

Next we characterize a social optimum in this economy. By plugging the value of C in Eq. (1) into Eq. (2) we write the loss function as $L(y,z)=\gamma(zky+(1-z)y-\bar{C})^2+y$. Notice that this function is strictly decreasing in z and U-shaped over y. We are looking for pairs (y, z) that solve the problem:

$$[\,P1\,]\begin{cases}\min_{\{y,z\}}L(y,z)\\ \text{s.t.} \quad 0\leq z\leq1\\ \qquad y\geq0.\end{cases}$$

The pair (y^{opt}, z^{opt}), with $y^{\text{opt}}=\frac{1}{k}\left(\bar{C}-\frac{1}{2\gamma k}\right)$ and $z^{\text{opt}}=1$ solves [P1]. Not surprisingly, the efficient aid policy involves the maximum level of reforms. The optimal aid disbursement is increasing in the parameters that represent the donor's altruism, namely, $\bar{C}$ and γ.

The strategic interaction between the donor and the recipient is modeled as a sequential game with the following timing:

Stage 1 (Commitment): The donor conditions aid level $\tilde{y}$ to reforms $\tilde{z}$. The pair $(\tilde{y},\tilde{z})$ is a non-enforceable agreement that minimizes the donor's loss and is accepted by the recipient.

Stage 2 (Reforms): The recipient undertakes reforms level z. There are two possibilities: either $z=\tilde{z}$ (the agreement is fulfilled), or $z\neq\tilde{z}$ (the agreement is not fulfilled).

Stage 3 (Disbursement): The donor disburses aid level y, where again, we may have $y=\tilde{y}$ or $y\neq\tilde{y}$.

This sequence of events entails time-inconsistency problems, derived from the donor's lack of credibility. If the recipient happens to set $z \neq \tilde{z}$, the donor responds by selecting the value for y that minimizes its loss provided that the recipient performed z. The recipient is aware of the donor's altruism, and hence manipulates the level of reform in Stage 2. This strategic behavior induces an inefficient allocation of aid and reforms. Moreover, when there is uncertainty (on the part of the donor) about the true value of θ, it can be the case that the donor engages in conditional aid schemes that end up being inefficient (because of time inconsistency). This situation occurs when the true reforms costs are higher than expected.

The next section analyzes the benchmark scenario in which the donor's commitment is credible, i.e., aid level $\tilde{y}$ is carried out.

4 The Commitment Game

If the donor country is able to credibly commit to aid level $\tilde{y}$, the third stage of the game is irrelevant. In this case, the donor acts as a *Stackelberg leader*. We first solve a sequential 2-stage game under the assumption that parameter θ is public information. Then, we analyze the case where the cost of reform is information privately owned by the recipient. The equilibrium concept used in both scenarios is that of Subgame Perfect Equilibrium (SPE). Given any aid level y, let $z(y)$ be the best response of the recipient. This best response comes from solving the following problem:

$$[\,\mathrm{P2}\,] \begin{cases} \max_{\{z\}} G_{\theta}(y,z)\rho \\ \text{s.t.} \quad 0 \leq z \leq 1. \end{cases}$$

We find that

$$z(y) = \begin{cases} 1 & \text{if } (k-1)y > \theta \\ 0 & \text{if } (k-1)y < \theta \\ z(y) \in [0,1] & \text{if } (k-1)y = \theta \end{cases}$$

The optimal response to any committed aid level $\tilde{y}$ depends on the relationship between the cost of reform (θ) and the effectiveness of such reform (k–1). Given k and θ, if the donor wants to induce the maximum level of reform, it must pledge aid levels to be high enough. The reason is that the larger is y, the higher is the marginal impact of reform on poverty reduction.

Subject to the recipient's step-reaction function, the donor selects the value for y that minimizes its loss. We call $\tilde{y}$ this value. Then, $\tilde{z} = z(\tilde{y})$.

If θ is known to the donor, and the donor has the power to commit to a conditional scheme, then the efficient aid policy turns out to be an equilibrium, as we establish in the proposition below.

Proposition 1: Under full information about θ, the only SPE of the commitment game is the efficient aid policy, i.e., $(\tilde{y}, \tilde{z}) = (y^{\mathrm{opt}}, z^{\mathrm{opt}})$.
Proof: See Appendix.

Given the government's reaction function, only two equilibria would be possible when θ is publicly known. One is $(y^{\mathrm{opt}}, z^{\mathrm{opt}})$, in which both reforms and aid are high. The other would entail aid level $y_0 < y^{\mathrm{opt}}$ and zero reform. If the donor is sufficiently altruistic (Assumption 2), the only SPE of the game is the one associated with high aid levels. The intuition is that, although y^{opt} is more costly for the donor than y_0, it also induces the most reforms, and this maximizes the effectiveness of aid. The equilibrium consumption in the recipient country is given by $C^{\mathrm{opt}} = k y^{\mathrm{opt}} = \bar{C} - \dfrac{1}{2\gamma k}$. Not surprisingly, more altruism (γ), effectiveness of reforms (k) and consumption target ($\bar{C}$) imply higher levels of C^{opt}.

The commitment policy may not be an equilibrium if there exists asymmetric information about parameter θ. In this case, the donor must consider statistical information about the distribution of θ in order to devise an efficient conditional scheme. For any realization of θ, the optimal response of a recipient to any given aid level will be either $z=0$ (if $(k-1)y < \theta$) or $z=1$ (if $(k-1)y > \theta$). The donor is only interested in inducing the maximum level of reform, but, differently to the full information case, it cannot guarantee that this outcome will come about after the (credible) promise of a certain aid level. Since the value of y positively affects the probability of achieving $z=1$, the best strategy for the donor is to attach a level of aid $y^C > y^{\mathrm{opt}}$ to the performance of reforms, and zero aid if $z=0$. For simplicity, we assume that θ is uniformly distributed on the interval $[\theta_L, \theta_H]$.

Proposition 2: When the cost of reforms θ is unknown to the donor, the only SPE of the commitment game is the pair (y^C, z^C), where $y^C > y^{\mathrm{opt}}$ and $z^C = 1$ with probability $p(y^C) < 1$.
Proof: See Appendix.

Uncertainty about the true cost of reform brings about an inefficient outcome. On the one hand, the donor increases aid levels above the optimum. On the other hand, the probability that the recipient sets $z=0$ is positive. The distortion on the optimal aid level induced by the lack of information about θ is part of the donor's equilibrium strategy aimed at increasing the probability of high reforms. Giving more aid than y^{opt} improves the donor's expectations about the performance of

structural reforms. In the full information benchmark scenario, this effect does not exist, since the donors only engage in conditional schemes with recipients whose reform costs are sufficiently low, and y^{opt} is then sufficient to induce $z=1$.

The choice of y^c is ex-ante optimal but not ex-post, since there may be realizations of θ such that $(k-1)y^c<\theta$. On the other hand, disbursing zero aid is not the donor's best response to $z=0$. However, if the donor is able to commit to such a threat, then $y=0$ in exchange for $z=0$ is the conditional policy that most incentivizes a choice of $z=1$.

In order to illustrate the results of this section, we provide a numerical example. Consider the set of parameters $k=2$, $\gamma=1$, and $\bar{C}=10$. Then, $y^{opt}=4.875$, $y^C=6.5$, and $z^{opt}=1$. If, for instance, θ is uniformly distributed on the interval [0, 20], we have prob$(z^c=1)=0.65$.

The next section analyzes the (more realistic) case in which the recipient is a *Stackelberg leader*, and hence faces incentives to manipulate the donor's response to its own benefit.

5 Time Inconsistency of Conditional Aid Policy

The present section is devoted to computing the equilibrium outcome that arises when conditional aid schemes are not credible, i.e., when the donor acts as a *Stackelberg follower*. As in the preceding section, we consider two alternative scenarios regarding the donor's information about parameter θ. The timing of this discretionary policy game is as described in Section 3 without including the first (commitment) stage. We compute the SPE of the game proceeding by backwards induction. In the disbursement stage, for any given z, the donor country selects y to minimize $L(y, z)$. This yields the following reaction function:

$$y(z)=A(z)\left[\bar{C}-\frac{1}{2\gamma}A(z)\right], \tag{4}$$

where $A(z)=\dfrac{1}{1+(k-1)z}$. The recipient country internalizes the donor's reaction function, and undertakes reforms level z to solve:

$$[P3]\begin{cases}\max_{\{z\}} G_\theta(y,z)\\ \text{s.t.} \quad y=y(z).\end{cases}$$

The first order condition of the above problem can be written as:

$$(k-1)y(z)+\frac{1}{A(z)}y'(z)=\theta. \tag{5}$$

The left hand side of the above expression is the marginal benefit of increasing z. The right hand term is the marginal cost. The term $\frac{1}{A(z)}y'(z)$ accounts for the variation in C caused by the donor's disbursement response to a change in reform z. Notice that this term would be equal to zero in the commitment scenario. In this discretional scenario, though, a Samaritan's dilemma-like situation emerges when the donor is sufficiently altruistic thus implying $y'(z)<0$. If the recipient impoverishes the country (through a low level of reform) it receives more aid.[11] In particular, solving for z Eq. (5) we obtain

$$z^* = \frac{1}{k-1}\left[\left(\frac{k-1}{2\theta\gamma}\right)^{1/2}-1\right]. \tag{6}$$

Straightforward computations show that the inequality $z^*<z^{\text{opt}}$ holds.[12] The marginal benefit of increasing z is now lower than the one obtained in the commitment setup. Therefore, the recipient finds it profitable to distort to a certain extent the reform level. Let us call (y^*, z^*) the equilibrium policy of the conditional aid game, where $y^*=y(z^*)$.

The bias towards low reforms depends positively on the cost of such reforms. One interesting question is: if the donors expect $z^*<1$, why should they believe that conditional schemes are effective? When θ is public information, the donor should anticipate that, even if the recipient has committed to $z=1$, it faces incentives to set up $z^*<1$. In this case, it is not clear why the donor may want to be engaged in a conditional aid contract. However, when θ is information privately owned by the recipient, it can be the case that the donor believes that the cost of reform is low enough so as to guarantee that $z^*=1$. Suppose that, when asked about the value of θ, the recipient reports $\hat{\theta}$ such that $\hat{\theta}\leq\frac{1}{2\gamma}\frac{k-1}{k^2}$. If the donor believes that $\hat{\theta}$ is the true cost, the conditional aid scheme appears to be time

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11 The reader can easily check that $y'(z)<0$ holds for the range of z such that $\gamma\bar{C}>A(z)$, which includes z^*. Pedersen (1996, 2001) and Federico (2004) also obtain a negative relationship between aid and reforms. In their models, it is the need to qualify for aid that induces low investment activities in the recipients. Regarding the relationship between aid and taxation, in a recent paper Carter (2013) finds little evidence that aid displaces domestic taxation.

12 Observe that $z^*=1$ occurs if the reform cost is sufficiently low, i.e., if $\theta\leq\frac{1}{2\gamma}\frac{k-1}{k^2}$. In that case, conditional policy would be time consistent. Assumption 1 rules out this possibility, since we are restricting our attention to a setup in which time inconsistency may arise.

consistent, since $z^*=1$. The donor's lack of information about θ makes it possible that donor countries get involved in apparently time consistent conditional schemes, ignoring the fact that it could be in the recipient's interest not to meet the conditions because the true value of θ is higher than reported.

In a scenario where the donor is a Stackelberg follower, however, private information on θ does not alter the SPE outcome. The reason is that the donor responds optimally to z, and no information about θ is necessary once the value of z has been set up. Therefore, the result stated below applies to both the cases of full and private information.

Proposition 3: In the absence of credible commitment, an aid-recipient country undertakes reforms below the optimal (commitment) level when the donor is altruistic enough. As a consequence, poverty reduction in the recipient country is smaller than the one obtained in the commitment setup.
Proof: See Appendix.

In a scenario where commitment on the part of the donor is not credible, the pair (y^{opt}, z^{opt}) is no longer an equilibrium outcome. The government's ability to manipulate the donor's final disbursement ends up reducing consumption in the recipient country. The reason is that the political cost of reform enters negatively into the government's utility function. Undertaking a small amount of reform improves the government's utility as it involves (i) lower political costs, and (ii) a positive response in the amount of aid disbursed by the donor. A suboptimal reform level $z^*<1$ emerges from the trade-off between reducing poverty and bearing higher political costs.

We can illustrate numerically this equilibrium outcome. Using the same set of parameters as in the example of the previous section, i.e., $k=2$, $\gamma=1$, $\bar{C}=10$, and considering a realization of $\theta=0.375$ we now have $z^*=0.154$ and $y^*=8.285>y^{opt}=4.875$.

The next section deals with the appropriate incentives to avoid the recipient government's manipulation. The proposed mechanism eliminates the two identified sources of inefficiency. Namely: time inconsistency of policy conditionality and uncertainty about the true reform costs.

6 Implementing the Efficient Aid Policy

This section presents a policy-contingent incentive scheme that induces the optimal aid policy when the cost of reform is private information. Under this scheme, aid disbursements are penalized at a rate that depends on the recipient's

reform level (z). We consider a penalty rate function which is shaped by parameters $\tilde{\theta}$ (reform cost, reported by the recipient) and λ (the degree of severity of the sanction, reported by the donor). The donor's loss under such an arrangement would be given by: $L(y,z)+t(z,\lambda,\tilde{\theta})y$, where $t(.)$ stands for the penalty rate function.

Let (λ, y) and (s, z) be, respectively, strategy pairs for the donor and the recipient. Let $s:[\theta_L,\theta_H]\rightarrow[\theta_L,\theta_H]$ be a report function for the recipient, that depends on the true cost of reforms. We denote by $\tilde{\theta}=s(\theta)$ the cost announced by the recipient when the true cost is θ. Notice that reports $\lambda\in(0, 1)$ and $\tilde{\theta}$ condition the functional form of the penalty rate function $t(.)$.

We are looking for a mechanism that achieves the optimal aid policy as an equilibrium outcome. In other words, the equilibrium strategies of the game defined by the mechanism must include the actions y^{opt} and z^{opt}. Let us define a Revelation Credibility Enhancing Scheme (RCES) as:

Definition 1: A RCES is a sequential mechanism consisting of the following stages: (1) the government of the recipient country reports $\tilde{\theta}$, and the donor country simultaneously announces λ; (2) the government undertakes reform level z; (3) the donor disburses aid y. The government's payoff is $G_\theta(y, z)$. The payoff for the donor is $-[L(y,z)+t(z,\lambda,\tilde{\theta})y]$, where

$$t(z,\lambda,\tilde{\theta})=\frac{2\gamma}{A(z)}[(1-z)K_\lambda(\tilde{\theta})+q_\lambda(z)]-1$$

with $K_\lambda(\tilde{\theta})=\lambda\frac{k-1}{k}\bar{C}+(1-\lambda)\tilde{\theta}$ and $q_\lambda(z)=\frac{1}{2\gamma k}\left[\frac{\lambda}{kA(z)}+1-\lambda\right]$.

It is worth commenting on some characteristics of the penalty rate function, especially those related to the role of parameters λ and $\tilde{\theta}$. First of all, observe that the penalty rate equals zero when the level of reform is $z^{\text{opt}}=1$ whereas this rate is positive for all $z<1$.[13] This means that aid donations entail additional costs for the donor only if the recipient misbehaves on reform policy. The sanction lowers the responsiveness of aid disbursements to changes in reform and then it reduces the recipient's ability to manipulate the final disbursement.

The penalty rate function is strictly increasing in λ. Hence, any given aid donation (when reforms are below the commitment) is penalized more heavily the higher is λ. This parameter can be seen as the degree of severity of the sanction. A higher sanction enhances the credibility of the commitment. Formally, the donor's reaction function under the penalty scheme is less responsive to changes in z the higher is λ.

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13 This and other claims made in the present section are proved in the Appendix.

In the announcement stage, the recipient might face incentives to misrepresent θ. Observe that reporting the lowest possible cost would entail, *ceteris paribus*, the lowest possible penalty for the donor. In this case, a "Samaritan's behavior" would be weakly punished, so in certain cases setting up reforms $z=0$ would make the recipient better off.[14] In order to avoid this possibility, a RCES gives the donor the power to decide about the severity of its own sanction. In equilibrium, the donor will set a value for λ above a certain threshold inversely related to $\tilde{\theta}$. This will eliminate the recipient's incentives to understate the cost of reform. The mechanism is devised in such a way that the interplay between $\tilde{\theta}$ and λ induces truthful revelation of the cost of reform.

Now we present the main result of the paper:

Proposition 3: A RCES implements in SPE the efficient aid policy.
Proof: See Appendix.

The equilibrium strategies include actions y^{opt} and z^{opt}. Moreover, the equilibrium sanction turns out to be zero and the donor faces incentives to engage in the mechanism.

Remark 1: A RCES is balanced in equilibrium and individually rational.

The sanction to the donor equals zero, provided that $t(z^{opt}, \lambda, \tilde{\theta})=0$. The donor is strictly better off under a RCES, as long as the inequality $L(y^{opt}, z^{opt}) < L(y^*, z^*)$ always holds.

Suppose that the parameters of the model are those provided in the numerical examples of the previous sections. Assume that θ is uniformly distributed on the interval $\left[0, \dfrac{3}{2}\right]$, and that the true value of the reforms cost is $\theta=0.375$. The equilibrium reports are then $\lambda^*=0.25$ and $\tilde{\theta}=0.375$, and the sanction function applied to aid disbursements is $t(z, \lambda^*, \tilde{\theta})=-3z^2+0.5z+2.5$. It is easy to see that this function is positive and strictly decreasing in the relevant range of z, it reaches a maximum value of 2.5 (when $z=0$), and a minimum value of 0 (when $z=1$).

The sanction function in a RCES has been devised to exactly offset the donor's altruistic motivations, and thus attacks one of the major acknowledged causes of failure of conditional aid programs. The scheme establishes the price to be paid

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14 In the proof of Proposition 4, we show that in situations where λ is low and/or θ is high enough, the strategy $s(\theta)=\theta_L$ for all θ (weakly) dominates a truthful report.

for being an altruist, and sets this price at a sufficiently high level to convince the recipient that she will get no advantage in the disbursement stage. In addition, it is in the donor's interest to accept getting involved in such a disciplining device. The reason is that, as long as the conditional aid scheme has been made credible to the recipient, the social loss becomes minimum and the equilibrium sanction is zero.

The next section integrates some conceptual insights of the mechanism with the policy debate on conditional aid.

7 Policy Implications

This paper considers the use of incentives in aid policy. However, as a difference with the donor-recipient arrangements studied in the literature,[15] rewards or penalties are only imposed on donor countries. The incentives are designed to act as a disciplining device for the donors thus enhancing the credibility of conditional schemes. The central idea of the mechanism presented here is that donors must bear a cost when disbursing aid to non-compliant recipients. The altruistic motivation that triggers recipients' manipulation is then offset and the Samaritan's Dilemma problem is overcome. Donors' compliance with the voluntary agreed procedures must be supervised, but no authority is needed to enforce conditionality with recipients. We ask: how could aid policy structures give rise to incentives that mimic the effects of the proposed mechanism?

There are two fundamental ways in which the rules of the mechanism can be implemented: An international treaty, and delegation of aid policy to a supranational institution. An international agreement reflects the donors' commitment to a legally binding and permanent obligation. A supranational aid agency provides legal coverage, enforces the principles agreed and is accountable.[16]

An international treaty is a commitment device that requires the coordination of donors. Under the label of "harmonization," the Paris Declaration on Aid

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15 The principal (bilateral agency, or donor country) rewards an agent (recipient government) in return for a certain task.

16 Bilateral aid agencies contribute nearly 70% of the total aid disbursed, and multilateral agencies contribute the remaining 30% (Burall et al. 2006). The most common ways to channel external aid are: (i) direct bilateral relationships between a donor and a recipient; (ii) direct multilateral relationships (several donors and/or several recipients); and (iii) indirect aid channeling procedures through International Financial Institutions (IFIs) like the World Bank and the IMF, or through other intermediaries such as NGOs. Hagen (2006), in Table 1 shows that the importance of intermediaries in the distribution of aid varies substantially among countries.

Effectiveness comprises the establishment of common arrangements, rationalized procedures and information sharing within the donors' community. Similar to the IMF's Articles of Agreement,[17] it is possible to conceive an international agreement on aid policy in which disbursement procedures include sanctions when donations are made to non-compliant recipients. Enforceability of this agreement will generally depend on characteristics of the funds donors. Provided that the majority of donor countries are based on the rule of law, violating treaty obligations entail reputation costs for governments.[18] Leeds (1999) argues that democratic political systems advantage states in making credible commitments in the international arena.[19] If the commitment between donors is credible, its implications for recipients are likely to be credible as well.

International cooperation problems, though, resemble a Prisoner's Dilemma game. Since poverty reduction is a global public good, voluntary settlements on aid discipline have a positive impact on the utility of altruistic donors. However, each donor may face incentives to renege on the terms of the agreement. When reputation is not sufficient to guarantee cooperative behavior, the institutional solution adopted is policy delegation to an independent agency[20] (for instance, the creation of the ECB is a prominent example of successful policy delegation to a supra-national institution).

This leads us to focus our attention on multilateral aid agencies.[21] Fund contributors to aid agencies delegate aid policy decisions in IFIs such as the World Bank or the IMF. Executive directors of these institutions are then in charge of implementing structural adjustment policies, in the form of programs or projects. How could the incentives of our mechanism be applied in such a setting?

We use contract theory in the same fashion as Walsh (1995) does in the optimal design of incentives for central bankers. In our setting, a performance contract consists of a transfer $T = a - t(z, \lambda, \tilde{\theta})y$ associated to each aid level disbursed y. The fixed term a is set up to induce acceptance of the contract. Once

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17 The IMF's Articles of Agreement are an international accord that obligates signatories to particular standards of monetary conduct. See Simmons (2000).

18 Simmons (2000) argues that reputational concerns explain patterns of commitment with international monetary law.

19 See also the empirical analysis in Siverson and Emmons (1991), Cowhey (1993), Fearon (1994, 1998), Gaubatz (1996), McGillivray and Smith (2000) or Leeds and Davis (1999).

20 Svensson (2000a) uses the approach in Rogoff (1985) to investigate delegation arrangements in the context of two recipients competing for aid, showing that the Samaritan's dilemma is mitigated if the aid agency has less poverty aversion than the donor.

21 Multilateral agencies can be seen as a mechanism for collective action. Moreover, as Rodrik (1995) notes, they are less politicized than governments, and this provides such agencies with an advantage in the exercise of conditionality.

accepted, the objective of the aid agency is to maximize $T-L(y,z)$, i.e., to minimize $L(y,z)+t(z,\lambda,\tilde{\theta})$. The transfer T induces the pair (y^{opt}, z^{opt}) as the only equilibrium aid policy.

The main practical issue to apply this transfer scheme lies in the questionable ability of the IFIs as credible enforcers of the mechanism. Difficulties in the actual implementation of conditional schemes have since long eroded the credibility of the WB and the IMF. However, the fact that the mechanism's rules must be enforced on donors (not on recipients) may help restore the role of the IFIs as third party enforcers. It is also conceivable to resort to other international organizations to work as appropriate enforcers of the mechanism in the types of structural reforms related to their specific mandates. For instance, the World Trade Organization (WTO) provides a legal framework for the implementation and monitoring of trade agreements. Hence, the WTO could be viewed by the donor community as a credible enforcer of the disciplining rules of the mechanism if the reform at stake is on trade liberalization. Similarly, the International Labor Organization (ILO) may be used if the reform is on social protection (rights at work, employment opportunities, etc.), the World Nature Organization (WNO) if the focus is on environmental protection, or the Office of the United Nations High Commissioner for Human Rights (OHCHR) if we deal with political reform (human rights and democratization). If the focus is on building market economies in a particular geographic area, then the multilateral development banks (European Investment Bank, European Bank for Reconstruction and Development, Inter-American Development Bank, etc.) could do the job. Product market reform (market integration, competition policy, etc.) within the EU might be enforced, for instance, by the Directorate-General for Economic and Financial Affairs of the European Commission.

The use of a RCES as an instrument to improve the effectiveness of conditional schemes has some implications for the debate about the speed of reform (big bang versus gradualism). As suggested in the preceding paragraph, it may be convenient to delegate enforcement of the rules in certain international organizations. The process of finding appropriate third party enforcers, and the process of building their credibility in the application of the rules is probably better understood within a gradual pace of reform.

The structure of contractual arrangements in foreign aid is analyzed in Murrell (2002). The main actors are the political-bureaucratic systems of donors and recipients, and sometimes an independent contractor (a for-profit consultancy, a not-for-profit organization or a NGO, or a separate arm of the governmental bureaucracy of the donor country). The intermediary contractor, hired by the donor, must provide a service that the donor has the ability to enforce. Enforcement is in substance the donor's ability to impose sanctions for inappropriate

performance or provide rewards when performance is appropriate.[22] Rewards schemes in the form of performance-based wage contracts for the aid-giving authority can then be used to encourage aid discipline. Salary incentive schemes should include a bonus that depends positively on the level of reforms undertaken by the recipient. Although these schemes are frequently used for managers of private firms, it is not straightforward how their use can be extended to officials of aid agencies.[23] For instance, if policy and disbursement decisions are not separated, penalizing improper disbursements provides incentives to establish less stringent conditions on recipients.

Imposing a sanction on improper aid disbursements is strategically equivalent to raising the opportunity cost of disbursing aid ex-post.[24] The effects of the "budget-pressure problem" in the credibility of aid policies are thus comparable to the ones caused by the recipient's perception of donors' altruism. Our mechanism works by modifying the donor's incentives to make it less altruist. Therefore, a plausible way to introduce incentives that mimic our sanction scheme is to find ways to increase the costs of ex-post disbursements. For instance, there should be lighter bureaucratic procedures that allow for costless ex-post budget modification.[25] Neither the department's budget (through smaller aid allocations), nor the position of the person in charge of making disbursement decisions, should suffer negative consequences from withdrawals of committed adjustment loans.

If the donors put up a bond[26] associated to every package of funds, the opportunity cost of aid increases. The bond would be completely refunded in case the conditions are met, and it would be partially refunded, or no refunded at all, depending on the degree of compliance of the conditions. By engaging in a binding pre-commitment mechanism, the donors communicate their intention to recipients.

Donor countries are heterogeneous in the way they value the same kind of reform. Think, for instance, in the weight the Nordic countries (Like Minded

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22 Enforcement is an element of accountability for service provision, as stated in The World Development Report of the WB in 2004.

23 When referring to the transformation of aid agencies, Bräutigam (2000) suggests that the cost of failed projects should be made public, and some kind of sanctions should be established for those who promoted these failed projects.

24 As noted by Svensson (2003), the low opportunity cost of pre-committed funds favors aid disbursements, even when the conditions have not been met.

25 Svensson (2003) proposes a reform of conditional policy in which recipients compete for aid, and the actual amount disbursed to each individual country depends on its relative performance. This reform has the effect of increasing the opportunity costs of ex post aid disbursements.

26 Grossman and Hart (1982) study the incentive effects of bonding behavior.

Group) put on social indicators compared to that of USA or Great Britain. The penalty function of the mechanism accounts for such heterogeneity. In the proposed model, parameter γ measures the extent to which each donor cares about the recipient's consumption level (interpreted as the degree of altruism of the donor country). The penalty function varies depending on the value of γ. Specifically, it depends positively[27] on γ, meaning that more altruism on the part of the donor corresponds to a higher penalty, *ceteris paribus*. This is not surprising. The role of the transfer is to discipline the donors, increasing the cost of aid disbursements when the conditions are not met. The higher is the donors' valuation of the recipient's welfare, the more "Samaritan's behavior" should be expected from the donor. Since the mechanism offsets these Samaritan's incentives, it must therefore include heavier penalizations to more altruistic countries. This view might be applied, for instance, to the bilateral foreign aid relationship between Norway and Tanzania, a case study extensively discussed in Selbervik (1999).

An optimal design of *t* also requires collecting information about the true cost of reforms. It is the task of the aid agency to ascertain the value of θ. However, when asked about it, recipients will face incentives to misrepresent the cost of structural reforms, in order to get more aid. This is why the mechanism grants the donors some influence in the design of the optimal sanction (parameter λ). In particular, the donors decide how sensitive are aid disbursements to the recipients' report on structural reform costs. This interaction protocol suggests that a participatory approach at the stage of conditional policy design is necessary. As members of the organization, both donors and recipients must exercise some influence in determining the form of the sanction scheme. This way, the donors are endowed with a self-disciplining instrument for a flexible transfer design that adapts to specific (reported) circumstances of the aid recipient country. Cooperation in policy-making should be placed within the general objective of "alignment" (Paris Declaration on Aid Effectiveness).

8 Concluding Remarks

The failure of policy conditionality is acknowledged as one of the major causes of the low effectiveness of aid donations on developing countries. This paper proposes an institutional approach to tackle the time-inconsistency of conditional aid policy. Under the assumption that the donor countries are altruistic, we

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27 It is easy to compute $\dfrac{\partial t}{\partial \gamma} = \dfrac{2}{A(z)}(1-z)K_\lambda(\tilde{\theta}) > 0$.

investigate which incentives would overcome the donors' Samaritan's dilemma. A scheme in which donations are penalized at a rate that depends on the degree of structural reforms implemented in the recipient country is shown to provide the right incentives for aid discipline. The reason is that, once the donor engages in this scheme, the recipient faces incentives to undertake policies that entail beneficial poverty reductions. As reforms levels are high, aid disbursements become more effective, in the sense that they contribute more to increase domestic consumption in recipient countries. The optimal penalty scheme is part of a sequential mechanism that implements the optimal aid policy in the absence of information about the political costs of structural adjustment.

Appendix

Proof of Proposition 1: First of all, we prove that, faced with y^{opt}, the recipient's best response is z^{opt}. This conclusion follows whenever the inequality $(k-1)y^{\text{opt}}>\theta$ holds. Assumptions 1 and 2 imply that $\theta<\dfrac{k-1}{k}\left(\bar{C}-\dfrac{1}{2\gamma k}\right)=(k-1)y^{\text{opt}}$. On the other hand, y^{opt} is the value for y that minimizes $L(y, z^{\text{opt}})$. Next we show that the pair $(y^{\text{opt}}, z^{\text{opt}})$ is the unique SPE of the game. To see this, consider any alternative strategy $y_0 \neq y^{\text{opt}}$ If $(k-1)y_0>\theta$ then y_0 cannot belong to an equilibrium. The reason is that faced with y_0 the recipient would set $z=1$, but the value that minimizes $L(y, z^{\text{opt}})$ is $y^{\text{opt}} \neq y_0$. If $(k-1)y_0=\theta$ any z_0 would be a best response. Consider $z_0<1$. The pair $\left(\dfrac{\theta}{k-1}, z_0\right)$ cannot be an equilibrium, since aid level y^{opt} would induce reforms z^{opt} and the strategy pair $(y^{\text{opt}}, z^{\text{opt}})$ gives a higher payoff to the donor. For $z_0=1$, the donor would be better off by selecting y^{opt}, so $(y_0, 1)$ is neither an equilibrium. Finally, if $(k-1)y_0<\theta$ the recipient sets up $z=0$. Let us call y_0^* the value for y_0 that minimizes the donor's loss given that $z=0$. Observe first that any pair $(y_0, 0)$ with $y_0 \neq y_0^*$ can never be an equilibrium since by definition y_0^* yields a better

payoff than y_0. We have that $(y_0^*,0)$ is neither an equilibrium. The reason is that the donor's loss associated with the pair $(y_0^*,0)$ is given by $L_0=\bar{C}-\dfrac{1}{4\gamma}$ while the loss under (y^{opt}, z^{opt}) is given by $L^{opt}=\dfrac{1}{k}\left(\bar{C}-\dfrac{1}{4\gamma k}\right)$, and $L^{opt}<L_0$ since $\gamma\geq\dfrac{1}{2\bar{C}}\dfrac{k-1}{k}$ is implied by Assumption 2. Therefore, $(y_0^*,0)$ is not a SPE of the game. This completes the proof.

Proof of Proposition 2:
Let $p(y)=\text{prob}(\theta\leq ky)$. The donor's problem is:

$$\min_{\{y\}} p(y)L(y,1)+[1-p(y)]L(0,0).$$

Let y^c be the solution of the above problem. We write the first order condition as:

$$p'(y^c)[L(y^c,1)-L(0,0)]+p(y^c)L'(y^c,1)=0.$$

From this condition we obtain:

$$L'(y^c,1)=-\frac{p'(y^c)}{p(y^c)}[L(y^c,1)-L(0,0)]$$

The loss function is such that $L(y^c, 1)<L(0, 0)$. Then, from the above FOC we deduce that $L'(y^c, 1)>0$. On the other hand, since y^{opt} minimizes function $L(y, 1)$ we have $L'(y^{opt}, 1)=0$. The inequality $L'(y^c, 1)>L'(y^{opt}, 1)=0$ holds, and then $y^c>y^{opt}$.

Proof of Proposition 3: Faced with z^* in Eq. (5) the donor disburses

$$y^*=y(z^*)=\left(\frac{2\gamma\theta}{k-1}\right)^{1/2}\bar{C}-\frac{\theta}{k-1}.$$

The minimal loss associated with any given z is:

$$l(z)=L(z,y(z))=A(z)\left[\bar{C}-\frac{1}{4\gamma}A(z)\right].$$

It is easy to see that $l'(z)<0$. As $z^*<z^{opt}=1$, we have that $l(z^*)>l(z^{opt})$. On the other hand, consumption level in the equilibrium pair (y^*, z^*) is given by

$$C^*=\bar{C}-\left(\frac{\theta}{2\gamma(k-1)}\right)^{1/2}.$$

We find that $C^* < C^{\mathrm{opt}} \Leftrightarrow \dfrac{k-1}{k^2} < 2\theta\gamma$. The latter inequality is true by Assumption 1. This finishes the proof.

Proof of Proposition 4: We solve the game by backwards induction. In the last stage of the game, the donor selects y to minimize $L(y,z) + t(z,\lambda,\tilde{\theta})y$. The first order condition of this problem yields the following reaction function:

$$y(z,\lambda,\tilde{\theta}) = A(z)\left[\bar{C} - \frac{1+t(z,\lambda,\tilde{\theta})}{2\gamma}A(z)\right]. \tag{7}$$

There are several statements in the main text that are now proven here. Observe first that $y(z)$ in Eq. (4) is above $y(z,\lambda,\tilde{\theta})$ for all z and for all λ. This proves the claim that, for given reforms level z, the donor disburses more aid in the absence of a sanction scheme. We are also interested in the dependence on the reports λ and $\tilde{\theta}$ of the reaction function above.

For this purpose we compute $\dfrac{\partial y(z,\lambda,\tilde{\theta})}{\partial\lambda} = -A(z)(1-z)[(k-1)y^{\mathrm{opt}} - \tilde{\theta}] < 0$, and $\dfrac{\partial y(z,\lambda,\tilde{\theta})}{\partial\tilde{\theta}} = -A(z)(1-z)(1-\lambda) < 0$. This proves that, *ceteris paribus*, the donor's equilibrium disbursement is lower the higher are λ and/or $\tilde{\theta}$. Moreover, aid disbursements are more (less) sensitive to changes in $\tilde{\theta}$ the lower (higher) is λ, and vice versa, since $\dfrac{\partial^2 y(z,\lambda,\tilde{\theta})}{\partial\lambda\partial\tilde{\theta}} = A(z)(1-z) > 0$. This feature of the mechanism turns out to be critical to induce truthtelling on the recipient. As we will see below, the donor reports λ high enough so as to avoid the recipient's misrepresentation of $\tilde{\theta}$.

In the second stage of the game, the recipient selects z to maximize $G_\theta(y(z,\lambda,\tilde{\theta}),z)$. We compute $\dfrac{\partial G_\theta(.)}{\partial z} = \lambda[(k-1)y^{\mathrm{opt}} - \tilde{\theta}] + \tilde{\theta} - \theta$. Let $\hat{z}$ be the value for z that maximizes $G_\theta(.)$. If $\dfrac{\partial G_\theta(.)}{\partial z} > 0$, then $\hat{z} = 1$, and if $\dfrac{\partial G_\theta(.)}{\partial z} < 0$ then $\hat{z} = 0$.

An equilibrium of the subgame starting in Stage 2 is given by $\hat{z} = 1$ and $y(1,\lambda,\tilde{\theta})$ if $\lambda[(k-1)y^{\mathrm{opt}} - \tilde{\theta}] + \tilde{\theta} - \theta > 0$. The equilibrium actions are $\hat{z} = 0$ and $y(0,\lambda,\tilde{\theta})$ when $\lambda[(k-1)y^{\mathrm{opt}} - \tilde{\theta}] + \tilde{\theta} - \theta < 0$, and $\hat{z} \in [0,1]$ and $y(z,\lambda,\tilde{\theta})$ when $\lambda[(k-1)y^{\mathrm{opt}} - \tilde{\theta}] + \tilde{\theta} - \theta = 0$. To compute the SPE of the game, we assume that both the donor and the recipient are aware of the outcomes derived from all possible equilibria of the subgame starting in Stage 2, and take them into account when announcing simultaneously λ and $\tilde{\theta}$ in the first stage of the game.

Let us now analyze the (Nash) equilibrium actions in the announcement stage of the game. Let $(\lambda^*, \tilde{\theta}^*)$ be a pair of NE actions. Then,

$$\lambda^* \in \underset{\{\lambda\}}{\arg\min}\, L(y(\hat{z}, \lambda, \tilde{\theta}^*), \hat{z}) + t(\hat{z}, \lambda, \tilde{\theta}^*) y(\hat{z}, \lambda, \tilde{\theta}^*)$$

and $\tilde{\theta}^* \in \underset{\{\tilde{\theta}\}}{\arg\max}\, G_\theta(y(\hat{z}, \lambda^*, \tilde{\theta}), \hat{z})$. Notice that if $\hat{z}=1$, then $y(1, \lambda, \tilde{\theta}) = y^{\text{opt}}$ for all λ and $\tilde{\theta}$. Next, we show that the highest possible payoff for the donor is obtained when $\hat{z} = z^{\text{opt}} = 1$ and $y(1, \lambda, \tilde{\theta}) = y^{\text{opt}}$. For this purpose, observe first that $L(y^{\text{opt}}, z^{\text{opt}})$ is a minimum. It remains to show that $t(z, \lambda, \tilde{\theta}) > 0$ for all λ, $\tilde{\theta}$, $z \neq z^{\text{opt}}$ and that $t(z^{\text{opt}}, \lambda, \tilde{\theta}) = 0$ for all λ, $\tilde{\theta}$. The latter is immediate. To prove the former we rewrite the inequality $t(z, \lambda, \tilde{\theta}) > 0$ as

$$\frac{2\gamma}{A(z)}(1-z)\left\{\lambda[(k-1)y^{\text{opt}} - \tilde{\theta}] + \tilde{\theta} - \frac{1}{2\gamma}\frac{k-1}{k}A(z)\right\} > 0.$$

Provided that $\frac{1}{k} < A(z) \leq 1$ for $z < 1$, Assumptions 1 and 2 imply that $(k-1)y^{\text{opt}} - \tilde{\theta} > 0$ and Assumption 1 implies $\tilde{\theta} > \frac{1}{2\gamma}\frac{k-1}{k}A(z)$. Hence, $t(z, \lambda, \tilde{\theta}) > 0$ holds for all λ, $\tilde{\theta}$ and $z \neq 1$. If the penalty rate is positive (except for $z=1$) and $L(y^{\text{opt}}, z^{\text{opt}})$ is the minimum social loss, the donor announces a value for λ with the goal of inducing $z = 1$. Reporting λ^* such that $\lambda^*[(k-1)y^{\text{opt}} - \tilde{\theta}] + \tilde{\theta} - \theta > 0$ for all $\tilde{\theta}$ (including $\tilde{\theta}^*$) dominates any other report. The donor's announcement must be high enough (so as to induce $\hat{z} = 1$ for any possible $\tilde{\theta}$) since otherwise, for certain $\tilde{\theta}$ it could be the case that $\lambda[(k-1)y^{\text{opt}} - \tilde{\theta}] + \tilde{\theta} - \theta < 0$ and hence $\hat{z} = 0$. Any equilibrium report from the donor must be such that the recipient can never be interested in performing $z=0$. In the absence of information about θ, the latter possibility is avoided by setting $\lambda^* \geq \lambda(\tilde{\theta}) = \frac{\theta_H - \tilde{\theta}}{(k-1)y^{\text{opt}} - \tilde{\theta}}$. Function $\lambda(\tilde{\theta})$ is a reaction function to any conjecture about $\tilde{\theta}$. Now, given that $\lambda^* \in [\lambda(\tilde{\theta}), 1]$, the recipient can never get advantage from misrepresenting θ. It turns out that reporting truthfully (i.e. using the strategy $s^*(\theta) = \theta$ for all θ) is optimal for the recipient. Then, for the pair $(\lambda^*, \tilde{\theta}^*)$ to be part of a SPE of the game induced by the mechanism, it is sufficient that $\lambda^* \geq \lambda(\tilde{\theta})$ and $\tilde{\theta}^* = s^*(\theta) = \theta$ for all θ.

Finally, since $(k-1)y^{\text{opt}} > \theta$ for all θ, in equilibrium we have $\frac{\partial G_\theta(.)}{\partial z} = \lambda^*[(k-1)y^{\text{opt}} - \theta] > 0$. Therefore, the optimal reforms level is $z^{\text{opt}} = 1$. Provided that the recipient performs $z^{\text{opt}} = 1$ in Stage 2, the donor disburses $y(1, \lambda^*, \theta) = y^{\text{opt}}$ in Stage 3. This completes the proof.

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