Aid and Corruption: Do Donors Use Development Assistance to Provide the "Right" Incentives?

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Abstract

In this paper, we focus on the determinants of the relationship between aid and corruption. We propose a static principal-agent model where a donor faces the problem of giving aid to a recipient country characterized by wide spread corruption. The model describes four possible equilibria: one, in which foreign aid is set by the donor independently of the level of corruption; a second one, where the donor uses aid to induce the "right" incentives on local elites. In the third and forth equilibria, the donor either cannot impose an incentive mechanism or prefers not to. In these last two cases, the aid-corruption relationship depends only on the preferences of the donor.

We then use the restrictions implied by our theoretical framework to test a model of aid allocation. Our empirical results allow us to group donors into three categories. The first one, which includes Canada, Norway and the UK, give less aid to more corrupt recipients. As a consequence, we label them as *altruistic* donors. The second category of donors (Australia, Denmark, Italy, Spain, Sweden and USA) does not seem to be influenced by the level of corruption in allocating foreign aid. For the remaining donors (Finland, France, Japan, Germany and the Netherlands) instead, the aid-corruption relationship is positive. Our results seem to suggest that France, Japan and Germany tends to induce incentives in the local elites, even though being large donors, the positive relationship could also reflect the fact that large aid flows might have indeed stimulated corruption and rent seeking.

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1 Introduction

Corruption is a very serious problem, particularly widespread in developing countries[1]. It aggravates poverty by having a significant and detrimental impact on the lives of the poor; it reduces their net income and wrecks the programs related to their basic needs. In societies where corruption and clientelism are pervasive, competition is severely distorted and, in the long run, corruption not only affects the distribution of resources, but also the process of economic growth, encouraging people to apply their skills and energies in non productive ways[2]. Last but not least, the phenomenon of corruption is also capable of frustrating the efforts of aid agencies in their fight against poverty and underdevelopment.

There is today an increased awareness of the development community[3], in both donor and recipient countries, that without countering corruption, aid is in danger of not achieving its goals, failing to reach the poor or just reaching them partially. Regardless of the general agreement on the relevance of this issue, and despite the many declarations of intent, do actually donors take the problem of corruption into account in their development policies?

Surprisingly, although the issue is at the center of the debate and anectodical evidence[4] suggests that corruption is capable of reducing aid effectiveness, rigorous studies on the attitude of donors toward corruption are relatively few. Svensson (2000) estimates a model of aid allocation where total aid is regressed on an indicator of corruption and a series of other variables and provides no evidence that donors systematically give aid to less corrupt recipients. More recently Easterly (2007) evaluating the performance of bilateral and multilateral aid agencies, considers the impact of corruption on aid policies for the World Bank, US, UK, France and Japan and finds that the negative effect of corruption on aid is concentrated over the period 1995-1999. However, the most comprehensive empirical assessment of the aid-corruption relationship is provided by Alesina and Weder (2002), who analyze the aid allocation of the 13 most important bilateral donors. These authors show that, for most donors, corruption is not a significant explanatory variable in bilateral aid allocation. Only for Australia and Sweden they find evidence that low corruption is rewarded with higher levels of aid, while the USA seem to give more aid to more corrupt recipients [5].

The purpose of this paper is twofold. First, we provide new evidence on the aid-corruption issue, not only by reassessing and updating the Alesina-Weder results, but also

[1] According to the Corruption Perception Index (2006) almost three-quarters of the countries (including all low-income countries and all but two African states) score below five and seventy one countries (nearly half) score below three.

[2] See for example Mauro, (1995).

[3] The global consensus on this objective is reflected by the ratification of the UN Convention Against Corruption (UNCAC). The need to fight corruption is also an important part of the Millennium Development Goals and of the global Poverty Reduction Strategy Paper (PRSP) process of the World Bank and the IMF.

[4] For some interesting examples on the issue of aid and corruption in Africa, see Cooksey (2003).

[5] See also Alesina and Dollar, (2000); McGillivray, (2003), (2004).

by showing how the link between aid and corruption has evolved in the last two decades. Second, and more importantly, we try to provide a structural interpretation of the evidence. With the help of a simple model of aid allocation under moral hazard, we ask what are the motives behind donors' attitudes toward corruption in developing countries.

The literature on aid allocation has mainly aimed at detecting empirically the factors behind donors' aid policies and has traditionally focused on the dichotomy between strategic economic interests and recipient needs.

We think, however, that the use of a theoretical model to interpret observed empirical relationships may be extremely helpful, since it provides a benchmark on which to evaluate current aid policies and, in particular, allows us to ask whether these policies can be interpreted as an optimal response to the information/incentive problems that are often encountered by donors in the actual implementation of development projects.

Corruption and rent seeking in developing country are usually the result of moral hazard, arising from the ability of corrupt bureaucrats to exploit their authority for private gains. Since, in this type of environment, donors could actually intervene through an appropriate contract design, an important question is whether aid is used as an instrument to provide the right incentives to local elites.

In order to provide a complete description of the aid-corruption relationship our model also allow for the possibility that donors give aid simply on the basis of recipient needs or for strategic-economic reason. In some cases, moral hazard problems may not be relevant or may not be perceived as relevant by donors. In other cases, donors may feel that they can hardly affect, from the outside, the local environment and, having little leverage on the political process, simply accept the existence of corruption as a structural characteristic of these economies. In this paper, therefore, we consider not only incentive issues but we also allow for the possibility that donors give aid either on the basis of recipient needs or on the basis of their own political, strategic and economic aims.

The model has four possible equilibria. In the first one, the donor does not perceive the existence of a significant moral hazard problem, and grants aid according to its preferences, regardless of the level of corruption in the recipient country. In the second equilibrium, the donor tries to influence the behavior of local elites by offering incentive compatible contracts: the optimal amount of aid is an increasing function of the level of corruption. Allowing some diversion of resources, in fact, may be used as a mean to compensate local elites for their effort and induce them to work toward the success of development projects.

The third and fourth equilibria are obtained, instead, when a donor does not impose an incentive mechanism, either because he does not want to, given its strategic/economic interests, or because it cannot impose it. In the third equilibrium, we can actually distinguish between two different cases. If donors prefer to favor local elites for geo-political factors, then aid is increasing in the level of corruption. If instead donors are sincerely motivated

by recipients need, then corruption is a decreasing function of aid. The fourth equilibrium describes an environment where corruption is perceived as excessively high: in this case, an altruistic donor could find optimal not to give aid at all. The results of the model are then used to provide a structural interpretation of the empirical analysis.

For the fourteen major donors, during the period 1985-2006, we estimate a Tobit model of aid allocation. Our regressions show that all donors included in the sample are motivated by a mix of altruistic and economic-strategic considerations. Most donors give aid to poorer and more democratic recipients. However, as already documented by the aid allocation literature, colonial and political ties, and trade relationships are also important factors in determining the volume of aid to any specific recipient country[6].

When we consider the relationship between aid and corruption, we find large differences among donors. Canada, Norway and the UK tend to give more aid, *ceteris paribus*, to less corrupt recipients. According to our model this negative correlation between the size of aid and the level of corruption characterizes unambiguously a situation where donors know that they can hardly affect the decisions of local elite but are highly interested in helping the poor. Knowing that in more corrupt countries resources will be diverted from their intended use, these donors tend to concentrate aid to the less corrupt ones.

Consistent with the first equilibrium of our model, instead, are the results for Australia, Denmark, Italy, Spain, Sweden and USA, where the level of corruption is not significant in explaining aid. For these donors moral hazard is not relevant and the level of corruption in the recipient country does not affect aid allocation decisions.

There is, finally, a third group of countries that includes Finland, France, Germany, Japan and the Netherlands that seem to have privileged more corrupt recipients. According to our model theoretical model, this can be either the signal that donors use the amount of aid as an incentive mechanism, i.e. they allow some corruption to compensate local elites for their effort and to induce them to work toward the success of development projects. But it may also signal instead that donors simply allow local elites to capture a large part of the aid flows for strategic or economic reasons. In order to distinguish between these two equilibria we use a pure indicator of strategic/economic interests: the variable *Military Expenditure*. In the case of France, Japan and Germany this variable turns out to be significant with the negative sign almost in all the equations. This allows us to conclude that there is a number of donors that try to use foreign aid to induce the right incentives in local elites.

The paper is organized as follows: Section 2 describes the theoretical model. Section 3 describes the empirical analysis. Last section concludes.

[6]See for example Alesina and Dollar, 2000 and Berthelemy and Tichit, 2004.

2 A Simple Model of Aid Allocation Under Asymmetric Information

We consider a bilateral cooperation program[7] between two countries: a donor and a recipient[8], where the government of the donor country decides the amount of resources, a, that should be devoted to implement a development project in the recipient country[9].

The recipient country is inhabited by a continuum of agents with unit mass. Agents are divided in two groups: type I agents, that we also call the *elite*, and type II agents defined as the *poor*. Only the *elite* has access to a stochastic technology to influence the outcome of the project; the poor cannot affect this outcome but receive, at the end of the production process, a fraction of the output.

We assume that the distribution of the output inside the country is exogenous and reflects its institutional characteristics. The government of the recipient country is run by the elite which is able to capture a fraction γ of the output of the project. The poor receive instead the remaining $(1-\gamma)$.

Production is stochastic and is affected by the actions undertaken by type I agents. We assume that the output of the project is given by a standard neoclassical production function $y = \theta f(a)$, where $f'(a) > 0$, $f''(a) < 0$, $f(0) = 0$, $f'(0) = \infty$ and θ is a stochastic productivity parameter. Type I agents can undertake two types of actions $i = 0$ or $i = 1$. When type I agents undertakes action $i = 0$, that we also denote as *bad action* they also exert the low level of effort, which implies a lower probability of success of the project; if $i = 1$, the agent undertakes the high level of effort which, however, implies for the agent a cost ψ expressed in terms of utility. We assume that the donor cannot observe the level of effort exerted by the elite and this gives rise to a moral hazard problem.

Depending on the action undertaken, output can assume the values $\{\underline{\theta} f(a), \overline{\theta} f(a)\}$ with $\overline{\theta} - \underline{\theta} = \Delta\theta > 0$ and the stochastic influence of the agent's action on production is characterized by the probabilities $Pr(\tilde{\theta} = \overline{\theta} \mid i = 0) = \pi_0$ and $Pr(\tilde{\theta} = \overline{\theta} \mid i = 1) = \pi_1$ with $\pi_1 > \pi_0$. Notice that effort improves production in the sense of first order stochastic dominance, i.e. $Pr(\tilde{\theta} \leq \theta^* \mid i)$ is decreasing in i for any given level of production θ^*.

A crucial assumption of this model is that when a type I agent undertakes action $i = 0$, he can also extract a private benefit, which is given by a further fraction b of the output in addition to the fraction γ to which he is entitled. We assume $\gamma + b < 1$. An agent that undertakes the bad action, therefore not only is able to save on the cost of effort, but is also able to divert a fraction of the available resources from their intended use. The private

[7] The bilateral Official Development Assistance (ODA) flows still represent the 75% of the sources of aid.

[8] This paper abstracts from issues of inter-recipient competition for aid, by assuming that this feature may affect budget decision but not the aid allocation process itself.

[9] A static model is obviously an over simplification with respect to reality, where usually there are repeated interactions between donors and recipients. A repeated moral hazard model of aid allocation is explored in Isopi and Mattesini (2009).

benefit b in this model is an indicator of the level of corruption in the economy. With this assumption, we want to stress two main consequences of moral hazard in developing countries: on one side there are the costs generated by an inefficient involvement of the local elites in the realization of development projects (low level of effort), on the other side there is an appropriation of resources that could be employed in the project or transferred to the poor, which is outright corruption.

Assuming, to keep the analysis simple, that type I agents' utility u^e is linear, we have

$$u_0^e = (\gamma + b)[\pi_0 \overline{\theta} f(a) + (1 - \pi_0)\underline{\theta} f(a)] \tag{1}$$

if they undertake the bad action and

$$u_1^e = \gamma[\pi_1 \overline{\theta} f(a) + (1 - \pi_1)\underline{\theta} f(a)] - \psi \tag{2}$$

if they undertake the good action.

The utility function of type II agents, u^p, depends on the final output of the project undertaken by the elite. We also assume a linear utility function for type II agents. The expected utility of the poor, therefore is given by:

$$u_0^p = (1 - \gamma - b)[\pi_0 \overline{\theta} f(a) + (1 - \pi_0)\underline{\theta} f(a)] \tag{3}$$

if type I agents undertake the *bad* action and

$$u_1^p = (1 - \gamma)[\pi_1 \overline{\theta} f(a) + (1 - \pi_1)\underline{\theta} f(a)] \tag{4}$$

if type I agents undertake the *good* action.

The government of the donor country gives aid in order to enhance the development process in the recipient country. A major objective of the donor is to favor the poor and therefore his utility is increasing in the welfare of type II agents. However, the form of the donor's utility function takes into account the effects that its actions have on the utility of type I agents which, in this model, have an active role in the production process. This intends to capture the idea that donors may not be entirely oriented toward the needs of the poor but may also desire to influence the elite of the recipient country for political and strategic/economic reasons.

Hence, the utility function of the donor will be a weighted average of the utility of the two social groups in the recipient country, minus the cost of giving aid, that is:

$$V_d = E[\lambda u^e + (1 - \lambda)u^p] - C(a) \tag{5}$$

where

$$C(a) = \delta a \tag{6}$$

The parameter λ represents the weight that the donor assigns to the utility function of the *elite* of the recipient country. The cost function, which for simplicity we assume linear, represents the opportunity cost for the donor of giving foreign aid. We assume the marginal cost of giving aid $\delta > 0$.

Notice that, in this model, the only variable which agents can contract on is the level of aid. In a situation characterized by moral hazard, where future punishments are excluded by the absence of repeated interactions, the choice of a must take into account the distortion created by asymmetric information.

Usually, in principal-agent models, the principal wishes that the agent undertakes the best level of effort and therefore, an optimal contract can be found by maximizing the principal's objective function under the assumption that the agent undertakes the good action. In our model, however, this is not necessarily true since the donor maximizes a weighted sum of the utility of type I agents and type II agents. In order to correctly specify the optimal contract, therefore, we must first determine whether it is optimal, for a donor, to always induce good behavior by type I agents (i.e. inducing type I agents to always exert the high level of effort).

A donor maximizes his utility under the assumption that type I agents undertake the high level of effort, if the overall utility he obtains in this case is greater than the utility he obtains when type I agents undertake the low level of effort, i.e. whether:

$$\begin{aligned}&[\lambda\gamma + (1-\lambda)(1-\gamma)][\pi_1\overline{\theta}f(a) + (1-\pi_1)\underline{\theta}f(a)] - \lambda\psi \geq \\ &[\lambda(\gamma+b) + (1-\lambda)(1-\gamma-b)][\pi_0\overline{\theta}f(a) + (1-\pi_0)\underline{\theta}f(a)]\end{aligned} \tag{7}$$

Defining, now,

$$\Phi_1 = E(\theta_1) = [\pi_1\overline{\theta} + (1-\pi_1)\underline{\theta}] \qquad and \quad \Phi_0 = E(\theta_0) = [\pi_0\overline{\theta} + (1-\pi_0)\underline{\theta}]$$

after some simple algebra, (7) can be rewritten as:

$$\Big\{[\lambda\gamma + (1-\lambda)(1-\gamma)](\Phi_1 - \Phi_0) + \Phi_0(1-2\lambda)b\Big\}f(a) \geq \lambda\psi \tag{8}$$

If condition (8) is satisfied, substituting (1), (2), (3), (4) and (6) into (5) the donor's maximization problem is given by:

$$\max_a \quad \Phi_1[\lambda\gamma + (1-\lambda)(1-\gamma)]f(a) - \delta a \tag{9}$$

$$sub \quad \Phi_1 \gamma f(a) - \Phi_0 \Big[(\gamma + b)\Big] f(a) - \psi \geq 0 \tag{10}$$

$$\Phi_1 \gamma f(a) - \psi \geq 0 \tag{11}$$

$$a \geq 0 \tag{12}$$

where equation (10) represents the incentive compatibility constraint (to ensure that, once the contract is signed, it will be optimal for the elite to undertake the best action); equation (11) is the individual rationality constraint (to ensure that the recipient will actually want to sign the contract); and equation (12) is the non negativity constraint on a, which rules out the possibility of negative transfers. The solution to this problem will be an optimal aid contract if condition (8) is satisfied.

It is interesting to notice that (8) is always satisfied if $\lambda = 0$. In this case, a donor is not at all concerned about the welfare of the elite of the recipient country and therefore, never derives disutility from the effort undertaken by this social group. When instead a donor is also concerned about the welfare of the elite, i.e. $\lambda > 0$, he must weigh the elite's disutility of effort associated with undertaking the low level of effort.

There are instances, however, when the solution to problem (9)-(12) does not define an optimal contract. This happens: i) if the solution to problem (9)-(12) does not satisfy condition (8), i.e. the donor's utility function increases when the elite undertakes the bad action; ii) if $\Big[(\Phi_1 - \Phi_0)\gamma - \Phi_0 b\Big] < 0$, which implies that the set of contracts that satisfies (10) is always empty, in which case a donor will never be able to induce good behavior by offering an appropriate level of aid. In both cases the optimal level of aid is given by the solution to the following maximization problem:

$$\max_a \quad \Phi_0 \Big[\lambda(\gamma + b) + (1 - \lambda)(1 - \gamma - b)\Big] f(a) - \delta a \tag{13}$$

$$sub \quad a \geq 0 \tag{14}$$

Denote, now, by $F(\gamma, \lambda) = [\lambda\gamma + (1 - \gamma)(1 - \lambda)]$, by $B(\gamma, b) = (\Phi_1 - \Phi_0)\gamma - \Phi_0 b$, by a^* the optimal level of aid, and definite $g(a) = f'^{-1}(a)$. We can state the following:

Proposition 1. *Suppose* $B(\gamma, b) > 0$ *and* $g\Big(\frac{\Phi_1 F(\gamma,\lambda)}{\delta}\Big)\Big[\frac{(1-\lambda)(\Phi_1-\Phi_0)-(1-2\lambda)B(\gamma,b)}{\lambda\gamma}\Big] \geq \psi$*, such that there always exists a level of aid at which both the donor and the elite of the recipient country are better off when* $i = 1$ *is chosen. Then we can have:*

1. *If* $f\Big(\frac{\Phi_1 F(\gamma,\lambda)}{\delta}\Big)B(\gamma, b) - \psi > 0$*, no incentive mechanism is necessary to induce high effort. The optimal level of aid is given by the first best equilibrium and is such that*

$$f'(a^*)\Phi_1 F(\gamma, \lambda) = \delta \tag{15}$$

2. *If* $f\Big(\frac{\Phi_1 F(\gamma,\lambda)}{\delta}\Big)B(\gamma, b) - \psi < 0$*, a donor will impose an incentive mechanism and the*

optimal level of aid is such that:

$$B(\gamma, b)f(a^*) = \psi \qquad \frac{\partial a^*}{\partial b} > 0 \tag{16}$$

Suppose, now $B(\gamma, b) \leq 0$ *and/or* $g\left(\frac{\Phi_1 F(\gamma,\lambda)}{\delta}\right)\left[\frac{(1-\lambda)(\Phi_1-\Phi_0)-(1-2\lambda)B(\gamma,b)}{\lambda\gamma}\right] < \psi$*, such that it is not possible to find a level of aid at which both the donor and the elite of the recipient country are better off when* $i = 1$ *is chosen. In equilibrium, type I agents always choose a level of effort* $i = 0$*.*

3. *If* $\left(\frac{\Phi_0(F(\gamma,\lambda)-(1-2\lambda)b)}{\delta}\right) > 0$*, it is always possible to find a positive level of aid where the benefits perceived by the donor are always greater than the costs induced by corruption. The optimal level of aid is given by:*

$$f'(a^*)\Phi_0\left[F(\gamma, \lambda) - (1 - 2\lambda)b\right] = \delta \tag{17}$$

Depending on the value of λ *we have*

$$\begin{array}{rcll} \dfrac{\partial a^*}{\partial b} & > & 0 \qquad if & \lambda > \dfrac{1}{2} \\ \dfrac{\partial a^*}{\partial b} & < & 0 \qquad if & \lambda < \dfrac{1}{2} \end{array}$$

4. *If* $\left(\frac{\Phi_0(F(\gamma,\lambda)-(1-2\lambda)b)}{\delta}\right) < 0$*, the level of corruption is so high that the costs for the donor of giving aid will never outweigh the benefits. Then equilibrium implies no aid, i.e.:*

$$a^* = 0 \tag{18}$$

Our model identifies four possible equilibria. The first two are obtained when it is possible to find a level of aid at which both the donor and the elite are better off when the elite undertakes the good action. The remaining two are obtained when such a level of aid can never be found, and imposing an incentive mechanism is never optimal, because is too costly and/or ineffective.

Let us first concentrate on equilibria 1 and 2, which occur only when the composite parameter $B(\gamma, b) > 0$. In this case, the optimal contracts are determined either by equilibrium 1 or by equilibrium 2 depending on the composite parameters $F(\gamma, \lambda)$ and $B(\gamma, b)$. Notice that $F(\gamma, \lambda) = [\lambda\gamma + (1 - \gamma)(1 - \lambda)]$ is the sum of two terms: i) the weight a donor assigns to the elite in his utility function multiplied by the share of output the elite receives and ii) the weight a donor assigns to the poor multiplied by the share of output the poor receive. The composite parameter $B(\gamma, b) = (\Phi_1 - \Phi_0)\gamma - \Phi_0 b$, instead, can be interpreted as the expected gain the elite obtains from undertaking the highest level of effort.

If equilibrium 1 prevails, the economy reaches the first best equilibrium. In this case, the net gain for the elite from undertaking $i = 1$ is always greater than the disutility of effort. In other words, the moral hazard issue is not relevant and the optimal contract is always incentive compatible, i.e. at this level of aid the local elite does not have any incentive to undertake the low level of effort and capture private benefits. Corruption, therefore, for the donor is not a relevant problem, and the size of the aid transfer in this first equilibrium reflects only the preferences of the donor either for the elite, (λ), and toward the poor, (1-λ), the donor's marginal cost of giving aid, (δ) and the share of output that goes respectively to the elite (γ) and to the poor $(1-\gamma)$.

The second possible equilibrium of the model occurs when $g\Big(\frac{\Phi_1 F(\gamma,\lambda)}{\delta}\Big)B(\gamma,b) - \psi < 0$. Technically, this result is obtained when the incentive compatibility constraint is binding. In this case, the donor induces type I agents to undertake the high level of effort by choosing an appropriate level of aid. In this equilibrium, the level of aid is not influenced by the donor's preferences but is increasing in the level of effort and decreasing in the composite parameter $B(\gamma, b)$. Since $B(\gamma, b)$ is decreasing in b, an increase in the private benefit will induce donors to grant a higher volume of aid. If the donor perceives that the local elite responds to incentives, and knows that type I agents will choose the good action only if they find it worthwhile, it will be optimal to provide a larger amount of aid the larger is the risk that effort is low and that aid is diverted. In this situation, where donors can only act on the size of the aid transfer, a donor is aware that the elite of the recipient country will work toward the success of the project only if the amount of aid is large and it is able to obtain a significant size of it. An increasing relationship between the size of aid and the private benefit may, therefore, be the consequence of a simple consideration: only by providing a sufficient amount of transfers it is possible to avoid the failure of aid programs, even if this implies rewarding excessively local elites.

The occurrence of equilibria 3 and 4 is due to two possible factors: either when $B(\gamma, b) < 0$ or/and when $g\Big(\frac{\Phi_1 F(\gamma,\lambda)}{\delta}\Big)\Big[\frac{(1-\lambda)(\Phi_1-\Phi_0)-(1-2\lambda)B(\gamma,b)}{\lambda\gamma}\Big] < \psi$. When $B(\gamma, b) < 0$ the private benefit the elites of the recipient country are able to extract is so high that there is no level of aid that guarantees incentive compatibility. Since it is not possible for the donor to induce type I agents to undertake the high level of effort, he reasonably determines the optimal amount of aid under the assumption that type I agents always undertake the low level of effort. When $g\Big(\frac{\Phi_1 F(\gamma,\lambda)}{\delta}\Big)\Big[\frac{(1-\lambda)(\Phi_1-\Phi_0)-(1-2\lambda)B(\gamma,b)}{\lambda\gamma}\Big] < \psi$ condition (8) does not hold and donors find it optimal that type I agents undertake the low level of effort. This may happen, for example, because donors, for strategic/economic reasons may want to favor local elites by letting them enjoy higher private benefits or bear lower costs of effort. In both cases, the optimal contract is a solution to problem (13)-(14).

Equilibrium 3 implies a positive level of aid, while equilibrium 4 implies zero aid. The optimal level of aid defined by the third equilibrium depends crucially on the private benefit

b and on the preferences of the donor country towards for the two social groups of the recipient country. If $\lambda > \frac{1}{2}$, then donor's utility is increasing in the welfare of type I agents and, as a consequence, the optimal level of aid is also an increasing function of the private benefit b. If instead $\lambda < \frac{1}{2}$, then a donor is mainly concerned about the effect of aid on the welfare of the poor, and since the higher is b the lower is the amount of resources that are going to reach the poor, aid will be a decreasing function of b.

In equilibrium 4, being $\lambda < \frac{1}{2}$, donors are again characterized by altruistic motivations but in this case the level of b is so high that donors prefer to deny aid to the recipient country: the donor is aware that foreign aid funds will be wasted, going only to enrich the local elites and therefore, optimality requires no aid.

3 Empirical Analysis

3.1 Definitions of Variables and Data Issues

In line with the empirical literature on foreign aid allocation, we study the motivations behind development assistance by regressing the *Aid/GDP* ratio, for each donor, on a series of explanatory variables that describe the main institutional and economic features of the recipients. Our sample covers 168 recipients and 14 donors, members of the Development Assistance Committee (DAC) of the OECD, spanning the period 1985-2006.

As suggested by McGillivray and White (1993), we use, as dependent variable, *Aid Commitments* rather than disbursements[10] and we include, among the explanatory variables, indicators of recipient needs (which reflect the altruistic motive for giving aid) and donors' strategic/economic interests. The data for aid commitment are obtained by the PLAID database, which is a new database on aid that encompasses multilateral and bilateral donor aid projects form 1945 to 2009. It contains information from traditional aid sources such as the OECD's Creditor Reporting System (CRS) as well as donors not captured by the CRS and activities that do not fit the OECD definition of Official Development Assistance (ODA).

Most donors target a selected group of recipients, giving a positive amount of aid to some countries and nothing to others. Our dependent variable, *Aid Commitments relative to GDP*, is therefore only partly continuous with positive probability mass at zero. Since the

[10] A commitment is a firm obligation expressed in an agreement or equivalent contract and supported by the availability of public funds, undertaken by the government, an official agency of the reporting country or an international organization, to furnish assistance of a specified amount under agreed financial terms and conditions and for specific purposes, for the benefit of a recipient country. A disbursement represents the actual international transfer of financial resources. They may be recorded at one of several stages: provision of goods and services, placing of funds at the disposal of the recipient in an earmarked fund or account, withdrawal of funds by the recipient from a earmarked fund or account payment by the donor of invoices on behalf of the recipient. The disbursement mechanism used tends to vary as a function of the type of financial (or technical) co-operation flow involved. Regarding the choice between aid per capita and aid in levels in foreign aid allocation regressions see McGillivray and Oczkowski (1992), and Neumayer (2003).

dependent variable is left censored, the estimation method that is most commonly used in aid allocation models is the Tobit model [11]. This method takes into account the endogenous selection of recipients, and estimates the determinants of the aid commitments/GDP ratio in one step.

The most relevant indicator of recipient needs is a country's per capita income, measured at international prices, *GDP per capita*. We expect this variable to have a negative sign for those donors who target their transfers according to recipients needs.

In order to test whether donor countries value the level of democracy as an important goal of aid assistance, we also include in our regressions the Index of Civil Liberty by the Freedom House, labeled *Democracy* [12].

Donors' strategic and economic interests are measured using a series of variables that reflect historical or economic ties between donor and recipient countries. The variable *Colony* is a dummy indicating whether the recipient country was a colony or was administered as a protectorate by the donor prior to independence[13]. Former colonial powers usually have remaining political, economic, cultural and other interests in their former colonies. In the case of the United States, we consider two other dummy variables *Egypt* and *Israel* that take into account the high volume of aid traditionally granted to these countries. Moreover, always for the USA, we include a measure of political proximity labeled *UN*, which measures the voting behavior of the country in the UN General Assembly, i.e. the percentage of times in which the country has voted in line with the United States. Some degree of donors' strategic/economic interest may also be reflected by the variable *Military Expenditure*, which is measured as the amount of military expenditures of the recipient scaled by GDP. A last important variable reflecting donors' economic interests is the variable *Trade*, which measures bilateral trade, and is given by the sum of the exports and imports between a donor and recipient country[14] .

[11]For an extensive discussion of this estimation method in the context of aid allocation, see Neumayer (2003). See also Berthelemy and Tichit (2005) and McGillivray (2004).

[12]This index measures freedom according to two broad categories: political rights and civil liberties. Political rights enable people to participate freely in the political process, including the right to vote, compete for public office, and elect representatives who have a decisive impact on public policies and are accountable to the electorate. Civil liberties allow for the freedom of expression and belief, associational and organizational rights, rule of law, and personal autonomy without interference from the state. The survey includes both analytical reports and numerical ratings for 192 countries and 18 select territories. Each country and territory is assigned a numerical rating, which is calculated based on the methodology described below, on a scale of 1 to 7. The total number of points awarded to the political rights and civil liberties checklists determines the political rights and civil liberties ratings. Each point total corresponds to a rating of 1 through 7, with 1 representing the highest and 7 the lowest level of freedom.

[13]Other papers, such as Alesina and Weder (2002) use instead the number of years a recipient country has been a colony of the donor in the last century. Unfortunately, these data were not available to us.

[14]Differently from other papers, where the economic interests of the donor are usually measured by the ratio of the sum of exports and imports over its GDP, here we use the simple sum of bilateral exports and imports in order to capture the measure of interest that the donor has for the economy of the recipient country; foreign development assistance based on self interest will be biased toward countries that tend to have more trade with the donor.

As we argued in the previous pages, the possibility to capture private benefits may significantly undermine the success of development projects, and therefore, donors that are particularly interested in the results of their efforts will pay close attention to this phenomenon, which we measure in this paper through the variable *Corruption*. Following the existing literature, we use the index provided by the *International Country Risk Guide*(ICRG)[15].

Although it doesn't have a clear interpretation in terms of altruism, strategic/economic motivations or efficiency considerations, we include among the regressors also the variable *Population*, which is a measure of the size of the country. By doing this, we follow the existing literature which has found, in many cases, the presence of a significant population bias in aid allocation.

The costs for a donor of providing aid are proxied, in this analysis, by the variable *Budget Deficit*, which is simply the annual government surplus of every single donor as a percentage of GDP. The higher is the deficit (i.e. the lower is the surplus), the higher the competing claims for government resources inside the donor country and the lower the amount of funds available for foreign aid assistance, i.e. the higher is the cost of providing aid.

3.2 Empirical Strategy

Our empirical strategy is based on the results of the the model analyzed in section 2, which admits four possible equilibria. In the first equilibrium the incentive compatibility constraint does not bind and therefore donors do not face a meaningful moral hazard problem. The optimal level of aid is simply determined by the equality between marginal benefits and marginal costs of aid and does not depend on corruption. The empirical implication is straightforward: a non significant relationship between the *Aid/GDP* variable and the corruption indicator signals that a donor is allocating foreign aid following the first equilibrium of the model.

A positive relationship between aid and corruption is consistent either with the second equilibrium or with the third equilibrium when $\lambda > 1/2$[16]. In the former case, donors use the amount of aid as an incentive mechanism, i.e. they allow some corruption to compensate local elites for their effort and to induce them to work toward the success of development projects. In the latter case, instead, donors do not impose any incentive mechanism but simply allow local elites to capture a large part of the aid flows for strategic or economic reasons. It is not possible to discriminate between these two equilibria only on the basis of the sign of the variable *Corruption*. Notice however that the third equilibrium

[15]This index is one of the most frequently used measure of corruption and as shown by Alesina and Weder, is widely correlated with other existing measure of the same phenomenon.

[16]Remember that the qualitative index of corruption that we are using in the paper associates higher points (from 1 to 6) to less corrupt countries.

is characterized by using aid as a foreign policy instrument, while the second equilibrium indicates an attempt to induce the local elite to work in a direction that would ultimately benefit the poor. Empirically, we try to capture this difference by including a pure indicator of economic/strategic interests, i.e. the variable *Military Expenditure*. If a donor gives more aid to more corrupt countries and, at the same time, favors countries that spend a larger part of their GDP on military expenditures, then we conclude that its aid policy is strongly conditioned by strategic and political considerations.

Finally, a donor that allocates aid to less corrupt countries behaves consistently with the third equilibrium of the model when $\lambda < 1/2$. A negative sign of the variable *Corruption* therefore is interpreted as a sign of altruistic behavior. Since in corrupt countries aid goes mainly to local elites, a donor that privileges less corrupt countries is pursuing aid allocation policies that are more likely to benefit the poor.

Our model has also a fourth equilibrium in which the donor prefers not to give any aid. In this equilibrium, our dependent variable must take a zero value and this is indeed the case: for all donors there exist some potential recipients that do not receive any aid. In order to take this into account, we use an estimation method that explicitly deals with the censored nature of the dependent variable.

3.3 The Determinants of the Aid Allocation

Consistently with Alesina and Weder (2002), we run a set of Tobit regressions for every donor country included in the sample. The analysis however differs in some important respects: we use as dependent variable *Aid/GDP* instead of aid per capita and a larger set of regressors; we consider a longer time span, i.e. 1985-1995 and 1996-2006 decades, and we take into account the panel dimension of the data.

The specification we estimate in this paper is similar to the one provided by Alesina and Weder. In our equations, *Aid Commitments/GDP* are regressed on *GDP per capita*, *Population*, *Democracy*, *Corruption*, *Trade*, *Colony* and, for the USA, we add also the variables *UN* to capture strategic interests and the dummies for *Egypt* and *Israel*. We then include the variable *Budget Deficit* in order to control for the opportunity cost of aid giving, and the variable *Military Expenditure* to control for strategic interests.

For every donor country we provide two sets of estimates. In the first set, we estimate a panel Tobit model with random effects. In the second set of regressions, we estimate an IV Tobit model to explicitly address the possible endogeneity between aid and corruption. The possibility that an increase in foreign aid levels affects the degree of corruption cannot in fact be excluded *a priori* and, indeed, there is a handful of papers that suggests that reverse causality may characterize the relationship between aid and corruption. Svensson (2000) estimates a 2SLS model of rent seeking and aid, using as instrument an indicator of

ethnic fractionalization. Tavares (2003) addresses the causality issue by instrumenting the level of aid with proximity variables multiplied by aid outflows. He concludes that actually foreign aid decreases corruption. Alesina and Weder (2002) evaluate the dynamic effects of an increase in the level of aid on corruption lumping, however, all donors together.

In this paper, in order to deal properly with this issue, we would need an estimator that is able to take into account, at the same time, the censored nature of the dependent variable, the panel dimension of our sample and the possible endogeneity of the variable *Corruption*. Since such estimator cannot be easily implemented, we decide to separately run a set of Tobit IV regressions instrumenting the variable *Corruption* by the variable *Ethnic Tensions*, which is an assessment of the degree of tension within a country attributable to racial, nationality, or language divisions. Lower ratings are given to countries where racial and nationality tensions are high because opposing groups are intolerant and unwilling to compromise. We think that this variable is a valid instrument since while a high level of ethnic tension often leads to political patronage, corruption and rent seeking, aid allocation is not directly affected by it.

The results of our panel Tobit regressions are reported in tables (3), (5) and (7), while the results of the Tobit IV regressions are reported in tables (4), (6) and (8). Consistently with the aid allocation literature, all countries show a mix of altruistic motives and strategic/economic considerations in their aid allocation choices. The variable *GDP per capita*[17] is negative and highly significant in all equations and in all the periods taken into account in the panel estimates, showing that all donors consistently tend to give a larger amount of aid to poorer recipients[18]. Also the well known bias toward smaller countries is confirmed by our results: in a large part of our regressions the variable *Population* is negative and significant and in few equations insignificant. The variable *Democracy* is significant for all donors[19] and enters with a negative sign. These results seem to indicate that donors tend to favor democratic countries and, sometimes, use aid as an instrument to promote democracy in the developing world.

There is, however, a clear bias, in aid flows, towards those recipients that have strong political, historical and economic ties with donors. For France, UK, Spain and Australia the coefficient of the variable *Colony*, when included in the regression, is positive and significant. Italy and the Netherland, instead, show a non significant relationship. The USA give a strong preference to Israel (less towards Egypt) in the all sample and in the period 1985-

[17] As sensitivity analysis, we also included in the regression the *Human Development Index*, which is a wider indicator of the country's welfare in order to test donors behavior towards another indicator of recipients' needs. This variable, however, turned out to be almost never significant when combined with *GDP per capita* and therefore, we decided to drop it from the regressions.

[18] However, in some of the IV Tobit estimates and for some donors *GDP per capita* shows a positive impact on aid

[19] Surprisingly, it is however insignificant in the IV Tobit regressions for the period 1985-06.

1995 but not in the sub-sample 1995-2006 where it becomes non significant[20]. The variable *UN* is negative and significant in the panel Tobit regression for the sub-sample 1985-1995 whereas it is non significant elsewhere. As we just said, for all donors and for the majority of the equations, the coefficient of the variable *Trade* is almost always significant and positive. The aid decision is also affected by the situation of the public budget, which represents a measure of the cost, for the donor country, of giving aid. In some cases (Denmark, France, Italy and the Netherlands) and in many periods it seems that an increase in the *Budget Deficit* had a negative effect on aid, although in a other cases (Australia, Finland, Japan, Norway and UK) there is also a positive relationship. The variable *Military Expenditure* is often very significant and sometimes it is also negatively related to aid.

Summing up, our regressions show that bilateral aid is the result of many conflicting motivations: while the effect of the variables *GDP per capita* and *Democracy* indicate that donors favor on average poorer and more democratic recipients, the significance of variables like *Trade, Colony* and to a much smaller extent *Military Expenditure,* suggests that political and economic considerations enter also the aid allocation decisions.

3.4 The Effect of Corruption on Aid

Wide differences instead arise among donors when we analyze whether in allocating aid they take into account the level of corruption in the recipient country. In table (1), we report the sign of the variable *Corruption* in all our regressions for all the periods taken into account.

Notice first that for Canada, Norway and the UK the coefficient of the variable *Corruption* is positive and more significant in the panel compared to the IV Tobit for the whole sample. The relationship is strong for Norway where the sign of the coefficient is positive and highly significant in almost all equations for the whole sample period and for the first subperiod. For the UK, the variable *Corruption* enters positively and significantly in all the Tobit regressions but only in the second subperiod of the IV Tobit regressions. These results suggest that those donors tend to favor less corrupt recipients. Recall that, according to our model, a negative relationship between aid and corruption (a positive sign of our variable) is an unambiguous indicator of what we label as "altruistic" behavior. Donors that know they can hardly affect corruption through their aid policies but care about recipients' needs tend to privilege less corrupt countries, since they are aware that a higher level of corruption means fewer resources to the poor.

The level of corruption, instead, does not affect aid allocation decisions in the Australia, Denmark, Italy, Spain, Sweden and USA in the whole sample and the first subperiod of the panel regressions. This result holds in the IV Tobit estimates for Australia, Denmark and USA, whereas Italy, Spain and Sweden turn out with a positive sign. In the regressions

[20]This probably reflects the shift occurred in US aid allocation policies after September 2001.

Table 1: Sign of the variable *Corruption*

	1985-2006		**1985-1995**		**1995-2006**	
	XTTOBIT	IVTOBIT	XTTOBIT	IVTOBIT	XTTOBIT	IVTOBIT
Australia	ns	ns	ns	ns	ns	ns
Canada	+	ns	ns	ns	+	ns
Denmark	ns	ns	ns	ns	ns	+
Finland	-	-	ns	-	-	ns
France	-	+	ns	+	-	ns
Germany	-	+	ns	ns	-	ns
Italy	ns	+	ns	+	-	+
Japan	-	+	ns	+	ns	+
Netherlands	-	ns	ns	ns	ns	ns
Norway	+	+	+	+	ns	+
Spain	ns	+	+	ns	ns	+
Sweden	ns	+	ns	ns	ns	+
UK	+	ns	+	ns	+	ns
USA	ns	ns	ns	ns	-	ns

relative to those donors the variable *Corruption* is (almost) never significant, showing that their aid policies are well captured by the first equilibrium of our model in which aid allocation decisions are mainly driven by factors concerning donors' preferences rather than recipients' behavior[21].

There is a third group of donors that seems to give more aid to more corrupt recipients: Finland, France, Japan, Germany and to some extent the Netherlands.

This results holds for the all sample and second period regressions in the panel estimates but only for Finland in the IV Tobit estimates. In fact, for France, Germany and Japan in the IV Tobit estimates, the coefficient becomes positive and significant in the whole sample period and in the first subperiod but insignificant in the second subperiod. Since in this second set of regressions we explicitly try to take into account the possible endogeneity of aid with respect to corruption, we take these results as an indication that indeed the negative sign of the variable *Corruption* might reflect the impact of corruption on aid. Considering that those we just mentioned are all large donors, it is quite plausible that the high volumes of aid granted to some countries create an environment conducive to more corruption and rent seeking.

As we explained above, a positive relationship between aid and corruption could signal two possible equilibria. One, in which donors use aid to provide the *right* incentives to local elites; the other one, where donors cannot impose an incentive mechanism. In this case, since they highly value the welfare of the elite for strategic-economic reasons, the level of aid will be increasing on corruption. As we argued above, to discriminate between these

[21] In the case of Netherlands, this maybe due to the fact that selectivity criteria have been introduced only in the 1999 when minister Herfkens got the minister.

two hypotheses we use the variable *Military Expenditure*.

When we consider the impact of this variable in the regressions concerning France, Germany and Japan we notice that this variable is negative and significant in both panel and IV Tobit regressions for the whole period[22]. This result is also confirmed in the two subperiods 1985-06 and 1985-95 panel and in the IV Tobit estimates even if in this last case the relationship is not very strong. This lead us to conclude that there is a bunch of donors that is willing to accept some degree of corruption hoping that this will ultimately benefit the poor in the recipients country.

4 Conclusions

In this paper, we focus on the determinants of the relationship between aid and corruption. We consider a static principal-agent model, where a donor faces the problem of giving aid to a recipient country in which the phenomenon of corruption is widely spread. Our model suggests that there can be four types of equilibria. In the first one, the moral hazard problem is not perceived as relevant and foreign aid depends only on the preferences of the donor. In the second equilibrium, moral hazard is a relevant issue and the donor decides to use aid transfers to reduce the incentives for local elites to divert resources from their intended use. In the third and fourth equilibria, the set of incentive compatible contracts is empty. Donors know that they cannot use aid to provide the *right* incentives and therefore react to corruption according to their individual preferences: a donor which is driven by strategic or economic interests may simply use aid to obtain the support of the local elites. A donor, instead, highly concerned that aid reaches people in need can decide to allocate more aid to less corrupt recipients or even to deny aid to the highly corrupt ones. We use the implied signs of the aid-corruption relationship to discriminate empirically the various motivations behind aid allocation. Our empirical results allow us to group donors into three categories. The first one, which includes Canada, Norway and the UK that gives less aid to more corrupt recipients. As a consequence, we label them as *altruistic* donors. The second category of donors (Australia, Denmark, Italy, Spain, Sweden and the USA) does not seem to be influenced by the level of corruption in allocating foreign aid. For the remaining donors (Finland, France, Japan, Germany and the Netherlands) instead the aid-corruption relationship is positive. The results from the panel Tobit estimates seem to suggest that these donors try to induce incentives in the local elites. Although, the IV Tobit estimates show that at least for France, Germany and Japan some level of endogeneity could not be excluded.

Summing up, even though the recent debate on foreign aid emphasizes the importance

[22]In the case of Finland the variable *Military Expenditure* is always non significant though sometimes positive.

of making a more efficient use of funds, we do find that the majority of donors included in our sample seem to allocate aid independently of the level of corruption. Consistently with the existing literature, the Scandinavian countries never reward higher corruption. There is, however, a minority of donors that try to use aid as an instrument to fight corruption.

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A Appendix

Proof 1. *Consider first the case* $B(\gamma,b)>0$ *and* $g\Big(\frac{\Phi_1 F(\gamma,\lambda)}{\delta}\Big)\Big[\frac{(1-\lambda)(\Phi_1-\Phi_0)-(1-2\lambda)B(\gamma,b)}{\lambda\gamma}\Big]\geq\psi$. *First, notice that if the incentive compatibility constraint* (10) *is satisfied, then:*

$$\Phi_1\gamma f(a)-\Phi_0(\gamma+b)f(a)\geq\psi \tag{19}$$

which implies that the individual rationality constraint (11) *is also satisfied. Assume, now, condition* (8) *is satisfied and that the incentive compatibility constraint is not binding. In this case, an optimal contract is a solution to problem* (9)- (12) *and, since we have assumed that the incentive compatibility constraint is not binding, the solution to the maximization problem is given by* (15).

Substituting (15) *into* (10) *and rearranging, we obtain:*

$$g\Big(\Phi_1\frac{F(\lambda,\gamma)}{\delta}\Big)\Big[(\Phi_1-\Phi_0)\gamma-\Phi_0 b\Big]-\psi\equiv g\Big(\frac{\Phi_1F(\gamma,\lambda)}{\delta}\Big)B(\gamma,b)-\psi\geq 0$$

Now, if (8) *is satisfied, then* (15) *is an equilibrium, since the incentive compatibility constraint will never be binding. Notice also that in this case, given that we have assumed* $g\Big(\frac{\Phi_1F(\gamma,\lambda)}{\delta}\Big)\Big[\frac{(1-\lambda)(\Phi_1-\Phi_0)-(1-2\lambda)B(\gamma,b)}{\lambda\gamma}\Big]\geq\psi$, *condition* (8) *will always be satisfied.*

Suppose, now, that after substituting (15) *into* (10), *we get* $f\Big(\frac{\Phi_1F(\gamma,\lambda)}{\delta}\Big)B(\gamma,b)-\psi<0$. *In this case, contract* (15) *does not satisfy the incentive compatibility constraint* (10) *and therefore, the incentive compatibility constraint must be binding. The equilibrium contract can be found solving for the aid transfer that satisfies* (10) *as an equality, which implies that equation* (16) *is an equilibrium of the model. Notice that, since* $f\Big(\frac{\Phi_1F(\gamma,\lambda)}{\delta}\Big)<\frac{\psi}{B(\gamma,\lambda)}$, *this contract also satisfies condition* (8).

Consider now the case $B(\gamma,\lambda)\leq 0$ *and/or* $g\Big(\frac{\Phi_1F(\gamma,\lambda)}{\delta}\Big)\Big[\frac{(1-\lambda)(\Phi_1-\Phi_0)-(1-2\lambda)B(\gamma,b)}{\lambda\gamma}\Big]<\psi$. *In this case, either the set of incentive compatible contracts is empty or the donor prefers that type I agents choose the low level of effort. The optimal contract will be the solution to problem* (13)-(14). *If* $\Big(\frac{\Phi_0(F(\gamma,\lambda)-(1-2\lambda)b)}{\delta}\Big)>0$, *then equation* (17) *is an equilibrium of the model. If however* $\Big(\frac{\Phi_0(F(\gamma,\lambda)-(1-2\lambda)b)}{\delta}\Big)\leq 0$, *then there exists no positive level of a that solves problem* (13)-(14) *and therefore,* $a^*=0$ *is the solution.* *Q.E.D.*

B Tables

Table 2: Variables and Source

Variable	**Description**	**Source**
Aid/GDP	Total real ODA commitments as a percentage of the GDP of the recipient country	PLAID 1.9 Database OECD Creditor and Reporting System
GDP per capita	Real GDP per capita in constant dollars (base year 2000)	World Bank, World Development Indicators (2007)
Trade	Net bilateral exports between donor and recipient country	IMF bilateral trade statistics
Population	Population expressed in millions, total	World Bank, World Development Indicators
Democracy	House Democracy Index	Freedom House Evaluation website
Military Expenditure	Military expenditure of the recipient country as a percentage of the GDP	World Development Indicators (2007)
Budget Deficit	Overall budget balance is current, capital revenue and official grants received less total expenditure and lending minus repayments	OECD Statistics
Corruption	Political Risk Services	http://www.prsgroup.com
Ethnic Tensions	Political Risk Services	http://www.prsgroup.com
UN Votes	E. Voeten and A. Merdzanovic United Nations General Assembly Voting Data	hdl: 1902.1/12379
Colony	Dummy Variable	Authors Calculations

Table 3: Tobit Results for 1985-2006

	GDP per capita	Population	Trade	Democracy	Colony	Egypt	Israel	UN Vote	Corruption	Budg. Def	Milit. Exp.	Constant	Observations	Number of id
Australia	-1.30606	0.08014	0.50674	-0.24037	5.54141				0.07811	0.08411	-0.08523	1.3102	1461	90
	(6.81)***	-0.49	(6.06)***	(3.68)***	(6.02)***				0.77	(2.50)**	-1.51	-0.67		
Canada	-2.10864	-0.23901	0.17615	-0.0966					0.14298	0.00548	0.01027	18.3588	1383	91
	(14.90)***	(1.78)*	(2.58)***	(2.38)**					(2.53)**	-0.44	-0.89	(11.52)***		
Denmark	-2.05751	0.25074	0.36914	-0.5339					-0.04453	-0.14975	-0.03651	8.54252	1396	91
	(6.45)***	-0.9	(1.78)*	(5.31)***					0.28	(2.58)***	-1.24	(3.11)***		
Finland	-1.87812	0.00621	0.38462	-0.26863					-0.23409	0.0497	0.01899	9.95724	1387	91
	(10.27)***	-0.04	(4.85)***	(4.54)***					(2.71)***	(3.00)***	1.18	(5.22)***		
France	-0.9896	0.05581	0.31476	-0.27883	3.54804				-0.2718	-0.08911	-0.10829	6.75371	1388	90
	(4.93)***	-0.32	(2.39)**	(4.45)***	(6.91)***				(3.21)***	(2.00)**	(4.00)***	(3.13)***		
Germany	-1.55309	0.42365	-0.06984	-0.30241					-0.32283	-0.02771	-0.06435	16.02567	1396	91
	(7.67)***	(2.39)**	-0.42	(4.64)***					(3.53)***	-0.84	(3.18)***	(8.21)***		
Italy	-2.2834	-0.4642	0.64426	-0.2754	1.37258				-0.12937	-0.12847	-0.02922	12.3299	1386	90
	(9.85)***	(2.53)**	(4.77)***	(4.68)***	-0.73				1.6	(6.68)***	(1.78)*	(5.66)***		
Japan	-1.57136	0.45767	0.11339	-0.41725					-0.17794	0.03315	-0.05113	12.98739	1375	90
	(6.15)***	(2.15)**	-0.92	(6.97)***					(2.04)**	(1.84)*	(2.81)***	(5.35)***		
Netherland	-2.52972	-0.23305	0.3293	-0.38401	-0.51157				-0.20076	-0.09572	-0.01594	20.0685	1386	90
	(11.36)***	-1.33	(2.65)***	(7.51)***	-0.25				(2.88)***	(4.24)***	-1.1	(10.10)***		
Norway	-2.05815	0.27753	0.1028	-0.12954					0.30652	0.1718	-0.00104	11.72553	1349	91
	(10.28)***	-1.36	-1.24	(1.89)*					(3.18)***	(11.11)***	0.06	(4.81)***		
Spain	-1.95752	-0.28893	1.00118	-0.2269	3.91263				0.04826	1.01041	-0.03116	1.9969	1380	90
	(8.39)***	-1.46	(6.88)***	(2.50)**	(6.58)***				0.34	(18.04)***	1.14	-0.89		
Sweden	-2.43881	-0.23263	0.60749	-0.35041					0.05742	-0.01853	0.02188	12.72225	1389	91
	(12.01)***	-1.1	(5.69)***	(5.37)***					0.62	-1.23	1.22	(5.40)***		
UK	-2.56124	0.30485	0.21171	-0.52922	1.88319				0.20486	0.06312	-0.06019	15.72862	1385	90
	(9.23)***	-1.35	-1.14	(7.20)***	(3.57)***				(2.00)**	(2.52)**	(2.75)***	(6.41)***		
USA	-2.20089	-0.50871	0.53637	-0.36283	0.31675	2.2576	5.54926	-0.89026	-0.12972	-0.01129	0.01746	17.99888	1369	90
	(9.84)***	(2.42)**	(4.40)***	(5.05)***	-0.2	-1.3	(2.01)**	-1.29	1.4	-0.33	-0.88	(10.43)***		

Method of estimation: Random-effects Tobit model

Standard errors are displayed below the coefficients and z provides information regarding the statistical significance of the variables.

Table 4: IV Tobit Results: 1985-2006

	GDP per capita	Population	Trade	Democracy	Colony	Egypt	Israel	Un Votes	Corruption	Budg. Def	Milit. Exp.	Constant	Observations
Australia	0.05343	-0.54833	1.15186	-0.10091	-0.27364				2.10886	0.30204	-0.05731	-0.09005	1445
	(15.10)***	(3.40)***	(14.81)***	(7.49)***	(5.30)***				1.39	(12.05)***	-1.19	-0.15	
Canada	-2.51776	-0.64002	0.55887	-0.11248					0.728	0.03704	-0.01114	17.04868	1367
	(20.53)***	(8.68)***	(9.40)***	(1.72)*					1.28	-0.75	-0.65	(11.93)***	
Denmark	0.09237	-0.04765	0.00429	-0.09439					3.72572	0.37675	-0.08899	1.69337	1380
	(3.02)***	-1.54	(1.94)*	(1.71)*					1.6	(13.72)***	-1.41	-1.19	
France	-2.17081	0.06331	0.39602	0.5395	2.29524				6.68248	0.62829	-0.22426	-5.71619	1373
	(5.80)***	-0.21	(1.82)*	(1.76)*	(3.26)***				(2.32)**	(1.97)**	(2.65)***	-0.79	
Germany	-1.8059	0.62602	-0.33144	0.03905					2.75932	-0.04033	-0.10306	11.5128	1380
	(10.59)***	(2.69)***	(1.89)*	-0.27					(1.98)**	-0.76	(2.42)**	(3.07)***	
Italy	0.03187	-0.21745	0.04677	-0.10145	1.48793				3.46369	0.18464	-0.08231	1.09542	1371
	(14.07)***	(3.05)***	(1.86)*	(7.25)***	(1.65)*				(3.96)***	(2.47)**	(2.53)**	(2.53)**	
Finland	-1.76989	-0.04718	0.00087	-0.61737					-3.86227	-0.07394	0.14646	22.28109	1371
	(6.15)***	(1.77)*	(4.10)***	(2.83)***					(1.80)*	-1.32	(2.80)***	(3.78)***	
Japan	-2.23066	0.71076	-0.11924	-0.04125					4.15506	-0.18661	-0.13551	1.10577	1360
	-0.85	(4.48)***	(2.08)**	(7.04)***					(4.08)***	(3.08)***	(3.58)***	(1.83)*	
Netherland	0.11396	-0.01188	-0.32132	-0.31771	-0.65269				0.73973	-0.07819	0.01089	-0.06411	1371
	(12.57)***	-0.4	-1.19	(6.32)***	(2.85)***				0.79	-0.39	-0.41	(8.34)***	
Norway	-3.09249	-0.1206	0.28905	0.09779					3.71973	-0.07	-0.0172	-3.35652	1334
	(14.18)***	-1.3	(3.24)***	(7.39)***					(3.34)***	(5.55)***	-0.51	(2.37)**	
Spain	-3.67019	-0.4985	-0.03338	-0.11346	6.15519				8.95013	-0.15575	-0.17157	-8.9451	1365
	(6.94)***	(2.04)**	(6.21)***	(2.50)**	(3.98)***				(3.30)***	(15.70)***	(2.33)**	(2.29)**	
Sweden	-3.73719	-0.38984	-0.03698	-0.08665					6.34974	0.26044	-0.07343	-6.34839	1373
	(6.77)***	(1.66)*	(3.78)***	-0.35					(1.98)**	(7.99)***	-0.84	0.08	
UK	-2.93607	0.08638	0.30041	-0.09595	-0.02428				1.23596	-0.03778	-0.10134	16.0356	1370
	-0.21	(3.87)***	(2.48)**	(6.63)***	-0.37				1.05	(4.68)***	(2.71)***	(5.11)***	
USA	-2.46112	-0.55717	0.63561	-0.55008	-0.03776	3.96673	4.86947	-0.71703	0.36671	-0.01936	0.02706	17.61141	1355
	(13.65)***	(5.65)***	(6.29)***	(6.33)***	-0.05	(3.88)***	(4.25)***	-0.45	0.38	-0.38	-0.81	(6.32)***	

Method of estimation: Instrumental variables and tobit model;

Standard errors are displayed below the coefficients and z provides information regarding the statistical significance of the variables.

Table 5: Tobit Results: 1985-1995

	GDP per capita	Population	Trade	Democracy	Colony	Egypt	Israel	UN Vote	Corruption	Budg. Def.	Milit. Exp.	Constant	Observations	Number of id
Australia	-3.16157	-0.70156	0.99992	-0.31717	5.73742				0.34068	-0.00065	-0.07672	11.21321	574	78
	(8.27)***	(2.23)**	(6.41)***	(2.27)**	(4.44)***				1.31	-0.01	-0.82	(3.43)***		
Canada	-2.36704	-0.2766	0.41106	-0.05082					0.08986	0.04686	0.00834	16.72648	567	77
	(9.70)***	-1.31	(2.92)***	-0.69					0.7	-1.49	-0.57	(7.35)***		
Denmark	-3.1607	-0.12134	0.70723	-0.50695					0.23807	-0.37032	-0.02298	12.35075	575	78
	(7.92)***	-0.34	(2.41)**	(3.50)***					0.83	(2.96)***	-0.81	(3.09)***		
Finland	-2.21073	0.14826	0.45621	-0.31218					-0.20971	0.04671	0.01476	9.81822	569	78
	(6.92)***	-0.68	(3.16)***	(2.89)***					1.04	-1.64	-0.75	(3.37)***		
France	-1.80723	0.00605	0.49772	-0.28375	4.31966				0.38162	-0.40265	-0.06231	4.3382	575	78
	(4.89)***	-0.02	-1.58	(2.07)**	(4.56)***				1.52	(4.40)***	-1.64	-1.33		
Germany	-2.56053	0.69108	-0.14957	-0.42834					0.33081	-0.08243	-0.02377	19.04181	575	78
	(5.35)***	-1.63	-0.38	(3.02)***					1.28	-1.43	-0.77	(5.06)***		
Italy	-2.86603	-0.60542	1.31281	-0.35317	0.64686				0.07411	-0.19326	-0.0205	3.8905	573	78
	(7.84)***	(2.40)**	(4.82)***	(3.34)***	-0.2				0.39	(2.07)**	-0.99	-1.09		
Japan	-2.00985	0.66991	-0.15148	-0.62204					-0.1245	-0.00903	-0.02717	19.61559	570	77
	(6.33)***	(2.84)***	-0.78	(6.29)***					0.67	-0.25	-1.29	(7.07)***		
Netherland	-2.82913	-0.21345	0.34383	-0.48389	-1.26146				-0.21891	-0.14297	-0.01499	21.36976	573	78
	(9.91)***	-0.93	-1.53	(6.08)***	-1.4				1.45	(3.39)***	-0.94	(7.87)***		
Norway	-3.1085	0.17033	0.31387	-0.26861					1.40807	0.08731	0.01292	12.64507	562	78
	(8.79)***	-0.67	(1.70)*	(1.82)*					(5.07)***	-0.89	-0.45	(3.68)***		
Spain	-4.38828	0.26967	2.7211	0.29183	13.06255				2.33975	0.48968	0.01926	-40.6729	575	78
	(4.28)***	-0.47	(4.05)***	-0.69	(6.42)***				(3.36)***	(1.71)*	-0.27	(5.00)***		
Sweden	-2.39502	-0.2341	0.37179	-0.26908					0.15001	-0.04559	0.0267	15.26322	569	78
	(7.54)***	-0.79	(2.23)**	(2.68)***					0.77	(2.57)**	-1.35	(5.34)***		
UK	-3.69341	-0.51473	1.33336	-0.6253	1.51743				0.39741	-0.1025	-0.02509	8.11458	575	78
	(8.58)***	-1.58	(3.67)***	(4.85)***	(1.99)**				(1.67)*	(2.45)**	-0.91	(2.29)**		
USA	-3.02899	-1.16668	1.18158	-0.48766	-0.35478	4.26001	8.38738	-2.81484	-0.13467	-0.15471	0.02112	17.43797	565	78
	(7.58)***	(3.72)***	(4.90)***	(4.80)***	-0.16	-1.19	(2.25)**	(2.87)***	0.75	(2.11)**	-1.01	(5.60)***		

Method of estimation: Random-effects Tobit model

Standard errors are displayed below the coefficients and z provides information regarding the statistical significance of the variables.

Table 6: IV Tobit Results: 1985-1995

	GDP per capita	Population	Trade	Democracy	Colony	Egypt	Israel	UN votes	Budg. Def	Milit. Exp.	Corruption	Costant	Observation
Australia	-4.37443	-0.98559	0.03345	-0.01557	4.74886				-0.02102	-0.0203	0.11911	1.51312	574
	(10.03)***	-0.7	(9.07)***	(3.32)***	(1.78)*				-0.19	-0.34	0.07	(3.23)***	
Canada	0.26048	-0.71522	-0.13906	-0.0251					-0.03328	0.0099	0.36256	-0.03922	567
	(5.48)***	(3.64)***	(3.99)***	-1.1					-0.48	-0.5	0.48	(9.73)***	
Denmark	-3.5907	0.09265	-0.11497	-0.01471					-0.57166	0.00727	-0.14872	1.59631	575
	(4.39)***	(2.30)**	-0.66	(4.10)***					(2.60)***	-0.15	0.08	(3.99)***	
Finland	-1.64254	0.12245	0.42108	-0.35187					-0.17237	0.14119	-4.85385	19.42611	569
	(3.07)***	-0.4	(1.74)*	(2.03)**					(1.70)*	(2.68)***	(2.30)**	(4.05)***	
France	-2.8837	-0.36837	0.94941	-0.21296	2.8323				-0.15857	-0.0916	3.79276	-2.76789	575
	(5.41)***	-1.21	(3.02)***	-1.42	(2.76)***				-0.85	(1.82)*	(2.04)**	-0.64	
Germnay	-2.27742	0.86762	-0.43325	-0.39768					-0.07217	-0.01722	0.70381	19.83577	575
	(6.51)***	(3.20)***	-1.61	(3.22)***					-0.93	-0.48	-0.56	(6.24)***	
Italy	-2.85547	-0.22714	0.62562	-0.32957	3.02531				-0.41255	-0.06345	4.14516	-0.86057	573
	(8.90)***	-0.95	(2.42)**	(2.40)**	-1.52				(1.96)*	-1.58	(2.92)***	-0.19	
Japan	-3.22709	0.22049	0.25846	-0.00665					0.15526	-0.09115	3.6748	1.89166	570
	(6.74)***	-0.97	-1.25	-0.29					(1.67)*	(2.28)**	(2.17)**	(3.22)***	
Netherland	0.16159	0.43649	-0.43691	-0.59147	-0.8411				-0.17764	0.04025	-0.72381	26.42508	573
	(7.61)***	-1.4	-1.1	(6.38)***	-0.13				(2.40)**	1.55	0.81	(10.20)***	
Norway	-4.22851	0.06075	-0.08144	-0.58492					-0.03467	0.02505	3.51615	-0.03732	562
	(8.65)***	(1.88)*	(3.04)***	(3.94)***					1.47	-0.64	(2.20)**	(2.93)***	
Spain	-4.77938	0.28522	2.91204	0.34776	13.99891				0.52928	0.01754	3.07223	-44.8177	575
	(3.64)***	-0.45	(4.11)***	-0.75	(5.40)***				-1.45	-0.21	0.95	(4.70)***	
Sweden	0.24302	-0.23452	-0.11306	-0.52398					-0.01665	0.0832	0.99016	1.67978	569
	(4.56)***	(2.76)***	(2.81)***	-0.33					-1.05	(2.25)**	0.67	(3.16)***	
UK	-3.93385	-0.07128	1.25645	-0.02068	-0.16691				-0.02747	-0.0463	1.5315	1.31938	575
	-0.27	(2.35)**	(1.95)*	(7.73)***	-1.59				-0.85	-1.39	1.25	(3.09)***	
USA	0.2994	-0.79591	0.93484	-0.01707	1.06989	3.0271	2.75188	-0.17607	-0.06779	0.01502	1.00379	2.69702	565
	(5.17)***	(4.56)***	(5.84)***	-0.78	(1.69)*	(1.72)*	(5.52)***	-0.52	-0.82	-0.54	1.41	(6.18)***	

Method of estimation: Instrumental variables and tobit model;

Standard errors are displayed below the coefficients and z provides information regarding the statistical significance of the variables.

Table 7: Tobit Results: 1996-2006

	GDP per capita	Population	Trade	Democracy	Colony	Egypt	Israel	UN Vote	Corruption	Budg. Def	Milit. Exp.	Constant	Observations	Number of id
Australia	-0.74694	0.46192	0.12115	-0.20783	6.56235				0.05821	-0.08338	0.09474	-0.07576	887	90
	(3.21)***	(2.64)***	-1.18	(2.60)***	(3.38)***				0.52	-1.38	-1.09	-0.03		
Canada	-1.77117	-0.11955	0.01162	-0.1467					0.11995	0.0006	-0.08817	18.29277	816	91
	(11.90)***	-0.89	-0.16	(2.73)***					(1.84)*	-0.02	-1.55	(11.87)***		
Denmark	-1.83707	0.7406	0.02488	-0.42641					0.02439	0.13916	-0.21987	7.60194	821	91
	(4.41)***	(2.21)**	-0.09	(2.79)***					0.1	(1.66)*	-1.31	(2.43)**		
Finland	-1.79732	0.02525	0.31705	-0.35407					-0.46104	0.08309	0.07578	10.98863	818	91
	(8.79)***	-0.14	(3.37)***	(4.58)***					(4.29)***	(3.24)***	-0.96	(5.43)***		
France	-1.41127	-0.47523	0.24515	-0.08372	2.7499				-0.10375	-0.15327	0.07901	15.04865	813	90
	(12.48)***	(5.01)***	(3.46)***	(1.92)*	(10.80)***				(1.81)*	(3.89)***	(1.89)*	(14.72)***		
Germany	-1.63574	-0.05251	0.02212	-0.19303					-0.34009	0.00733	-0.03899	19.53479	821	91
	(8.74)***	-0.32	-0.16	(3.04)***					(3.90)***	-0.2	-0.63	(12.45)***		
Italy	-1.91343	-0.40759	0.42883	-0.16905	1.71917				-0.31389	-0.00466	0.05166	13.97393	813	90
	(7.92)***	(2.03)**	(2.72)***	(2.13)**	(1.96)*				(3.14)***	-0.11	0.65	(6.25)***		
Japan	-1.63186	0.32742	0.20888	-0.36395					-0.09106	0.04251	-0.27133	12.87493	805	90
	(6.68)***	-1.48	-1.56	(4.10)***					0.78	-1.04	(2.95)***	(5.27)***		
Netherland	-2.09604	0.01592	-0.03134	-0.18858	0.23431				-0.09466	-0.18915	0.04867	20.0521	813	90
	(11.13)***	-0.08	-0.22	(2.52)**	-0.12				1.01	(4.51)***	-0.6	(9.78)***		
Norway	-1.75987	-0.12484	0.04863	0.06305					0.02213	0.00052	-0.01444	16.28424	787	91
	(9.57)***	-0.83	-0.71	-0.98					0.28	-0.04	-0.21	(7.96)***		
Spain	-1.6773	-0.34061	0.3118	-0.01226	4.12988				0.01919	0.58516	0.06086	12.712	805	89
	(7.72)***	(1.93)*	(2.37)**	-0.15	(7.25)***				0.16	(12.01)***	-0.74	(6.44)***		
Sweden	-2.62054	-0.56212	0.69859	-0.27489					0.16873	0.05498	-0.08307	15.78591	820	91
	(11.81)***	(2.82)***	(5.72)***	(3.06)***					1.48	-1.54	-0.91	(6.70)***		
UK	-2.31855	0.27811	-0.19201	-0.301	2.20995				0.40423	0.12632	-0.14492	21.41452	810	90
	(8.90)***	-1.31	-1.01	(3.41)***	(4.38)***				(3.40)***	(4.03)***	1.49	(10.68)***		
USA	-2.37855	-0.57066	0.59166	-0.5155	0.13287	2.33812	2.99799	-0.39964	-0.36976	0.04445	0.24142	19.38016	804	90
	(9.47)***	(2.80)***	(4.13)***	(5.39)***	-0.14	-1.62	-1.26	-0.36	(2.56)**	-0.89	(2.52)**	(8.77)***		

Method of estimation: Random-effects Tobit model

Standard errors are displayed below the coefficients and z provides information regarding the statistical significance of the variables.

Table 8: IV Tobit Results: 1996-2006

	GDP per capita	Population	Trade	Democracy	Colony	Egypt	Israel	Un Votes	Budg. Def.	Milit. Exp.	Corruption	Constant	Observation
Australia	-2.36012	-0.4992	1.02926	-0.09437	4.16909				0.03953	0.06081	0.98074	2.1682	871
	(15.33)***	(2.48)**	(12.92)***	-0.4	(3.43)***				-0.18	-0.65	0.74	-0.45	
Canada	-2.10281	-0.35685	0.28774	-0.01285					0.05404	-0.16273	1.08268	15.39078	800
	(20.09)***	(2.26)**	(3.17)***	-0.11					-0.73	(2.90)***	1.54	(6.56)***	
Denmark	-3.05503	1.4637	-0.25749	-0.15413					0.82883	-0.63567	6.55386	2.77544	805
	(6.95)***	(4.49)***	-0.52	(9.16)***					(1.92)*	(2.51)**	(1.87)*	-0.47	
Finland	0.00153	-0.14361	0.05621	-0.16152					-0.07703	0.0533	-0.62953	0.97812	802
	(13.43)***	(4.21)***	(2.30)**	-1.62					-0.75	0.62	0.49	(3.12)***	
France	-1.57627	-0.54018	0.0971	-0.17949	2.47621				-0.16885	0.05049	0.17481	0.29763	798
	(22.69)***	(4.80)***	(3.08)***	(10.12)***	-0.33				(3.10)***	1.52	0.44	(11.16)***	
Germany	-1.78009	-0.06884	0.1041	-0.08662					-0.07484	-0.02414	0.33716	18.12676	805
	(15.40)***	-0.43	-0.31	(9.68)***					-0.82	-0.45	0.48	(7.82)***	
Italy	0.00952	-0.11363	0.0387	0.42917	0.10617				-0.0127	-0.17395	2.88607	2.83527	798
	(11.55)***	(3.64)***	(2.72)***	(2.11)**	-0.51				-0.51	(1.95)*	(2.56)**	(1.69)*	
Japan	-1.51911	-0.17139	-0.42574	-0.16904					0.01814	-0.4076	5.64482	3.17866	790
	(5.87)***	(3.38)***	(2.00)**	(9.86)***					-1.1	(3.04)***	(3.14)***	-0.49	
Netherland	-2.04154	0.29123	0.03024	-0.16194	-0.59709				-0.257	0.02674	0.68096	-0.96837	798
	-0.68	(2.84)***	(3.69)***	(9.61)***	(2.20)**				(2.86)***	0.41	0.76	(7.23)***	
Norway	-2.42655	-0.22505	0.14474	0.15275					0.11029	-0.03749	1.71732	15.23298	772
	(19.51)***	-1.41	-1.58	-0.89					-1.59	-0.49	(1.72)*	(4.07)***	
Spain	-2.39895	-0.50723	0.73281	0.43847	3.81556				1.16194	-0.14544	2.96576	4.09207	790
	(13.09)***	(2.35)**	(5.68)***	(1.77)*	(10.65)***				(4.09)***	1.57	(2.17)**	1.06	
Sweden	0.00405	-0.1278	0.04939	0.21445					-0.04988	-0.11714	3.59634	2.95646	804
	-0.09	-0.88	-1.61	-0.78					(2.12)**	0.96	(2.25)**	(1.76)*	
UK	-0.07479	-0.06035	0.08838	-0.16478	0.01319				0.191	-0.19873	-1.34027	1.4276	795
	(13.10)***	-0.29	-0.51	(3.94)***	(7.69)***				(3.40)***	(2.35)**	1.48	(7.76)***	
USA	0.0306	-0.06611	0.6335	-0.66594	-0.47724	-0.42615	1.6082	1.81409	0.03858	0.2027	-0.93426	2.39377	690
	-0.82	(2.23)**	-0.25	(3.69)***	-0.14	(3.10)***	-0.7	(6.14)***	-0.12	(2.08)**	0.76	(6.18)***	

Method of estimation: Instrumental variables and tobit model;

Standard errors are displayed below the coefficients and z provides information regarding the statistical significance of the variables.