MORAL HAZARD AND THE COMPOSITION OF TRANSFERS: THEORY WITH AN APPLICATION TO FOREIGN AID

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Abstract

The paper presents a theoretical and empirical analysis of a donor's choice of the *composition* of unrestricted and in-kind/restricted transfers to a recipient and how this composition is adjusted in response to changes in the moral hazard behavior of the recipient. In-kind or restricted transfers may be used, among others, to control a recipient's moral hazard behavior but may be associated with deadweight losses. Within the context of foreign aid, we use a canonical political agency model to construct a simple signaling game between a possibly corrupt politician in a recipient country and a donor to illustrate the donor's optimal choice of tied (restricted) and untied foreign aid. We clarify the condition under which a reduction in the recipient's moral hazard behavior (i.e., improvement in the level of governance) leads to a fall in the proportion of tied aid. We test the predictions of our theoretical analysis using data on the *composition* of foreign aid by multilateral and bilateral donors.

JEL Code: D73, F35, H87, I38.

Keywords: tied foreign aid, governance, moral hazard, political agency, restricted transfer.

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"Rich countries pursue their own fixations and fads... They tie aid so that it can only be used to buy the donor's own products or services – effectively reducing the value of aid by as much as 30 percent..." Tony Blair's Commission for Africa (2005, p. 58)

1. Introduction

The need to ensure that transfers reach their intended recipients (i.e., efficient targetting) is one of the cornestones of the information-based approach to public economics pioneered by Mirrlees (1971). In achieving this goal, it is well known that in-kind or restricted transfers may dominate unrestricted transfers. More specifically, restricted transfers lead to better targeting, reduce moral hazard behaviour, and relax self selection constraints; see, for example, Nichols and Zeckhauser, 1982; Besley and Coate, 1991, 1992; Bruce and Waldman, 1991; Coate, 1989, 1995; Blackkorby and Donaldson, 1988; Boadway, 1997, 1998; and Gahvari and Enlinson, 2007).[1] However, a disadvantage of in-kind or restricted transfers is that they may be associated with deadweight losses since the donor may have incomplete information about the preferences of the recipient or may narrow the recipient's consumption set relative to his consumption set if the transfers were in cash.[2]

The paper presents a theoretical and empirical analysis of a donor's choice of the *composition* of unrestricted cash and in-kind (restricted) transfers to a recipient and how this composition is adjusted in response to changes in the moral hazard behavior

[1] In Besley and Coate (1991) only in-kind transfers are used. Gahvari and de Mattos (2007) show that combining conditional cash transfers with in-kind transfers in the Besley and Coate (1991) model reduces or eliminates the deadweight losses of in-kind transfers. Nichols and Zeckhauser (1982) and Blackorby and Donaldson (1988) also combine cash and in-kind transfers.

[2] This need not be the case, though (e.g., Moffitt, 1989). In Nichols and Zeckhauser (1982) there are deadweight losses, even if the transfers are in cash. This is because to satisfy self-selection constraints and thus qualify for a cash transfer, it is necessary to introduce distortions into the recipient's labor supply, such that by earning income below a certain threshold his type is revealed. In Moffitt (1983), cash transfers lead to deadweight losses because the recipients suffer from a stigma of being on public assistance (i.e., welfare stigma).

of the recipient. The analysis is general but it is couched within the specific context of foreign aid.

While it is widely known and accepted that restricted transfers may be used to control moral hazard behavior, we are not aware of any tests of an implication of this dictum, namely that the proportion of restricted or in-kind transfers in total transfers must fall as the incidence of moral hazard behavior on the part of the recipient falls. In foreign aid, the World Bank recognizes this point when it recommends that "[i]n a country with sound public expenditure management, a larger portion of aid can be in the form of general budget support (i.e., untied aid). This recognizes the reality of fungibility and economizes on the administrative costs of aid." (World Bank, 1998, p. 80), parenthesis ours.[3]

The paucity of empirical investigation of this issue may partly be due to the lack of data on mixed transfers and/or the inability to observe changes in the moral hazard behavior of recipients over a sustained period. Data on the composition of foreign aid and the availability of indices of recipient countries' level of governance provide a unique opportunity to test this proposition. We therefore believe that our paper is the first to empirically investigate how the *composition* of transfers (i.e., the mix of in-kind/restricted and unrestricted transfers) changes in response to changes in a recipient's moral hazard behavior.

To be sure, there are empirical studies that study how the size of transfers like welfare payments including in-kind transfers like food stamps affect incentives to save, look for work, labor supply decisions, etc and/or how the size of such payments is adjusted in response to the behavior of recipients (e.g., Fraker and Moffitt, 1988;

[3] See also Radelet (2004).

and the surveys by Danzinger et al., 1981; Moffitt, 1992). But these studies focus on changes in the *size* of transfers as opposed to changes in the *composition* of transfers in response to changes in moral hazard behavior.[4]

We use a canonical political agency model due to construct a simple signaling game between a possibly corrupt politician in the recipient country and an altruistic donor to illustrate the donor's optimal choice of tied and untied aid. The model strikes a balance between the deadweight loss of tied aid and its superior ability, relative to untied aid, in controlling a recipient's moral hazard behavior. We show that the donor reduces the proportion of tied aid as governance in the recipient country improves.

In our empirical analysis, we find that for multilateral donors, there is an inverse relationship between the proportion of tied aid and the level of the recipient's good governance. Also, we find that for bilateral donors, the relationship between the proportion of tied aid and the level of good governance is relatively weak.

The paper is organized as follows: the next section discusses the literature on foreign aid. Section 3 develops a simple theoretical model of a donor's optimal choice of tied and untied aid. Sections 4 and 5 describe the data and empirical analysis. We conclude the paper in section 6.

2. Foreign aid: tied versus untied

Foreign aid is a controversial topic that has led to past and on-going vibrant debates among academics and policy makers. The aversion of human beings towards poverty and suffering partly explains the continued flows of foreign aid from donors

[4] Moffitt (1990) finds that US state legislatures allowed federally-financed in-kind transfers like Food Stamp benefits and federally-subsidized Medicaid benefits to substitute for cash transfer programs like AFDC. In a recent paper, Marton and Wildasin (2007) develop a model to examine how US states choose the mix of cash transfers (i.e., AFDC/TANF) and in-kind transfers (i.e., Medicaid) for poor households, and how this mix is affected by changes in the level of Federal government support for each program. These papers are based on complete information, so there are no moral hazard or self-selection issues. Hence they do not address the issues in our paper.

to recipients. However, strategic and political reasons, independent of humanitarian considerations, influence foreign aid decisions. The anti-aid group believes that foreign aid does more harm than good and promotes a dependency syndrome.[5] Partly in response to such criticisms, there has been a move in recent years to condition aid on the quality of governance in recipient countries.

There is a relatively big literature on the determinants of the size of foriegn aid. For example, Alesina and Dollar (2000) find that past colonial ties, political alliances and, to some extent, good governance are major determinants of foriegn aid. Neumayer (2003) also finds that the degree of good governance, past colonial ties, population, and per capita GDP have a positive effect on the size of foriegn aid. Kuziemko and Weker (2006) find that being a rotating member of the UN Security Council has a positive effect on aid transfers from the USA and the UN. These studies focus on the quantity or *size* of aid.[6]

In contrast, the study of the *composition* of foreign tied aid has not received much systematic and formal analysis.[7,8] To the best of our knowledge, the current paper is the first to provide both a theoretical and empirical analysis of the mix of tied and untied foreign aid based on striking a balance between the deadweight loss of tied aid

[5] For some work on the aid debate, see Burnside and Dollar (2000), Cassen and Associates (1994), Easterly et al (2004), Jepma (1991), Mosley (1987) and Kanbur (2006).
[6] See the references cited in Neumayer (2003).
[7]Theoretical analyses of tied aid, usually by international trade economists inspired by the famous 'transfer paradox', has focused on the deadweight losses, terms of trade and welfare effects of tied aid but not its ability to control moral hazard behavior (see, for example, Kemp and Kojima (1985), and Lahiri and Raimondos (1995), Schweinberger (1990)). Also, in contrast to the present paper, this literature does not focus on the donor's optimal choice of tied and untied aid. It only focuses on tied aid.
[8] Jepma (1991) was one of the first to undertake a study of tied aid. This study was undertaken on behalf of the OECD. However, this study does not focus on the relationship between tied aid and governance that the present paper focuses on. It also does not focus on the issues of moral hazard behaviour and the formal analyses undertaken in this paper.

and its superior ability, relative to untied aid, in controlling moral hazard behavior.[9]

There are three forms of tying aid. Foreign aid can be tied to (i) specific development projects and programs, (ii) specific commodities and services, and (iii) a country or group of countries where procurement has to take place.

The first two forms of tied aid are in-kind transfers, although program aid may not be considered as such. The third form of tying could be seen as a restricted cash transfer. In what follows, we use tied aid and in-kind aid interchangeably because, as originally pointed out by Nichols and Zeckhauser (1982), restricted cash transfers and in-kind transfers have similar effects and are used to accomplish similar goals (see also Jepma, 1991). Also, these forms of tying are not mutually exclusive. For example, aid in the form of technical assistance from the donor country falls in groups (ii) and (iii), and in some cases, in group (i) as well.

A foreign donor may benefit directly from in-kind or tied aid because such transfers may promote trade between the donor and the recipient (Jepma, 1991).[10] Indeed, in some cases, donors use in-kind aid in the form of technical assistance or require that part of the aid should be used to hire the services of consultants and firms from the donor country as evidenced in the above quote by UK's Prime Minister Tony

[9] Easterly (2006b) finds that tied aid in the form of technical assistance as a proportion of total aid from bilateral donors has remained constant, while the proportion of food aid has fallen over time. However, he does not investigate the causes of the decline in food aid. Furthermore, he suggests that this decline may not reflect any long-run trend but rather a reflection of the surge in food aid during the famines of the 1980s in Africa.

[10] To elaborate on this point, note that when a country gives tied aid, it clearly requires the donor to use the resources given to it to purchase goods and services from the donor country. This is not trade because it is the donor's own resources that the recipient country is using. It is clearly a transfer from the donor country to the recipient. Where the trade effect might kick in is when tied aid gives, for example, consulting firms in the donor country exposure or connections into the recipient country's economic and business community. In this way, further transactions between these firms and the recipient country might arise over and beyond the initial contact generated by tied aid. This latter transaction is not a transfer, it is trade. This implies that the causality must go from the proportion of tied aid to trade not the reverse. However, even if one found that tied aid had no effect on trade, it does not mean that a "donor-interest" motive does not exist. This is because as mentioned below, tied aid is also used to redistribute income to special interests in the donor country. However, as Jepma (1991, p.11) argues proving that tied aid causes trade is very difficult and "…tied aid represents only a small percentage of donor countries' total exports."

Blair's Commission for Africa. Hence one motive for giving aid may be to promote trade or serve special interests by requiring that the recipient uses the aid to buy goods and services from the donor country. This common practice has been referred to by the NGO, ActionAid International as "phantom aid".[11]

As Kanbur (2006) notes tied aid may also be used as a way of redistributing income within the donor country, given that such aid may be raised from general taxation within the donor country but must be spent on purchasing the output of a particular industry or the services of consulting firms in the donor country. And more than forty years ago, Schultz (1960) noted that farm surpluses in the US and Europe were used as tied foreign aid with the goal of protecting the income of farmers in these donor countries.

However, tied aid may also be used to control the moral hazard behavior of a recipient. In the context of foreign aid, moral hazard behavior may arise because the recipient country's politicians may be corrupt and so have the incentive to embezzle foreign aid.

Our discussions and subsequent theoretical analysis suggest that a donor whose sole reason for using tied foreign aid is to control moral hazard behavior - while minimizing the deadweight losses of such aid in the recipient country - will reduce the proportion of tied aid if the recipient's past behavior gives him cause to believe that the incidence of moral hazard behavior is lower. Therefore, for such donors we expect to see an inverse relationship between the proportion of tied aid and the quality of the recipient's governance. But for donors who use tied aid to promote trade or domestic redistribution of income, we expect the effect of governance on the proportion of tied aid to be weak (i.e., not significantly different from zero) or weaker than a donor who

[11] See their report "Real Aid 2: Making Technical Assistance Work" available at http://www.actionaid.org.uk/doc_lib/real_aid2.pdf

uses tied aid to control moral hazard behavior.[12] Following the literature on foreign aid (e.g., McKinlay and Little, 1979; Maizels and Nissanke, 1984), one may refer to the former motive as the recipient-need motive and the latter motive as the donor-interest motive.

Focussing on the *size* of foreign aid, Maizels and Nissanke (1984) undertook a study using data for eighty developing countries over the period 1969-70 and 1978-80. They found that the magnitude of bilateral donors' aid was consistent with a "donor interest" model, where aid was given for political, security, and trade interests, while the magnitude of multilateral donor aid was consistent with a "recipient need" model, where aid was given in response to shortfalls in the recipient country's resources. Burnside and Dollar (2000, p. 864) also found "… no significant tendency for total aid or bilateral aid to favour good policy. On the other hand, aid that is managed multilaterally … is allocated in favour of good policy."[13] Alesina and Dollar (2000, p. 55), also find that for bilateral donors factors such as "... colonial past and voting patterns in the United Nations explain more of the distribution of aid than the political institutions and economic policy of recipients."[14]

While the results in the preceding paragragph are consistent with our empirical results on the *composition* of aid mentioned in section 1, we argue that these results on the determinants of the *size* of foreign aid do not necessarily imply our results. In

[12]Having shown that a donor does not use tied aid to control moral hazard behavior, we do not further investigate whether this donor uses tied aid to promote trade or the redistribution of income motive. Indeed, for our purposes it suffices to show that a donor does not use tied aid to control moral hazard behavior and to be agnostic about his motives for using tied aid.

[13]Note that this finding in their paper is not the focus of Easterly et al. (2004) critique. Easterly et al (2004) critique focuses on Burnside and Dollar's (2000) finding that aid causes growth in good policy environment.

[14]Gates and Hoeffler (2004) find, however, that Nordic countries allocate more aid based on democracy and human rights record in recipient countries rather than for strategic and political reasons. But again these studies focus on the quantity of aid. We focus on the quality of aid. Furthermore, Nordic countries' total aid constitutes a small proportion of global aid flows.

particular, if the level of governance has an effect on the magnitude of foreign aid, this does not necessarily imply the direction of the effect of governance on the proportion of tied aid.

Given the difference in behavior between bilateral and multilateral donors, a puzzling observation is why the same bilateral donor also donates to multilateral organizations. There appears to be duplication of efforts by bilateral and multilateral donors. Indeed, Kanbur et al. (1999) strongly advocate for a common pool approach to foriegn aid, where all bilateral donors coordinate their efforts by putting their aid in a common pool.[15] However, the fact remains that bilateral donors have their own parochial, strategic, and geo-political interests. Due to the economies of scale of pooling resources together, there are certain goals like poverty reduction that multilateral agencies can achieve at much lower cost than bilateral agencies but other goals like a donor's foriegn policy interests that are achieved better by a donor acting alone. Hence, striking a balance between achieving one's own unique preferences (e.g., strategic foreign policy interests) and achieving common goals (e.g., poverty reduction) at lower cost can explain the co-existence of the same country's participation in both bilateral and multilateral aid programs (Mavrotas and Villanger, 2006) and the difference in behavior between these two groups of donors.

On the preceding point, Martens et al. (2002, p. 37, 47, and 188-189) argue that a reason why donor countries set up multilateral agencies is to make such agencies less susceptible to the political demands that forces bilateral donors to pursue parochial, strategic and non-altruistic policies in recipient countries.

[15]Easterly (2006b) discusses the adverse effects of donor fragmentation or lack of coordination. Knack and Rahman (2007) formally study the implications of donor fragmentation on the quality of government bureaucracy in recipient countries.

3. A model of tied aid and untied aid

In this section, we construct a simple model to theoretically determine a donor's optimal choice of tied and untied foreign aid. We demonstrate and clarify the channel through which an improvement in governance might lead to a reduction in the proportion of tied aid. As mentioned in section 2, tied aid could take the form of an in-kind transfer or a restricted cash transfer.

We use a canonical model of political agency due to Barro (1973) and extended by Ferejohn (1986) with the donor playing the role that voters (i.e., the principals) play in this class of models.[16] In these models, politicians are disciplined via the risk of being voted out of office and thereby losing the rents of being in office. In our model, the leader (politician) in the recipient country is not voted out of office but is disciplined by the donor conditioning the size and composition of aid on the quality of governance. However, as we indicate in a footnote below, the donor in our model plays an additional role (i.e., makes expenditure decisions) that voters in this class of political agency models do not play.

Suppose that leaders of the recipient country come in one of two types: good (honest) or bad (dishonest). These types are independent random draws from an identical distribution, where honest types are drawn with probability, π and dishonest types are drawn with probability $1 - \pi$, where $0 < \pi < 1$. A leader's type is his private information. As in Coate and Morris (1995), Besley and Smart (2007) and Besley and Prat (2006), we assume that a leader rules for only two periods, where a period is

[16] See, for example, Besley and Case (1995), Persson et al. (1997), Coate and Morris (1995), Besley and Smart (2007) and Besley and Prat (2006). See also the books by Persson and Tabellini (2000) and Besley (2006) for more references and exposition.

indexed by t = 1, 2.[17] Let $0 < \delta < 1$ be a leader's discount factor.

Foreign aid is given to the leader of the recipient country for the provision of a public good which is assumed to fully depreciate in each period. The leader can embezzle all the aid or part of it. In particular we assume that all of untied aid can be embezzled but tied aid cannot be embezzled or resold in the market. It is in this sense that tied aid controls moral hazard behaviour. This interpretation is consistent with how in-kind or restricted transfers are used to induce incentive-compatible outcomes as in, for example, Besley and Coate (1991), Blackorby and Donaldson (1988), and Nichols and Zeckhauser (1982).[18]

If tied foreign aid takes the form of an in-kind transfer (e.g., technical assistance), then it cannot be embezzled if it is of no value to a corrupt politician and has no resale value. If it is a restricted cash transfer, we could assume that it cannot be embezzled because the donor invests resources to monitor its use and disbursement. For example, the donor may use *stricter* disbursement, procurement, and auditing rules.[19] However, as we elaborate below, the assumption that tied aid cannot be embezzled is not crucial to the analysis. What matters is that the proportion of tied aid that can be embezzled is *smaller* than the proportion of untied aid that be embezzled.

When the donor gives the recipient country G_t dollars in period t, it can be used to produce G_t/θ units of the public good in period t, where $\theta > 0$ is the cost of a unit of the public good, $G_t \in [0, \overline{G}]$, and $\overline{G} > 0$. We assume that θ is a binary random variable which can be high or low in each period. That is, $\theta \in \{\theta_L, \theta_H\}$, where

[17] In our model, leaders rule for two periods with certainty. In Besley and Smart (2007) and Besley and Prat (2006), they rule for two periods if and only if they are re-elected. In both papers, the authors focus on the incentive effects of elections, with voters observing direct signals from politicians in the former case and indirectly doing so through the media in the latter case. However, as explained in the preceding paragraph, the leader in our model faces the same political incentives.

[18] A difference is that in-kind or restricted transfers are used to prevent adverse selection in these papers while we use them to control moral hazard behaviour.

[19] This makes sense. Otherwise, why would the donor put in place strict rules if he does not intend to ensure that these rules are enforced. Jepma (1991) discusses such auditing and procurement rules.

$\theta_H > \theta_L > 0$. The probability that the unit cost is high is $Pr(\theta_H) = q$. So $Pr(\theta_L) = 1 - q$, where $0 < q < 1$. We assume that the realization of θ is private information to the leader of the recipient country. Also, the provision of the public good cannot exceed G_t/θ_L because the donor's aid is the only source of revenue for financing the public good, t = 1, 2. The donor knows the distribution of costs and leaders' types but does not directly observe any of these variables.

Let $x_t - C(G_t)$ be the donor's objective function in period t, where x_t is the per capita provision (consumption) of the public good in the recipient country by the leader, and $C(G_t)$ is the cost of G_t dollars to the donor.[20] We assume that foreign aid is financed through distortionary taxation in the donor country, so $C(G_t) > G_t$.[21] We also assume that $C(G_t)$ is increasing, strictly convex, and twice differentiable. Also, $C(0) = 0$, $\lim_{G_t \to \overline{G}} C'(G_t) = \infty$ and $\lim_{G_t \to 0} C'(G_t) = 0$.

The donor's choice of the size and composition of aid in period t depends on the level of governance in the recipient country in period t-1. To the donor, the quality of governance in the recipient country in period t is an increasing function of the level of public good provision and is given by $g_t = g_t(x_t)$, t = 1,2. Without any loss of generality, we assume that $g_t(x_t) = x_t$. This function is common knowledge.

This simple interaction is a dynamic game of incomplete information between the donor and the leader (i.e., agent) of the recipient country. We look for perfect Bayesian equilibria of this game.

[20] We could also define x_t to be the per capita provision (consumption) of some private good such as health or education. Implicit in the donor's objective function is the assumption that he is altruistic since he cares about the consumption of individuals in the recipient country.

[21] See Besley and Smart (2007) for a similar assumption but in a different context. Alternatively, the extra cost could be the transactions costs of transferring G dollars to the recipient (Besley and Prat, 2006).

3.1 Equilibrium analysis for untied aid

We first focus on untied aid. Let $\rho_t \equiv \rho_t\left(h|g_{t-1}\right)$ be the donor's posterior belief in period t that the leader is honest given that he observed a level of governance g_{t-1} in the previous period. Necessarily $\rho_1 = \pi$. Define $g_1^H \equiv G_1/\theta_H$ and $g_1^L \equiv G_1/\theta_L$. Since the game ends in period 2, the quality of governance in period 2 has no effect on the donor's behaviour, so we only focus on $g_1 = x_1$.

Consider the following *candidate* perfect Bayesian equilibrium: in period t, an honest leader produces G_t/θ_L units of the public good if $\theta = \theta_L$ and G_t/θ_H units if $\theta = \theta_H$, t =1, 2. If $\theta = \theta_L$, then in period 1, a dishonest leader chooses $g_1 = G_1/\theta_H$, spends X_1 dollars on the public good, and embezzles $(G_1 - X_1)$ dollars of aid, where $X_1/\theta_L = G_1/\theta_H$. If $\theta = \theta_H$, a dishonest leader sets $g_1 = 0$ (i.e., embezzles all aid) in period 1. A dishonest leader embezzles all aid in period 2, regardless of θ. The donor's equilibrium belief in period 1 is $\rho_1 = \pi$. His beliefs in period 2, using Bayes' rule, are as follows: $\rho_2\left(h|g_1 = 0\right) = 0$, $\rho_2\left(h|g_1^H\right) = q\pi/(q\pi + (1- \pi)(1-q))$, and $\rho_2\left(h\left|g_1^L\right.\right) = 1$. If the donor uses untied tied in a given period, the optimal size is a function of his beliefs in that period and is given by $G_t(\rho_t)$, t = 1,2. If a dishonest leader embezzles all untied aid in period 1, the donor uses tied aid in period 2.

Note that if the donor observes any level of the public good in period 1 such that $G_1/\theta_H < g_1 < G_1/\theta_L$, then he knows that the leader got a cost draw of θ_L since $g_1 > G_1/\theta_H$ is not possible if $\theta = \theta_H$. But since $g_1 < G_1/\theta_L$, he can correctly infer that the leader has embezzled some funds and is therefore corrupt. Also, if $g_1 < G_1/\theta_H$, the donor can correctly infer that the leader is dishonest (i.e., embezzled some funds) and

will therefore embezzle all aid in period 2. Therefore, a reasonable out-of-equilibrium belief for the donor is $\rho_2\left(h|g_1\right) = 0$ if $g_1 \notin \{g_1^H, g_1^L\}$. In this case, the donor uses tied aid in period 2, since we have assumed that the leader cannot embezzle tied aid. [22]

One might argue that for $G_1/\theta_H < g_1 < G_1/\theta_L$, it may be optimal for the donor to use untied aid in period 2 even if he knew that that leader was corrupt. In this case, the leader will exercise more restraint by setting g_1 such that $G_1/\theta_H < g_1 < G_1/\theta_L$ instead of $g_1 = G_1/\theta_H$, if $\theta = \theta_L$. The problem with this strategy is that it is not credible because the donor cannot commit to not using tied aid in period 2 given his posterior belief of $\rho_2\left(h|g_1\right) = 0$.

In our candidate equilibrium, a dishonest leader mimicks (i.e., pools with) an honest leader when $\theta = \theta_L$ but separates when $\theta = \theta_H$. We now show that our candidate equilibrium is indeed a perfect Bayesian equilibrium.

We first determine the donor's optimal choice of untied aid. Note that a necessary condition for the donor to use untied aid in a given period is $\rho_t > 0$, t = 1, 2. Hence in finding the optimal untied aid, we restrict our analysis to $\rho_t > 0$, t = 1, 2. Note that $\rho_1 = \pi > 0$. But $\rho_2 > 0$ if and only if the donor observed G_1/θ_L or G_1/θ_H in period 1.

[22] This assumption is not crucial to our analysis. What matters is that the proportion of tied aid that can be embezzled is *smaller* than the proportion of untied aid that be embezzled. Given our assumptions on the properties of C(G), the donor will still use tied aid even if some proportion of tied aid can be embezzled or is fungible, so long as the proportion that is fungible is smaller than 1. To see this, suppose the donor gives x(G) units of tied aid in period 2, and a dishonest leader embezzles (1-λ)x(G) units of it, where $0 < \lambda \leq 1$, x(0) = 0, and x is increasing in G. The donor will choose G to maximize λx(G) – C(G). Then given $\lim_{G_t \to 0} C'(G_t) = 0$, it is easy to show the donor will choose G > 0. To reiterate, the crucial assumption for our analysis is that the leader can embezzle a higher proportion of untied aid than tied aid. However, for simplicity, we assume that all untied aid can be embezzled but no proportion of tied aid be embezzled.

Given the strategies of dishonest and honest types in our candidate equilibrium, the donor chooses untied aid G_1 in period 1, given his posterior belief $\rho_1 = \pi$, to maximize[23]

$$W_U(\rho_1) = \rho_1\left((1-q)(G_1/\theta_L) + q(G_1/\theta_H)\right) + (1-\rho_1)(1-q)(G_1/\theta_H) - C(G_1) \quad (1)$$

Noting that a dishonest leader embezzles all untied aid in period 2, it follows that if the donor observed G_1/θ_L or G_1/θ_H in period 1, he chooses untied aid G_2 in period 2 to maximize

$$W_U(\rho_2) = \rho_2\left((1-q)(G_2/\theta_L) + q(G_2/\theta_H)\right) - C(G_2) \quad (2)$$

where $\rho_2\left(h\middle|g_1^H\right) = q\pi/(q\pi + (1-\pi)(1-q))$ and $\rho_2\left(h\middle|g_1^L\right) = 1$.

Setting $\partial W_U / \partial G_t = 0$ and solving for G_t, we abuse notation by writing the optimal untied aid in periods 1 and 2 (respectively) as

$$G_U^*(\rho_1) = C'^{-1}\left(\frac{(1-q)(1-\rho_1)}{\theta_H} + \rho_1\left(\frac{q}{\theta_H} + \frac{1-q}{\theta_L}\right)\right) \quad (3)$$

and

$$G_U^*(\rho_2) = C'^{-1}\left(\rho_2\left(\frac{q}{\theta_H} + \frac{1-q}{\theta_L}\right)\right) \quad (4)$$

where C'^{-1} is the inverse function of $C'(G_t)$.

Let $W_U^*(\rho_1)$ and $W_U^*(\rho_2)$ be the maximized values of (1) and (2) respectively. By the envelope theorem, $\partial W_U^*(\rho_t)/\partial \rho_t > 0$, t = 1, 2. Since $C(G_t)$ is strictly convex, it follows that $\partial G_U^*(\rho_t)/\partial \rho_t > 0$, t = 1, 2.

[23] Notice that in Besley and Smart (2007) and Besley and Prat (2006), the politician chooses the size of total resources for public expenditure and how much of this to embezzle. In our model, the size of total resources is determined by the donor (i.e., the principal) not the politician (i.e., the agent). The politician only chooses how much to embezzle. Therefore, the principal in our model plays an additional role that voters do not typically play in this political agency model.

For now suppose that $q \leq 0.5$.[24] Then

$\rho_2\left(h|g_1^H\right) = q\pi/(q\pi + (1-\pi)(1-q)) \leq \pi = \rho_1$. So $\rho_1 \geq \rho_2$ if $g_1 = G_1/\theta_H$. Then

given $(1-q)(1-\rho_1) > 0$, it follows from (3) and (4), that $G_U^*(\rho_1) > G_U^*(\rho_2)$ if the donor observed $g_1 = G_1/\theta_H$ in period 1.

Now consider a leader in the recipient country. Given that honest leaders are non-strategic, we focus on dishonest leaders. Since period 2 is the last period of this game, it is optimal for a dishonest leader to embezzle all aid in period 2.

Consider period 1. In our candidate equilibrium, a dishonest leader exercises restraint in period 1 by spending X_1 dollars on the public good and providing $X_1/\theta_L = G_1/\theta_H$ units of the public good, if $\theta = \theta_L$. This restraint by the leader is the *discipline effect* of the donor conditioning further untied aid on good governance.[25] For this to be an equilibrium strategy, we require that

$$\delta G_2(\rho_2) + \left(G_1(\rho_1) - X_1\right) \geq G_1(\rho_1). \qquad (5)$$

Noting that we can write $X_1 = \theta_L G_1(\rho_1)/\theta_H$ allows us to rewrite (5) as

$$\delta G_2(\rho_2) \geq \frac{\theta_L}{\theta_H} G_1(\rho_1) \qquad (5a)$$

It is important to note that if $\theta = \theta_L$, a dishonest leader will not deviate from the strategy in our candidate equilibrium in period 1 given that (5a) holds and the donor's out-of-equilibrium belief is $\rho_2\left(h|g_1\right) = 0$ if $g_1 \notin \{g_1^H, g_1^L\}$,

Now consider $\theta = \theta_H$. Given the donor's out-of-equilibrium beliefs, there is no point in embezzling less than G_1 dollars of aid in period 1 if $\theta = \theta_H$. Suppose instead that a dishonest leader deviates from our candidate equilibrium strategy by pooling with an honest type in period 1 and providing G_1/θ_H units of the public good. That is,

[24] We shall relax this assumption later.
[25] This discipline effect is common in this class of political agency models.

he will not embezzle any aid in period 1, if $\theta = \theta_H$. But given that (5a) holds, it follows that a dishonest leader provides G_1/θ_H units of the public good in period 1 regardless of θ. Then the donor's belief in period 2, using Bayes' rule, is $\rho_2\left(h\middle|g_1^H\right) = q\pi/(q\pi + (1- \pi)) < \pi = \rho_1$. Then $\rho_1 > \rho_2$ implies $G_U^*(\rho_1) > G_U^*(\rho_2)$. Given $\theta = \theta_H$, a dishonest leader's discounted payoff, if he does not embezzle any aid in period 1, is $\delta G_U^*(\rho_2)$. But $G_U^*(\rho_1) > G_U^*(\rho_2)$ implies $G_U^*(\rho_1) > \delta G_U^*(\rho_2)$. Hence if $\theta = \theta_H$, a dishonest leader is better off if he embezzles all aid in period 1.[26]

It follows that a dishonest leader will not deviate from our candidate equilibrium in periods 1 and 2. Also, the donor's choices of untied aid, $G_U^*(\rho_1)$ and $G_U^*(\rho_2)$, in each period are optimal, given his beliefs. Therefore, our candidate equilibrium is indeed a perfect Bayesian equilibrium.

Now suppose $q > 0.5$, $\rho_2\left(h\middle|g_1^H\right) = q\pi/(q\pi + (1- \pi)(1-q)) > \pi \equiv \rho_1$, and $G_U^*(\rho_1) < G_U^*(\rho_2)$, given that the equilibrium in the first period was pooling. We can still construct the equilibrium above, so long as we assume that (5a) holds and $G_U^*(\rho_1) > \delta G_U^*(\rho_2)$.

Since $\rho_2\left(h\middle|g_1^L\right) > \rho_2\left(h\middle|g_1^H\right) > \rho_2\left(h\middle|g_1 = 0\right)$, it follows that $\rho_2\left(h\middle|g_1\right)$ is increasing in g_1 in equilibrium.

3.2 Additional assumptions and equilibrium analysis for tied aid

We now formally examine tied aid. When the donor uses tied aid, we assume that the public good is produced at a unit cost of $\theta_D \neq \theta \in \{\theta_L, \theta_H\}$. For example, the

[26] This means that there exists no equilibrium in which a dishonest leader provides G_1/θ_H units of the public good in period 1 regardless of the value of θ.

donor may require that the recipient must use the services of firms, consultants, etc in the donor's country.

We assume that θ_D is a random variable continuously distributed on $[\underline{\theta}, \overline{\theta}]$ with density $f(\theta_D) > 0$, a strictly increasing distribution function $F(\theta_D)$ and $\underline{\theta} > 0$. We assume that $\underline{\theta} > \theta_H$. Then, $\theta_D > \theta_H > \theta_L$. Therefore tied aid increases the unit cost of production relative to untied aid (Jepma, 1991; Commission for Africa, 2005). Herein lies the deadweight loss of tied aid stemming from incomplete information. Since the donor does not know whether the leader is honest or dishonest, there is a deadweight loss of tied aid if a potentially honest leader could have produced the public good at a lower unit cost of $\theta < \theta_D$, where $\theta \in \{\theta_L, \theta_H\}$. A deadweight loss could also occur if the leader is corrupt but wants to pool in the first period (i.e., a corrupt leader got a draw of θ_L) and θ_D is sufficiently high.[27]

However, tied aid has the advantage of reducing moral hazard behaviour since it is more difficult for the leader to embezzle funds when aid is tied. Hence following the literature on unrestricted versus in-kind (restricted) transfers, we incorporate these two features of tied aid into our analysis.

As noted earlier, if tied aid takes the form of a restricted cash transfer, the donor invests resources in monitoring its use in order to eliminate or reduce embezzlement. In this case, we could write the cost of monitoring G dollars of such restricted cash transfer as $\beta C(G)$, where $\beta \geq 0$ and such monitoring eliminates embezzlement. So the total cost of G dollars of tied aid to the donor is $(1+\beta)C(G)$. This will not affect our analysis, so we set $\beta = 0$.

[27] Alternatively, we could have captured this deadweight loss by assuming that there is a parameter in the utility function of a representative citizen of the recipient country which is private information to the leader. The current formulation makes the signalling problem much easier to model and is consistent with the channel through which the deadweight loss of tied aid is identified in the literature (e.g., Jepma, 1991).

Since we assume that tied aid cannot be embezzled, the donor chooses the same size of tied aid G in each period to maximize

$$W_T = \frac{G}{\theta_D} - C(G) \tag{6}$$

The solution to this problem gives $G_T^*(\theta_D)$ and $W_T^*(\theta_D, G_T^*(\theta_D))$. It is easy to show that $\partial G_T^* / \partial \theta_D < 0$. Also, the envelope theorem gives $\partial W_T^* / \partial \theta_D < 0$.

3.3 Optimal choice of tied and untied aid

In the first period, when the donor uses untied aid his expected payoff is $W_U^*(\rho_1)$. Hence, the donor is indifferent between tied aid and untied aid in the first period if $W_T^*(\theta_D, G_T^*(\theta_D)) = W_U^*(\rho_1)$. We abuse notation by rewriting this equation as $W_T^*(\theta_D) = W_U^*(\rho_1)$. This equation gives the critical unit cost $\hat{\theta}_D(\rho_1) = S^{-1}(W_U^*(\rho_1))$, where S^{-1} is the inverse function of W_T^*. This inverse function exists because W_T^* is monotonic in θ_D. Since W_T^* is decreasing in θ_D, it follows the donor will use tied aid in period 1 if $\theta_D \leq \hat{\theta}_D(\rho_1)$ and will untied aid if $\theta_D > \hat{\theta}_D(\rho_1)$. Then probability that the donor will use tied aid in period 1 is

$$\Pr_1(\text{tied aid}) \equiv \sigma_1^* = \int_{\underline{\theta}}^{\hat{\theta}_D(\rho_1)} f(\theta)d\theta = F(\hat{\theta}_D(\rho_1)) \tag{7}$$

To make the analysis interesting, we assume that $W_T^*(\underline{\theta}) > W_U^*(\rho_1)$ and $W_T^*(\overline{\theta}) < W_U^*(\rho_1)$. Then $\underline{\theta} < \hat{\theta}_D(\rho_1) < \overline{\theta}$.

Now consider the second period. If the donor observed $g_1 = 0$ in the first period, then he uses tied aid with certainty in the second period. Hence, the donor

increases the proportion of tied aid to the *maximum* level in the second period, given that governance was at its *minimum* level in the first period.

If the donor observed $g_1^H \equiv G_1/\theta_H$ or $g_1^L \equiv G_1/\theta_L$ in period 1, then the donor knows that in the second period his expected payoff, if he uses untied aid, is $W_U^*(\rho_2)$, where $\rho_2\left(h\middle|g_1^L\right) > \rho_2\left(h\middle|g_1^H\right)$. So if $W_T^*(\theta_D) = W_U^*(\rho_2)$, the donor will be indifferent between tied and untied aid in the second period. Then we may write the critical unit cost as $\hat{\theta}_D(\rho_2) = S^{-1}(W_U^*(\rho_2))$, where S^{-1} is the inverse function of W_T^*. Since W_T^* is decreasing in θ_D, it follows that $\partial\hat{\theta}_D / \partial W_U^* < 0$.

As before, the donor will use tied aid in period 2 if $\theta_D \le \hat{\theta}_D(\rho_2)$ and will use untied aid if $\theta_D > \hat{\theta}_D(\rho_2)$. The probability of tied aid in period 2 is

$$\Pr_2(\text{tied aid}) \equiv \sigma_2^* = \int_{\underline{\theta}}^{\hat{\theta}_D(\rho_2)} f(\theta)d\theta = F(\hat{\theta}_D(\rho_2)) \tag{8}$$

Again, we assume that $\underline{\theta} < \hat{\theta}_D(\rho_2) < \overline{\theta}$.

Given equation (8), we obtain

$$\frac{\partial\sigma_2^*}{\partial g_1} = \frac{\partial F}{\partial\hat{\theta}_D}\frac{\partial\hat{\theta}_D}{\partial W_U^*}\frac{\partial W_U^*}{\partial\rho_2}\frac{\partial\rho_2}{\partial g_1} < 0 \tag{9}$$

The first derivative on the right hand side of (9) is positive since $F(\theta_D)$ is increasing in θ_D. The second derivative is negative as shown above. We have also shown that the last two derivatives are each positive. Thus in equilibrium, the probability that the donor will use tied aid is smaller, as the level of governance improves. This comparative static result in (9) establishes the result that the proportion of tied aid falls as the level of governance improves.

The intuition for this comparative static result stems from the fact an improvement in governance increases the donor's posterior that the leader is honest and increases the probability (i.e., ρ_2) that the cost savings due to a draw of $\theta \in \{\theta_L, \theta_H\}$ will be realized. This increases the expected payoff from using untied aid; that is, $\partial W_U^*(\rho_2)/\partial g_1 > 0$. Hence, an improvement in governance leads to an increase in the expected deadweight loss of tied aid and a reduction in expected moral hazard behaviour. This causes the donor to reduce the range of cost types for which he will choose to use tied aid (i.e., $\partial \hat{\theta}_D(\rho_2)/\partial g_1 < 0$).

We summarize our analysis in the following proposition:

Proposition 1: *For a donor who uses tied foreign aid to control a recipient's moral hazard behaviour while taking cognizance of the possible deadweight loss of such aid, an improvement in the recipient's level of governance reduces the proportion of aid that is tied.* [28]

It is important to note that we cannot necessarily conclude that $\partial G_U^*(\rho_2)/\partial \rho_2 > 0$ implies that $\partial \sigma_2^*/\partial \rho_2 < 0$. We need to consider other factors before concluding that if an improvement in the level of governance leads to an increase in the *size* of aid, [29] then this will also reduce the proportion of tied aid. What also needs to be considered is the effect of an improvement in governance on the deadweight loss of tied aid since this increases the expected payoff from using untied aid. This latter effect is captured by $\partial W_U^*(\rho_2)/\partial g_1 > 0$ resulting in $\partial \hat{\theta}_D/\partial W_U^* < 0$.

[28] There is also an equilibrium in which a dishonest leader embezzles all aid in period 1 regardless of the value of θ. Of course, this occurs if δ is sufficiently small. While we do not focus on this equilibrium, it is also consistent with our proposition 1 because the donor uses tied aid with certainty in the second period. Hence, the donor increases the proportion of tied aid to the *maximum* level in the second period, given that governance was at its *minimum* level in the first period.

[29] In our model, the level of governance does not directly affect the size of tied aid. It only affects the probability that the donor will use tied aid. Therefore, to capture how the level of governance affects the size of total aid, we focus on how governance affects the size of untied aid, G_U^*.

It is also important to note that one cannot conclude that $\partial G_U^*(\rho_2)/\partial\rho_2 = 0$ implies that $\partial\sigma_2^*/\partial\rho_2 = 0$. One could argue that it is possible to have $\partial G_U^*(\rho_2)/\partial\rho_2 = 0$ but $\partial\sigma_2^*/\partial\rho_2 < 0$. To see this, suppose the cost of untied aid to the donor is a linear function, such that the optimal size of untied aid is a corner solution, $\overline{G} > 0$. The donor's welfare will be still be increasing in ρ_2, although $\overline{G}$ is independent of ρ_2. Then if we assume that the cost of tied aid is still C(G), it is easy to show that the proportion of tied aid falls as governance improves. However, the conditions required to obtain this result do not accord with casual empiricism or are too stringent.

First, the corner solution means that we have a knife-edge result for the optimal untied aid which requires severe restrictions on the parameters of the model. Second, if as argued in section 2, tied aid is used as a redistributive tool to serve special interests like firms in the donor country and if good governance leads to better economic outcomes and opportunities in the recipient country, then one may argue that more aid will be tied as governance improves. To be precise, suppose a recipient is given a total aid of size G, where some proportion must be spent on goods from the donor country. Now suppose that there is an improvement in governance in the recipient country leading to better economic opportunities. To enable firms in the donor country to take advantage of the better economic opportunities, the donor may increase the proportion of tied aid, holding G fixed. But it is not clear why the *size* of aid will also not be increased to take advantage of the better economic opportunities in the recipient country.

Therefore, it is difficult, if not impossible, to think of a plausible story or model where the size of aid is not responsive to the level of governance but the proportion of tied aid is.[30]

One may conjecture that if the level of governance is very bad, the donor might give a very small total aid but since the aid is very small, he will not find it necessary to tie it. Our model makes this prediction under the following conditions. Recall that if the deadweight loss of tied aid is very high (i.e., $\theta_D > \hat{\theta}_D(\rho_2)$), then the donor will not use tied aid. If ρ_2 is very low, then the optimal untied aid, $G_U^*(\rho_2)$, in period 2 will be very low. Hence if the deadweight loss of tied aid is sufficiently high and the donor's posterior belief of the quality of politicians is very low, then the total aid will be very small but will be untied. On the other hand, if the deadweight loss of tied aid is very low, then the donor will use tied aid. So while the size of aid could conceivably affect the decision to use full untied aid or full tied aid, the direction of this effect may be ambiguous.

The preceding does not imply a continuous relationship between the size of aid and the proportion of tied aid. It suggests that there is a discontinuous relationship between size of aid and proportion of tied aid where there is a threshold size of total aid below which aid is not tied.

Note that the donor would never use untied aid if we had assumed that $\theta_L > \theta_D$. However, it is important to note that our analysis would still have gone through if we had assumed that $\theta_L < \theta_D < \theta_H$. What we require for the donor to use untied aid with some positive probability is that there is a positive probability of a deadweight loss associated with tied aid. Given $\theta_L < \theta_D < \theta_H$, there is a deadweight loss when the cost

[30] In any case, for a donor who may be influenced by the level of governance in the recipient country, but does not use tied aid to control moral hazard behaviour, the proportion of tied aid is likely to either increase or remain constant as governance improves.

draw is θ_L and the politician is honest or the politician is corrupt but wants to restrain himself, and θ_D is sufficiently large relative to θ_L.

Our model is very simple. However, we believe that it captures the salient features of our point on the need to strike a balance between the deadweight loss of tied aid and its superior ability, relative to untied aid, in controlling moral hazard behaviour.

In the literature on the efficiency properties of cash and in-kind transfers, the comparison is usually made as a choice between either a cash transfer or an in-kind transfer. But, as noted earlier, Gahvari and de Mattos (2007) show that combining a conditional cash transfer with an in-kind transfer can reduce or eliminate the deadweight losses of in-kind transfers. They model this combination of cash and in-kind transfers in a deterministic way. One could see our framework as one in which the donor uses a probabilistic combination of tied and untied transfers depending on his draw of θ_D.[31] However, whether the combination between tied and untied transfers is deterministic or probabilistic, the economics of using both remains the same. So as in Gahvari and de Mattos (2007), cash transfers are used in our model because of the

[31] A deterministic combination of tied and untied aid can be modelled as follows. Suppose a proportion μ_t of the donor's aid is untied in period t, t =1, 2. So in period t, the donor chooses a total aid of G_t dollars where $\mu_t G_t$ is tied and $(1-\mu_t)G_t$ is untied, t = 1, 2. Continue to assume that all untied aid can be embezzled but tied aid cannot be embezzled. Assume that θ_D is also known by the leader. And suppose the total cost of $\mu_t G_t$ dollars of tied aid and $(1-\mu_t)G_t$ dollars of untied aid is $C(G_t)$, where $C(G_t)$ is the cost function in the text. Then as before, we can construct an equilibrium where a corrupt leader embezzles all untied aid in period 2; embezzles all untied aid in period 1 if $\theta = \theta_H$; and the level of public good provision in period 1 by a corrupt leader is $\mu_1 G_1/\theta_D + (1-\mu_1)G_2/\theta_H$, if $\theta = \theta_L$. For an honest leader, the level of public good provision in period t is $\mu_t G_t/\theta_D + (1-\mu_t)G_t/\theta_H$, if $\theta = \theta_H$ and it is $\mu_t G_t/\theta_D + (1-\mu_t)G_t/\theta_L$, if $\theta = \theta_L$, t = 1, 2. It is easy to show that the donor's payoff in period t can be written as a weighted sum of the payoffs in the text. That is, the donor's payoff in period t is $V(\rho_t) = \mu_t W_T + (1-\mu_t)W_U(\rho_t)$, t = 1,2. Then given G_t, $\mu_t^* = 1$ if $W_T \geq W_U(\rho_t)$ and $\mu_t^* = 0$ if $W_T < W_U(\rho_t)$, t = 1,2. Therefore, the donor chooses only untied aid to maximize $W_U(\rho_t)$, and chooses only tied aid to maximize W_T and then compares the payoffs. This is exactly what we have in the text. Now suppose $C_T(G)$ be the cost of G dollars of tied aid and let $C_U(G)$ be the corresponding cost for untied aid. Then if $C_T(G)$ and $C_U(G)$ are both increasing and strictly convex, we could have $0 < \mu_t^* < 1$. In period t, the cost of untied aid will be $C_U((1-\mu_t)G_t)$ and the cost of tied aid will be $C_T(\mu_t G_t)$. We can then show that $\partial \mu_t^* / \partial \rho_t < 0$. Differences in the cost of tied and untied aid to the donor may stem from differences in transportation and transactions costs of transferring a dollar of in-kind aid to the recipient relative to the cost of transferring a dollar in cash. But in order not to appeal to differences in costs to the donor, we used the formulation in the text. Moreover, it is easier to analyze.

possible deadweight loss of in-kind transfers and in-kind transfers are used to control moral hazard behaviour or relax self-selection constraints.

Finally, we note that since in our model, the donor has no information on the past level of governance in period 1 and therefore bases his choice of tied or untied aid on an exogenous prior, π, we do not think that there is any economic insight gained from comparing the relative magnitudes of σ_1^* and σ_2^* as far as determining how past governance affects the proportion of tied aid is concerned.

4. Data Set and Summary Statistics

In order to empirically test the predictions of our theoretical model we need proxies for both an indicator of the extent of tied multilateral/bilateral aid in total aid receipts and a measure of governance.

The aid data is from the OECD-Credit Reporting System (CRS) database. For bilateral donors the information shows that aid to a recipient is reported in three categories: (i) untied and/or (ii) fully tied and/or (iii) partially tied. For multilateral agencies the information shows that aid is untied and/or partially tied. There was no fully tied category for multilateral aid.

Untied aid means that no proportion of it is tied to the goods and services of any country. Fully tied aid means that 100% of it is tied to the procurement of goods and services from the donor country. Partially tied aid requires that aid must be used to procure goods and services in the donor country or among a *restricted* group of other countries chosen by the donor which must include developing countries. The OECD notes that this kind of aid is subject to the same disciplines as tied aid. However, as

the UNDP (2005, p. 102) notes "[T]he full extent of tied aid is unknown because of unclear or incomplete reporting by donors."[32]

As proxies for governance we use two indices compiled by the Freedom House since 1972, namely the political rights index (PR) and the civil liberties index (CL). These indices are very popular and commonly used in the foreign aid literature (e.g., Alesina and Dollar, 2000). The political rights index is meant to capture the extent to which citizens can participate in the political process by competing for public office and exercising their right to vote. In contrast, the civil rights index measures whether citizens have enough freedom to develop opinions and personal autonomy without state interference. The scores range from 1 to 7 for both indices, where a lower score indicates better governance.

For the sake of convenience, we reverse the order so that higher values correspond to better governance. One should note that there are of course other indicators of good governance that have been used in the literature. One popular proxy has been the International Country Risk Guide (ICRG) indices. More recently, the World Bank has also constructed the Country Policy and Institutional Assessment (CPIA) index of governance. While the CPIA clearly has some advantages with regard to accurately capturing good governance, unfortunately they are only available for a number of recent years and would make any panel estimation infeasible in our context. More importantly, in the years that they are all available, these indices tend to be significantly correlated with the Freedom House indices (Dollar and Levin, 2004).

We also include population and GDP per capita as additional explanatory variables. Our data on GDP per capita and population are taken from the Penn Tables. All in all, non-missing observations on all our variables left us with a total sample of

[32] For example, the USA has not reported tying data since 1996. In addition to incomplete reporting, indirect, *de facto*, or informal tying could understate the true extent of tied aid (see Jepma, 1991).

119 recipient countries for bilateral donors and 115 recipients for multilateral donors over the 1993-2003 period.[33] One should note in this regard that not all years were available for all recipients, in part due to missing values and in part due to the nature of our dependent variable, where in years of no aid, the proportion tied was obviously undefined. Thus our sample is of an unbalanced panel nature.

We have graphed total multilateral aid, partially tied multilateral aid, and the proportion of partially tied multilateral in figures 1 and 2. We also did the same for bilateral aid in figures 3 and 4. With regard to multilateral aid, it is apparent that total aid has increased substantially over the period hitting a maximum of over 20 billion in 2003. At the same time the share that is tied has also increased substantially. More precisely, while in the early 1990s only a small proportion of multilateral aid was tied, by 2003 over a quarter of aid was tied. The mean proportion of partially tied multilateral aid during this period, as shown in Table 1, was about 32%. However, as noted earlier, one cannot be fully sure of the extent of tied aid.

While total bilateral aid has shown an up-and-down movement over our sample period, the share of aid that is tied, in contrast to multilateral aid, seems to have fallen over the period. Figure 4 shows that the proportion of bilateral fully tied aid was substantially higher than the proportion of bilateral partially tied at the beginning of our sample period (i.e., 1993-2003) but the gap had narrowed at the end of the period. The mean difference between these variables is about 0.14 as shown in Table 1.

In figure 5, we graphed the average values of our two indices of governance of our sample. These indices have followed similar trends during our sample period. It is clear that governance has on average improved, rising steadily during the 1993-2003 period.

[33] The list of bilateral and multilateral donors is given in appendix A.

5. Econometric Analysis

One way of testing a donor's motive for using tied aid is to code the dependent variable as 1 if a donor used either fully tied or partially tied aid or both and 0 if and only if he used only untied aid, and then use probit model to estimate the probability that tied aid will be used. However, a probit model or any qualitative response regression model requires that the choice of one alternative precludes the choice of all other alternatives. This situation does not apply to our case because a donor can simultaneously choose a combination of tied and untied aid. More importantly, both groups of donors in our sample chose some mix of tied and untied aid for almost all years and for almost all recipients. Indeed, for multilateral aid, there were no extreme values (i.e., 1 or 0) for our dependent variable. We elaborate more in the next footnote.

In view of the preceding point, we test the predictions of our model by instead estimating the following regression equation:

$$\log(\text{tied\_aid}_{it}) = \alpha + \phi g_{it-1} + \gamma X_{it-1} + \varepsilon_{it} \qquad (10)$$

where *tied_aid* refers to the proportion of aid that is tied for recipient i in time t from either all bilateral or multilateral sources, g is our proxy for governance (either *PR* or *CL*), X is a vector of other explanatory variables, and ε is an error term.[34] The log-linear specification in (10) is very common in the foreign aid literature where the

[34] Since the proportion of tied aid is bounded between 0 and 1, it might be necessary to, for example, apply a logistic transformation to this proportion in order to avoid problems of a bounded dependent variable. However, there were very few observations in our data in which the dependent variable was either 0 or 1. As noted earlier, there were no zero values or 1 in the multilateral case. And in more than a 1000 observations in the bilateral case, there were only 27 zero values (i.e., less than 2.7%) and two values of 1 when the dependent variable is the proportion of fully tied bilateral aid. When the dependent variable is the proportion of all tied bilateral aid (i.e., includes partially tied aid), there were only two values of 1 and 11 zero values. Nevertheless, to ensure that the few zero observations of the proportion of tied bilateral aid do not drop out of the analysis when we take logarithms we added 0.0001 to the zero values. As noted by Dollar and Levin (2006, p. 2037), adding a small positive number to zero values is a common transformation (see, for example, note 14 in Alesina and Dollar, 2000; Dollar and Levin, 2006, p. 2037; Kuziemko and Werker, pp. 919 and 927).

dependent variable is the log of the *size* of aid (e.g., see Alesina and Dollar, 2004; Kuziemko and Werker, 2006).

Consistent with our theoretical analysis, we assume that the level of governance at time t-1 may affect the proportion of tied aid at time t. We thus similarly also allow the effect of other explanatory variables to have a lagged effect on the dependent variable.

An important prerequisite for unbiased estimates of the coefficients in any panel empirical equation, such as equation (10), is that the (unexplained) error term is uncorrelated with the chosen explanatory variables. In other words, any unobservable factors determining proportion of tied aid which may be correlated with the regressors must be properly controlled for to avoid endogeneity bias. In order to control for this possibility in terms of time invariant unobservables we use a simple fixed effects estimator.[35]

We estimate equation (10) for bilateral and multilateral donors. The distinction between these groups of donors reflects results in the literature on foreign aid, discussed in section 2, which suggest that that these two groups of donors face different incentives and therefore behave differently. Moreover, we only had access to this kind of aggregate data from the OECD database. We return to this dichotomy between multilateral and bilateral donors in our concluding remarks.

Both partially tied and fully tied fall in the class of *restricted* transfers which are *presumably* used to control moral hazard behaviour. Of course, this is what we wish to test. So to the extent that partially tied aid has some restriction, albeit, less restriction than fully tied aid, we treat partially tied aid as fully tied. In the case of bilateral aid, where both categories of aid are available, we define *total bilateral tied*

[35] Since we follow our model in that good governance at time t-1 determines the proportion of tied aid at time t we can abstract from any simultaneity bias after we have purged unobserved fixed effects.

aid as the sum of partially tied aid and fully tied aid, where the dependent variable is the log of the proportion of total bilateral tied aid. However, we also ran our regressions using the log of the proportion of fully tied bilateral aid as the dependent variable. In case of multilateral aid which has no fully tied aid category, we use the log of the proportion of partially tied multilateral aid as the dependent variable.

Our empirical results for multilateral aid are presented in Table 2. The first two columns contain the estimates for our two proxies without including any additional explanatory variables. As can be seen, in accordance with our model both proxies, *CL* and *PR*, have a negative and significant effect on the proportion of tied multilateral aid. In other words, when countries display better governance a smaller proportion of their multilateral aid is tied. As is apparent from the final two columns, this finding is robust to including additional explanatory variables, where we added the lagged values GDP per capita and total population, to control for wealth and country size effects, respectively.

In contrast, our governance measures have no discernable effect on the proportion of tied aid from bilateral donors as is shown in Table 3. More precisely, the coefficient on *CL* and *PR* are insignificant and are implausibly positive which suggests that, for bilateral donors, tied aid is not used to control moral hazard behavior. This result, as can be seen from the final two columns, is robust to the inclusion of our additional explanatory variables.

We re-ran our bilateral specification with the log of the proportion of only fully tied aid as the dependent variable, the results of which are shown in Table 4. In this case, the sign on our *CL* governance proxy is positive and insignificant, with and without the inclusion of GDP per capita and population size. For our *PR* governance

measure, the sign is negative but insignificant, with and without our additional explanatory variables.

6. Conclusion

There is huge literature on foreign aid. Most of this literature has focussed on the quantity of aid. Not much formal analyses and empirical attention have been devoted to tied foreign aid.

While the information-based approach to public economics has extensively and formally examined the use of in-kind transfers as incentive-compatible schemes of transfers within national borders, it has surprisingly not paid a similar attention to the use of such transfers between sovereign nations. Drawing on insights in this literature, we investigated the role of tied aid as a mechanism for controlling moral hazard behaviour in foreign aid transfers.

Our findings suggest that multilateral agencies use tied aid to control the perverse behaviour of recipients, and do reward good behaviour by reducing the proportion of tied aid. We find that these findings are weaker for bilateral donors or do not apply to them. Bilateral donors do not seem to use tied aid to control moral hazard behaviour. They may well use it to promote the redistribution of income to special interests in their countries.

On a more general note, we believe that our paper is the first to empirically investigate how the composition of transfers (i.e., the mix of in-kind and cash transfers or the mix of restricted and unrestricted cash transfers) changes in response to changes in a recipient's moral hazard behavior.

To the extent that conditioning the composition of aid on governance may induce recipient countries to deliver better socio-economic outcomes, one may be tempted to

argue that our paper contributes to the debate on the effectiveness of aid (e.g., Burnside and Dollar, 2000, 2004; Easterly, 2001, 2006b; Easterly et al, 2004; Sachs, 2005). If good governance influences aid decisions, then aid is more likely to be effective to the extent that the prospect of future aid will induce aid recipients to strive for better political and economic performance. However, we do not wish to claim too much for our results in this regard. Foreign aid, even if tied, may create a different kind of moral hazard behavior through the over dependence of the recipient on the donor's charity (see, for example, Coate, 1995; and Pedersen, 2001). This moral hazard behavior (i.e., dependency syndrome) stemming from aid may exist even if the politicians in the recipient country are honest.[36]

In conclusion, we wish to point out that our theoretical framework does not predict whether a particular donor will change the composition of foreign aid in response to moral hazard behaviour. Hence the difference in the behaviour of bilateral and multilateral donors, while interesting, need not be our main contribution. Our theoretical analysis offers a framework and methodology for testing this proposition. Our main contribution is therefore a theoretical and empirical methodology that allows us to test whether a foreign donor uses in-kind or restricted transfers to control moral hazard behaviour. Our methodology accomplishes this goal by investigating the relationship between the proportion of a donor's tied aid in total transfers and a recipient country's level of governance.

[36] We do not examine the effect of the proportion of tied aid on growth and poverty reduction nor do we examine whether the quality of political institutions, as captured by measures of governance such as ours, cause growth (Glaeser et al, 2004). These issues are beyond the scope of this paper and are irrelevant for our purposes.

Table 1: Summary Statistics

Variable	Mean	Std. Dev.	Min	Max
Proportion of Partially Tied Multilateral Aid	0.3190288	0.3355069	0.0000397	0.99999
Proportion of Fully Tied Bilateral Aid	0.1867267	0.2176963	0	1
Proportion of Partially Tied Bilateral Aid	0.0468941	0.1021083	0	1
Proportion of All Tied Bilateral Aid	0.2251157	0.2265601	0	1
Freedomhouse Political Rights Index	4.114958	1.948526	1	7
Freedomhouse Civil Liberties Index	4.216066	1.497244	1	7
Population (in thousands)	40529.23	151086.2	69.655	1286976
Real GDP Per capita (in US dollars)	4308.028	4022.596	170.555	25834.03

Notes: For proportions of tied aid, Max and Min refer to the maximum or minimum individual (i.e., recipient) values in the data during the 1993-2003 period. These are *not* the maximum or minimum *annual averages* of these variables during the 1993-1994 period. The average for each year can be found in figures 2 and 4. The mean is calculated over the entire 1993-2003 period.

Figure 1: Total Multilateral Aid and Amount Tied (Billions of USD)

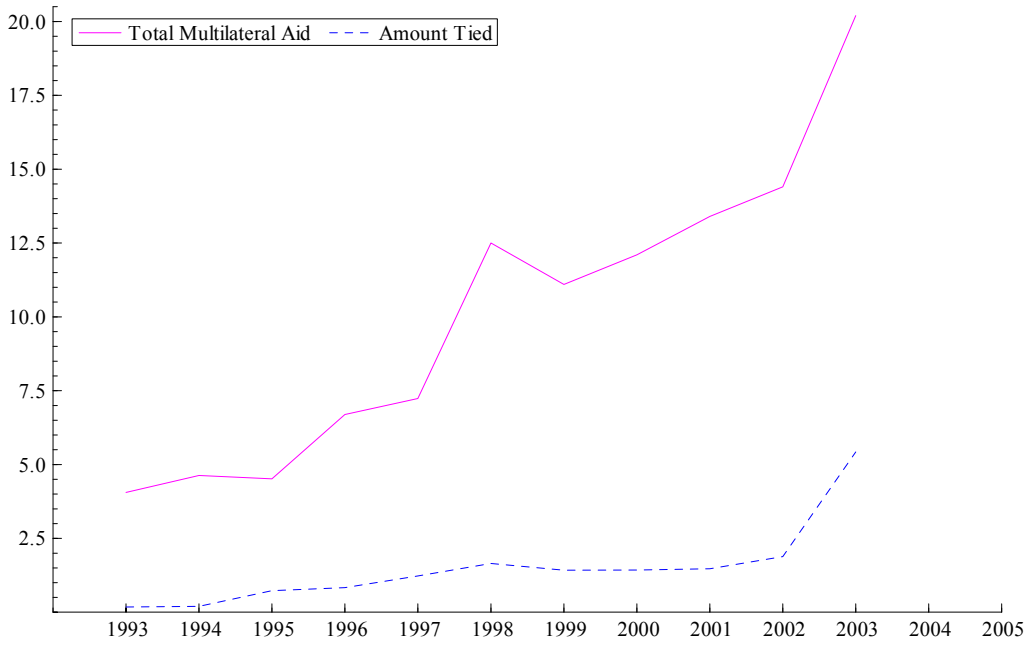


Figure 2: Proportion of Aid Tied in Total Multilateral Aid

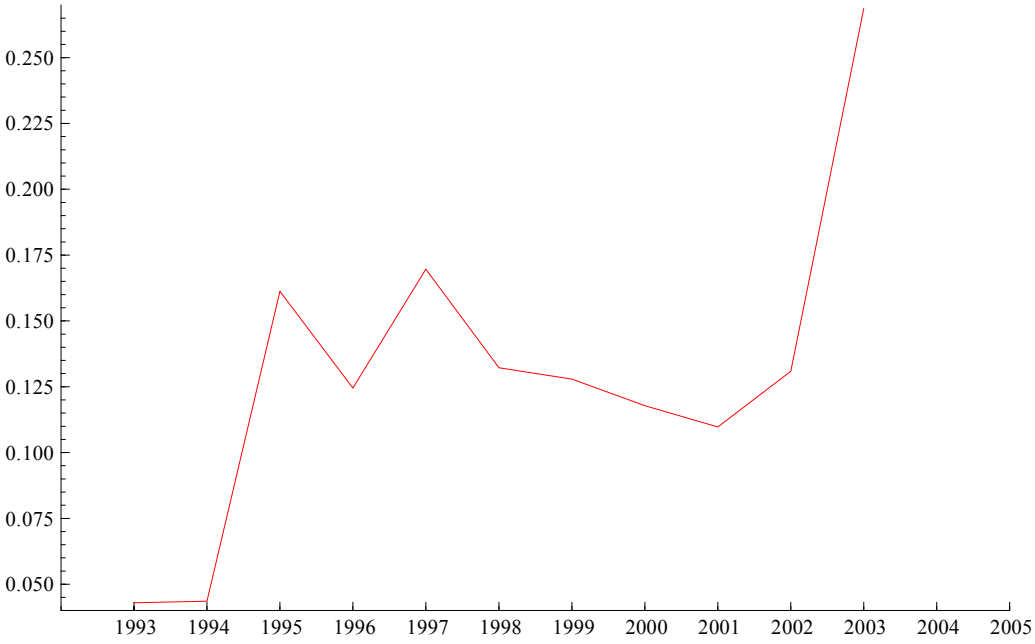


Figure 3: Amount of Total Bilateral Aid and Amount Fully and Partially Tied (Billions of USD)

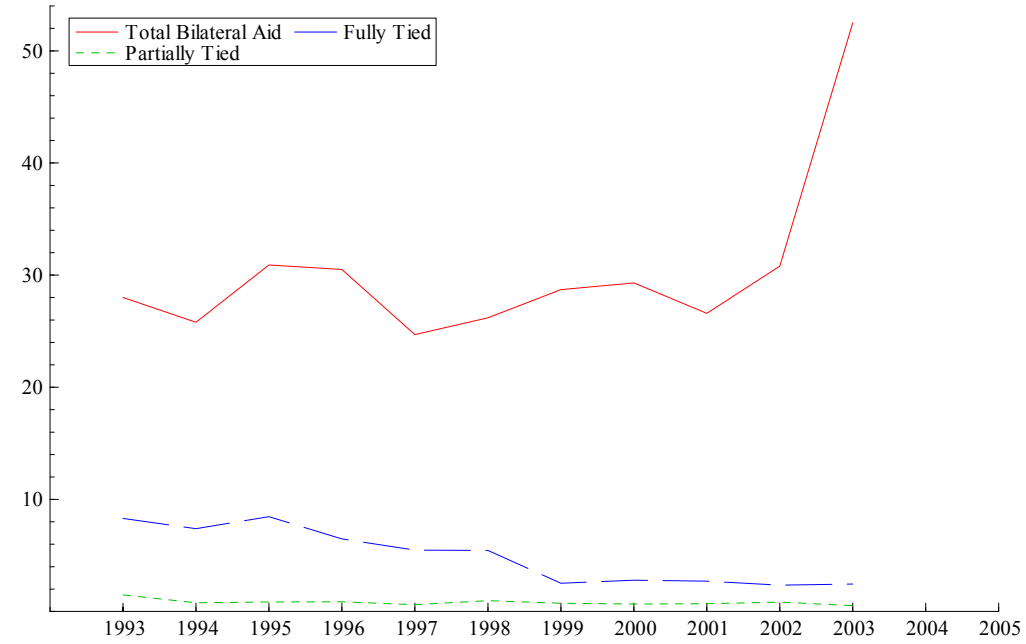


Figure 4: Proportion of Fully and Partially Tied Aid in Total Bilateral Aid

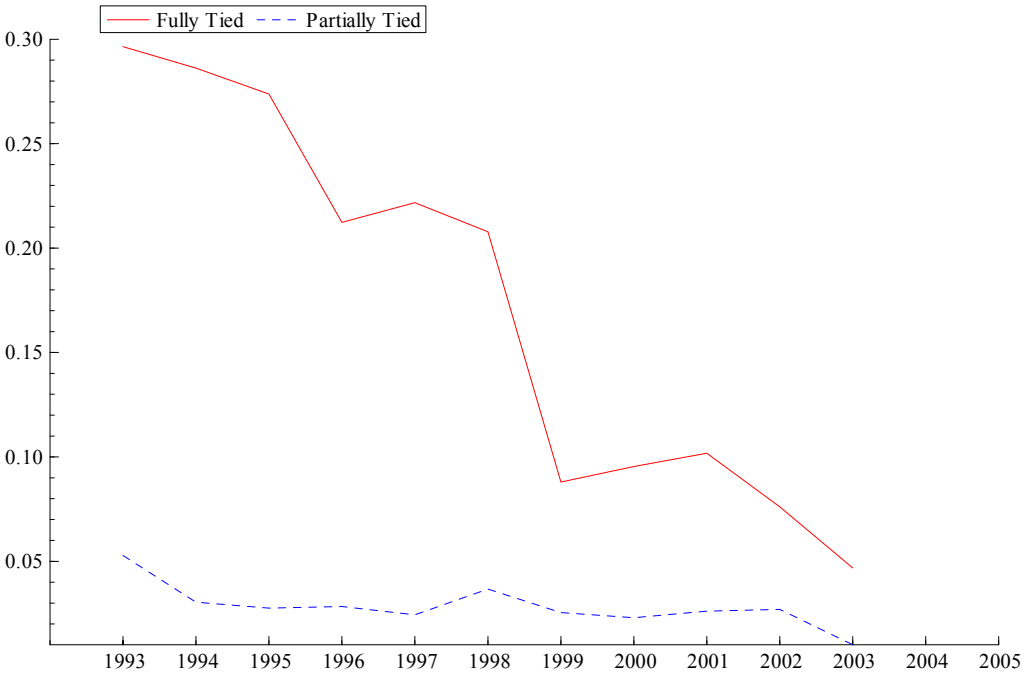
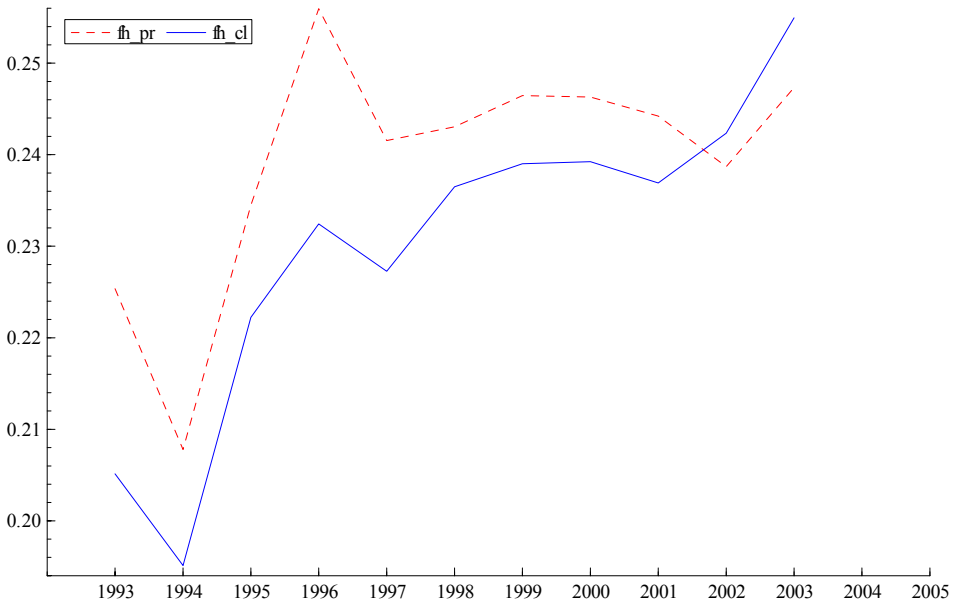


Figure 5: Average values of Freedom House Indices of Governance



Note: ordering of indices are reversed so higher values indicate better governance

Table 2: Proportion of Multilateral Tied Aid

Dependent variable: log[(partially tied multilateral aid)/(Total multilateral aid)]

	(1)	(2)	(3)	(4)
CL(t-1)	-0.234*		-0.226*	
	(0.122)		(0.125)	
PR(t-1)		-0.185**		-0.178*
		(0.090)		(0.091)
log[GDP/CAP(t-1)]			-0.139	-0.180
			(0.507)	(0.508)
log[POP(t-1)]			0.147	0.439
			(1.988)	(1.972)
Observations	685	685	671	671
Number of c_id	115	115	113	113
F(ξ =0)	7.54***	7.60***	5.97***	6.02***
R-squared	0.13	0.13	0.12	0.13

Notes: (1) Robust standard errors in parentheses; (2) ***, **, and * indicate 1, 5, and 10 per cent significance levels, respectively; (3) F(ξ=0) is F-test of joint significance of all explanatory variables; (4) Time dummies included.

Table 3: Proportion of Total Bilateral Tied Aid

Dependent variable: log[(fully tied bilateral aid + partially tied bilateral aid)/(Total bilateral aid)]

	(1)	(2)	(3)	(4)
CL(t-1)	0.107		0.092	
	(0.074)		(0.076)	
PR(t-1)		0.029		0.024
		(0.051)		(0.052)
log[GDP/CAP(t-1)]			-0.024	-0.008
			(0.280)	(0.280)
log[POP(t-1)]			-2.023*	-2.167*
			(1.145)	(1.139)
Observations	1167	1167	1134	1134
Number of c_id	119	119	119	119
F(ξ =0)	23.91***	23.71**	19.39**	19.27**
R-squared	0.20	0.20	0.20	0.20

Notes: (1) Robust standard errors in parentheses; (2) ***, **, and * indicate 1, 5, and 10 per cent significance levels, respectively; (3) F(ξ =0) is F-test of joint significance of all explanatory variables; (4) Time dummies included.

Table 4: Proportion of Fully Tied Bilateral Aid

Dependent variable: log[(fully tied bilateral aid)/(Total bilateral aid)]

	(1)	(2)	(3)	(4)
CL(t-1)	0.092		0.075	
	(0.089)		(0.091)	
PR(t-1)		-0.033		-0.037
		(0.061)		(0.062)
log[GDP/CAP(t-1)]			-0.470	-0.440
			(0.334)	(0.333)
log[POP(t-1)]			-3.783***	-3.940***
			(1.366)	(1.358)
Observations	1167	1167	1134	1134
Number of c_id	119	119	119	119
F(ξ=0)	26.78***	26.69***	22.29***	22.26**
R-squared	0.22	0.22	0.22	0.22

Notes: (1) Robust standard errors in parentheses; (2) ***, **, and * indicate 1, 5, and 10 per cent significance levels, respectively; (3) F(ξ=0) is F-test of joint significance of all explanatory variables; (4) Time dummies included.

Appendix A

List of Multilateral donors

African Development Bank
Asian Development Bank
European Commission
Inter-American Development Bank
International Fund for Agricultural Development
United Nations Development Programme
World Bank
African Development Fund
Asian Development Fund
International Development Association
United Nations Children's Fund
United Nations Population Fund

List of Bilateral donors

Australia
Austria
Belgium
Canada
Denmark
Finland
France
Germany
Greece
Ireland
Italy
Japan
Luxembourg
Netherlands
New Zealand
Norway
Portugal
Spain
Sweden
Switzerland
United Kingdom
United States

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