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Foreign aid and rent-seeking

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Abstract

Why has the macroeconomic impact of foreign aid seemingly been so poor? Is there a relationship between the widespread level of corruption and other types of rent-seeking activities and concessional assistance? To answer these questions we provide a simple game-theoretic rent-seeking model. The model has a number of implications. First, under certain circumstances, an increase in government revenue lowers the provision of public goods. Second, the mere expectation of aid may suffice to increase rent dissipation and reduce productive public spending. This result may be reversed, however, if the donor community can enter into a binding policy commitment. We also provide some preliminary empirical evidence in support of the hypothesis that foreign aid and windfalls are on average associated with higher corruption in countries more likely to suffer from competing social groups. We find no evidence that the donors systematically allocate aid to countries with less corruption.

Keywords: Corruption; Foreign aid; Rent-seeking

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1. Introduction

Empirical evidence indicates that rent-seeking is a serious problem in developing countries. This type of discretionary redistribution also tends to be particularly severe in ''good'' times. A country-specific example illustrates the point. ''Public

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spending in Nigeria during the oil boom in the early 1990s increased by more than 50 percent, yet over the same period school enrollment shrunk due to tight education funding. The Nigerian Nobel Prize winner and dissident writer Wole Soyinka (1996) notes that a government-appointed commission of inquiry was unable to account for what happened to much of the 1990s government oil windfall'' (Easterly and Levine, 1997).

Causal empiricism suggests that the dramatic increase in foreign aid over the past three decades has had a similar effect in many countries. The World Bank, for instance, reports that the rapid increase in foreign exchange resources, mainly due to large concessional flows, has greatly expanded the opportunities of malfeasance (World Bank, 1989, pp. 27, 61), and Klitgaard (1990) gives a vivid description of aid-related corruption in Africa. In many developing countries foreign assistance is an important source of revenue. For the 50 most aid-dependent countries the mean value of aid as share of central government expenditures for the period 1975–95 was 53.8 percent (World Bank, 1998). Despite this vast resource transfer, a number of empirical studies have shown that the macroeconomic effects of aid are, at best, ambiguous (Boone, 1996).

To explain this puzzle we develop a game-theoretic rent-seeking model in which (social) groups compete over common-pool resources. The common resources can either be invested in public goods, or be appropriated for private consumption. The latter either by means of direct appropriation (e.g., seizure of power) or manipulations of bureaucrats and politicians to implement favorable transfers, regulations or other redistributive policies. In a static setting it is not hard to see how this setup can lead to a Pareto-inefficient Nash equilibrium: each group will be strictly better off if all reduced their costly appropriation efforts, but a unilateral decrease is not rational for the individual social group. However, since the social groups interact repeatedly, this may provide a mechanism that can reduce the conflict of interest.[1] At the same time, these forces may not suffice to deliver the first-best outcome since full cooperation maximizes the reward of behaving opportunistically. Hence, it is possible to envision an economy where the degree of cooperation among social groups is, at the margin, balancing the benefit of cooperative behavior with the cost of sustaining the equilibrium.[2]

Within this setup, we show that an increase in government revenues may lower the provision of public goods. This provides an explanation for why large disbursements of aid, or windfalls, do not necessarily lead to increased welfare. Second, we show that mere expectation of aid according to the recipients' future needs may increase rent dissipation and reduce the expected number of periods in which efficient policies can be sustained. This may be an important observation

[1] See Benhabib and Rustichini (1996) for a dynamic model with this ingredient.

[2] The general idea was initially proposed by Rotemberg and Saloner (1986) to explain how tacit coordination among producers varies throughout the business cycle.

because a positive correlation between recipients' needs and aid flows has been noted in the literature.

These results have three novel implications. First, since concessional assistance may influence policy in the recipient country even without any resources actually being disbursed, evaluations of project and sector assistance may overestimate the total impact of foreign aid. Second, the effects of development aid critically depend on the political equilibrium in the recipient country. An empirical investigation of the impact of aid that does not explicitly take this into account may be biased. Finally, if the donor community can enter into a binding policy commitment, aid may mitigate the incentives for social groups to engage in rent-seeking activities.

The empirical prediction of the model is that discretionary aid, and windfalls, in countries suffering from competing social groups will on average be associated with increased rent-seeking. Motivated by the theory we specify a simultaneous equation system to test this implication. To this end, we try to identify characteristics of the political and socio-political structure of a country which are plausibly correlated with the existence of influential social groups. As dependent variable we employ an index of corruption. The model's prediction hold up when confronted with cross-country data and is robust to a number of prospective statistical problems.

There is only limited work on foreign aid and endogenous macroeconomic policy. Casella and Eichengreen (1994) show, in line with our results, using the Alesina and Drazen (1991) model, that the prospect of aid can actually exacerbate the delay in stabilization, by inducing the social groups to postpone making sacrifices until aid actually materializes. In our model, the adverse impact of aid holds irrespective of specific timing assumptions. Further, Ranis and Mahmood (1992) argue that the availability of external resources tends to promote irresponsible policies. Boycko et al. (1996) discuss the impact of foreign assistance in countries characterized by a divided government, arguing that aid may be counterproductive if based on the wrong premise of government. This is an argument which accords well with our model's prediction. The papers closest in spirit to ours are Lane and Tornell (1995, 1996). They show that in a growth model with several powerful interest groups, a change in productivity (or terms of trade) may lead to a reduction in the growth rate. Our analysis, by studying a repeated rather than a dynamic game, should be regarded as complementing their work. However, our model differs from that of Lane and Tornell in a number of ways. First, the shocks are stochastic, rather than a one-time change in a perfect-foresight model as in Lane and Tornell. More important, in Lane and Tornell, the voracity effect whereby an increase in the raw return to aggregate capital leads to a more than proportional increase in redistributive transfers, is due to a coordination failure across interest groups. Our results, on the contrary, arise from Pareto constrained responses by the social groups to changing incentives to deviate. The main difference though is that we focus on foreign aid. Foreign aid

differs from other sources of windfalls in that the outcome depends on the donors' actions. When explicitly taking this into account, we find that foreign aid also affects the equilibrium through a less tangible mechanism – the mechanism that enforces the control of rent dissipation in the economy.

Recently a number of studies have empirically investigated the macroeconomic impact of foreign aid. Boone (1996) concludes that aid primarily goes to consumption and that there is no relationship between aid and growth, nor does it benefit the poor as measured by improvements in human development indicators. Burnside and Dollar (1997) find that aid has a positive impact on growth in countries with ''good'' fiscal, monetary and trade policies, while Svensson (1998a) shows that the long-run growth impact of aid is conditional on the degree of political rights. The empirical section of the paper provides additional evidence on the aggregate impact of foreign aid, but rather than studying the relationship between aid and growth, we study the relationship between aid and corruption.

This paper is organized as follows. In Section 2 the model is presented. In Section 3, the noncooperative and the fully cooperative equilibria in the stage game are derived. The second-best equilibrium is studied in Section 4. In Section 5 the model is extended by explicitly modeling the donor's behavior. Section 6 provides some empirical results. Section 7 discusses the interpretation of these findings, while Section 8 concludes.

2. A political model of public spending and rent dissipation

2.1. The model

Consider an economy consisting of n powerful social groups. All groups have ''common access'' to the government's budget constraint. Specifically, at the beginning of each time period the government receives income (revenue) y_t. Income can be used either on local public goods, or appropriated by each individual social group. Appropriation of common resources is costly. Rent-seeking outlays by group i, denoted by z_i, result in total appropriation equal to $d_i = y(z_{it}/\Sigma_{j=1}^{n} z_{jt})$ for $z_{it} > 0$, and $d_i = 0$ for $z_{it} = 0$. Thus, private consumption is

$$c_{it} = \begin{cases} y_i, & \text{for } z_{it} = 0, \\ y(\theta_t)\dfrac{z_{it}}{\sum_{j=1}^{n} z_{jt}} - z_{it} + y_i, & \text{for } z_{it} > 0, \end{cases} \tag{1}$$

where $y(\theta_t)$ is government revenue, c_{it} denotes private consumption of the ith group, and z_{it} is rent-seeking outlays by social group i, all expressed in time period t.[3] The last term in (1), y_i, denotes the exogenously given income received by

[3]This setup builds on Tullock (1980).

group i at the beginning of each time period. We think of this as income derived from the informal sector or from capital held abroad. It is assumed that y_i is secure from appropriation from others. Eq. (1) warrants two remarks. First, income for private consumption is derived from two sources: appropriation of government revenue, the first two terms in (1), and from the secure stock of capital (y_i). Second, the appropriation technology is exogenously given. This should be interpreted as a reduced form of a more structural model in which organized social groups can capture a large share of government income either by means of direct appropriation, or by manipulating the political system to implement favorable transfers, regulations, and other redistributive policies. Thus z_{it} is a composite variable of both direct costs of redistribution (e.g., bribes), and indirect costs of political competition (e.g., protection costs, resources employed to seize, or attempt to seize, power and restrict opponents' political activities).

Government income, $y(\theta_t)$, is stochastic, where θ_t is the realization at t of the observable shock to revenues with $y'(\theta_t) > 0$. We assume that the shocks are independently and identically distributed over time. θ_t has domain $[\underline{\theta},\bar{\theta}]$, and a distribution function $F(\theta_t)$.

Each social group has a population of size 1. There is no heterogeneity within groups. Citizens derive utility from private consumption and public projects. Group i's per period utility is $u_{it} = b_{it} + c_{it}$, where $b_i = [y(\theta_t) - \Sigma_{j=1}^{n} d_i]/n$ is the amount of local public goods benefiting group i.

The social groups interact strategically, each maximizing expected utility

$$E\sum_{t=0}^{\infty} \delta^t u_{it} \tag{2}$$

subject to the per period budget constraint $z_{it} \leq y_i$.

This model defines a repeated game among the n social groups. At the beginning of each period, θ_t becomes common knowledge. The social groups then simultaneously choose rent seeking outlays $z_i \in [0, y_c]$. Resources not appropriated by the social groups are thereafter spent on local public goods in a symmetric fashion. A strategy for the individual social group is a policy function $z_i(\theta_t)$ that specifies the amount of rent-seeking outlays for each realization of θ_t.

3. The stage game

To solve the problem we start by calculating the symmetric Nash (NE) and cooperative (CE) equilibria in the stage game.

3.1. Nash equilibrium

Each social group determines the optimal level of rent-seeking outlays, z_{it}, taking z_{jt} for $j \neq i$ as given. The first-order condition for this problem can be written as

$$\frac{y(\theta_t)}{\sum_{j=1}^{n} z_{jt}}\left[1-\frac{z_{it}}{\sum_{j=1}^{n} z_{jt}}\right]-1=0. \tag{3}$$

Hence, in equilibrium the marginal gain of rent-seeking, taking the form of a higher share of total net income, should be equal to the marginal cost, unity. Solving for z_{it} and summing over i gives us the aggregate level of rent dissipation

$$Z^n(\theta_t)=\frac{(n-1)}{n}y(\theta_t), \tag{4}$$

where superscript n denotes the symmetric NE. Clearly, rent dissipation is an increasing function of the number of social groups and income.

In the NE, all common resources will be appropriated from the budget. Hence, $b_i^n(\theta)=0$ and $\Sigma_i^n d_i^n(\theta_t)=y(\theta_t)$. However, as appropriation is costly, only a fraction of the appropriated resources will actually benefit the social groups through higher private consumption.

3.2. Cooperation among the social groups

Now consider instead the fully cooperative equilibrium (CE). The symmetric CE is a vector of feasible policy functions $[z_i(\theta_t),\ldots z_n(\theta_t)]$ such that all social groups exert the same level of rent-seeking activities and $z_i(\theta_t)=\arg\max E\Sigma_{i=1}^{n} u_{it}$.

Clearly, since rent-seeking is a zero-sum game in influence, but a negative-sum game in total resources, $z_i^c(\theta_t)=0\ \forall i$, where superscript c denotes the CE. Hence, in the CE all resources will be spent on public projects, $b_i^c(\theta)=y(\theta_t)/n$, and utility will be strictly higher.

4. The repeated game

4.1. Second-best equilibrium (SBE)

The game described in Section 2 is a repeated game. Hence, one equilibrium is the NE in the stage game repeated infinitely. However, infinitely played games of the type described above are usually able to sustain an equilibrium that strictly dominates the outcome in the corresponding static NE played repeatedly, even if the groups cannot sign binding contracts. The extreme case would be if the social groups could sustain the CE in all states. In reality the actual outcome may lie between the extreme regimes of either full cooperation or noncooperative behavior. This is so because, on the one hand, repeated interaction provides a mechanism which can sustain a subgame perfect equilibrium with higher payoffs for all groups with trigger strategies. On the other hand, these forces may not

suffice to deliver the fully cooperative outcome in all states, since full cooperation maximizes the reward of behaving opportunistically. Hence, it is possible to envision an economy where the degree of cooperation among the social groups is, at the margin, balancing the benefit of cooperative behavior with the cost of sustaining the equilibrium.

To deter groups from deviating, the equilibrium must involve a mechanism that punishes deviations. One such mechanism would be the use of punishment against defecting groups in periods following the defection (Friedman, 1971). A simple, but not the only, way to ensure sequential rationality is for the punishment to involve playing of the static NE for the reminder of the game after the first defection is detected. We restrict attention to these strategies.[4]

Definition 4.1. The second-best equilibrium (SBE) is a sequence of feasible policy functions $[z_i(\theta_t), \ldots, z_n(\theta_t)]$ such that: (i) all social groups exert the same level of rent-seeking activities; (ii) the rent-seeking configuration is sustainable in equilibrium; (iii) the expected present discounted utility of each group along the equilibrium path is not Pareto dominated by other equilibrium payoffs.

The equilibrium is solved in two steps. First, the highest sustainable level of income is determined for a given punishment. Second, the optimal punishment as a function of the highest sustainable level of income is derived. This defines a mapping from the set of possible punishments into itself. The fixed point of this mapping, then, defines a threshold value for θ_t.

We start by exploring the social groups' options for each value of θ_t. Let $v^c(\theta_t) = y(\theta_t)/n$ be the equilibrium level of ''net'' utility (i.e. net of own income y_i) for each social group under full cooperation. Since $y(\theta_t)$ is increasing in θ_t, ''net-utility'' is increasing in θ_t.

Along the cooperative equilibrium path, an increase in z_i with an arbitrary small amount raises net-utility for the group that deviates to almost $y(\theta_t)$. Thus, group i would deviate from the joint utility-maximizing strategy if

$$y(\theta_t) > \frac{n}{n-1}P, \tag{5}$$

where P is the punishment inflicted on group i in the future if it deviates at time t. Note that the higher θ_t, the higher is $y(\theta_t)$, and the greater are the incentives to deviate for a given P. Since $y'(\theta_t) > 0$, there exist some $\hat{\theta}_t$, for which $y(\hat{\theta}_t) = (n/(n-1))P$. Thus, if $v(\hat{\theta}_t, \theta_t)$ denotes the highest level of net-utility each group can sustain in the SBE

[4] As discussed in the working paper version of this paper, switching forever to the stage-game Nash equilibrium is the strongest credible punishment (i.e. optimal punishment) provided that the number of social groups are sufficiently high (Svensson, 1998b).

$$v(\hat{\theta}_t,\theta_t)=\begin{cases} v^c(\theta_t), & \text{for } \theta_t \le \hat{\theta}_t, \\ v^c(\hat{\theta}_t)=\dfrac{1}{n-1}P, & \text{for } \theta_t > \hat{\theta}_t. \end{cases} \tag{6}$$

Clearly, the higher the punishment, P, the higher the equilibrium level of net-utility. The future loss from deviation at some date, discounted at the same date, can be stated as

$$P(\hat{\theta}_t,\theta_t)=\frac{\delta}{(1-\delta)}\int_{\underline{\theta}}^{\bar{\theta}}[v(\hat{\theta}_t,\theta_t)-v^n(\theta_t)]\mathrm{d}F(\theta_t). \tag{7}$$

That is, P is the difference between the expected discounted value of net utility from time $t+1$ to ∞ between the SBE and the repeated NE.

Eq. (7) gives a mapping from the set of possible punishments into itself: a given P implies a cutoff value $\hat{\theta}_t$ from (6), which in turn defines a punishment level from (7). The equilibrium of the model is the fixed point of this mapping with the highest value of P; i.e. the highest level of utility for the social groups.

In Appendix B we show that sufficient conditions for the existence of a fixed point are

$$\text{(i) } y(\underline{\theta})\Gamma < -(\beta/n^2)E[y(\theta_t)], \quad \text{(ii) } y(\bar{\theta}_t)/E[y(\theta_t)] > \frac{\delta}{(1-\delta)n^2},$$

where $\beta \equiv \delta/(1-\delta)$, $\Gamma \equiv (1-\beta/(n-1))$ and E is the expectation operator.

Condition (i) states that the discount factor must be sufficiently high. Otherwise the social groups discount the future too much, implying that the punishment become less important and it will no longer be possible to sustain the fully cooperative equilibrium. Condition (ii) ensures that full cooperation is not the only solution in every state. This condition is satisfied provided that there is sufficient dispersion in the distribution of revenues.

Lemma 4.2. *If conditions (i) and (ii) are satisfied, there exists a fixed point* $\hat{\theta}_t$ *such that (6) holds with P defined in Eq. (7).*

Proposition 4.3. *An increase in revenue above the threshold value,* $\hat{\theta}$*, lowers the provision of public projects, leaving total utility unchanged. The equilibrium configuration for the endogenous variables are*

$$b_i(\theta_t)=y(\theta_t)/n,\ c_i(\theta_t)=y_i,\ z_i(\theta_t)=0, \quad \text{for } \theta_t \le \hat{\theta}_t,$$
$$b_i(\theta_t)=0,\ c_i(\theta_t)=y(\hat{\theta}_t)/n+y_i,\ z_i(\theta_t)=[y(\theta_t)-y(\hat{\theta}_t)]/n, \quad \text{for } \theta_t > \hat{\theta}_t.$$

Proof. Follows from Lemma 4.2 and the first-order condition (3). ■

The higher the income the higher the incentive to deviate from the cooperative

conduct. To counter-balance this, the social groups must increase their appropriation rate so as to reduce the aggregate net level of resources for redistribution. In equilibrium, all incomes above $y(\hat{\theta}_t)$ are dissipated, leaving welfare unchanged. Note that in the SBE aggregate appropriation must increase by more than the rise in income, implying that the provision of public projects actually falls with an increase in income above $y(\hat{\theta}_t)$.

This finding has one important implication. If the political game described in the paper is relevant, and provided that θ_t is near $\hat{\theta}_t$, we should observe surprisingly small or in fact even contractible effects on welfare and public project provision following increased inflows of foreign aid, or windfall gains in revenue.[5]

5. Aid and rent dissipation: the indirect linkage

The main point highlighted in this section is that foreign aid may affect the equilibrium outcome not only through the direct effect explored in the previous section, but also through a less tangible mechanism – the mechanism enforcing the control of rent dissipation in the economy.

5.1. A modified model

Consider the following extension of the model. Besides the n social groups there is also a donor. The donor's problem is to maximize its expected utility

$$E\sum_{t=1}^{\infty}\delta^t[\varphi f_t + w(s_t)] \tag{8}$$

subject to the budget constraint $f_t + a_t \leq r$. In (8), f_t denotes the domestic activity of the donor at time t, $s_t \equiv \Sigma_i^n u_{it}$, a_t is the level of aid disbursed at time t, r is the income received at the beginning of each period and $w(\cdot)$ is a concave, increasing function. Alternatively, f_t captures the welfare of giving aid to other recipient countries or to activities not valued by the recipient. Assuming that the donor's utility is linear in its domestic activity simplifies the analysis. However, the qualitative results do not hinge on this specification (see Svensson, 1998b). The parameter φ is the constant marginal utility of the domestic activity.

We believe that (8) is a realistic and rather general characterization of the donor's preferences. The empirical literature on the determinants of foreign aid have found that aid is driven both by the donor's own interests (captured by f) and by recipients' needs (captured by s) (see, e.g., Burnside and Dollar, 1997).

[5]The comparative statics with respect to n and δ are analyzed in Svensson (1998b). Contrary to the results in Lane and Tornell (1995) and the standard result in the rent-seeking literature, the effect of n on $\hat{\theta}$ is non-monotonic. An increase in δ raises $\hat{\theta}$.

We assume initially that aid is given in the form of public projects. Assuming that aid is disbursed as untied program support does not alter the qualitative result. In fact, we consider the alternative in Section 5.1.2.

5.1.1. Foreign aid with discretion

Consider first a discretionary aid regime where it is impossible to commit policy in advance. Thus, the sequencing of events are as described in Section 2.1 with the exception that the donor now determines the level of aid disbursed simultaneously with the choices of the n social groups, taking $[z_i(\theta), \ldots, z_n(\theta)]$ as given.

The equilibrium in the stage game is characterized by two conditions. The first condition defines the amount of rent-seeking outlays and is described in Section 3. The second concerns the disbursement of foreign aid, and is given by the first-order condition of the donor's maximization program

$$w'\left(\sum_{i=1}^{n}[c_i(\theta_t|a_t)+b_i(\theta_t|a_t)]\right)-\varphi\leq 0, \tag{9}$$

where r is assumed to be sufficiently large to guarantee an interior solution. $c_i(\theta_t|a_t)$ is defined in (1) and

$$b_i(\theta_t|a_t)=\frac{1}{n}[y(\theta_t)+a_t]-\frac{1}{n}\sum_{i=1}^{n}\left[y(\theta_t)\frac{z_i(\theta_t)}{\sum_{j=1}^{n}z_j(\theta_t)}\right] \tag{10}$$

when the groups act noncooperatively, and $c_i = y_c$ and $b_i = (1/n)[y(\theta_t) + a_t]$ when they act cooperatively. Thus, the donor will provide assistance up to the point where the marginal utility of aid is equal to the opportunity cost, φ. As evident from Eq. (9), the inclusion of a donor sets a lower bound on the welfare of the agents.[6] Since the payoff in the NE is strictly smaller than the payoff in the CE for all θ, foreign aid will affect the two scenarios asymmetrically. Specifically, more aid will be given in the NE. Thus, the presence of a donor increases expected welfare in the NE relative the CE. As the punishment is the expected discounted difference in utility between the second-best and Nash equilibrium, foreign aid will undermine the enforcement mechanism available for the social groups.

Proposition 5.1. *A discretionary aid policy will make cooperative behavior more difficult to sustain thereby lowering the threshold value* $\hat{\theta}_t$.

Proof. See Appendix C. ■

A discretionary aid policy of higher aid disbursements when income is low will undermine the enforcement mechanism available for the social groups. Since harsh

[6] We assume that $w_c^{-1}(\varphi) < \Sigma_{i=1}^{n} u_i^c(\bar{\theta})$ so that consumption is not constant in the fully cooperative equilibrium.

punishment facilitates cooperation, foreign aid makes cooperation more difficult to sustain. As a result, the social groups must content themselves with fewer periods in which the fully cooperative outcome can be sustained. Consequently, the expected level of rent dissipation increases.

This result warrants four remarks. First, it is not the actual increased disbursement of aid in bad states that drives the result, but the expectation that this will happen. Hence, the fact that the donor acts according to recipients' needs may by itself increase rent dissipation in the recipient country, and reduce the number of periods in which efficient policies can be sustained.[7]

Second, aid is effective at the micro-level while having adverse macroeconomic consequences. Hence, the model provides a possible explanation for the ''macro–micro paradox'' that has been discussed in the aid literature (see, e.g., Mosley, 1987).[8] Moreover, even though aid is given as project support, project evaluations would yield biased estimates of the overall impact of the aid program.

Third, even though the aid relationship causes corruption, the social groups are better off (in expected terms) with aid than without.

Finally, taking the model literally, rent-seeking and aid cannot coexist in the SBE. The reason for this is that as long as the country receives aid, i.e. $y(\theta) < y(\theta_1)$ where $y(\theta_1)$ denote the cutoff value of $y(\theta)$ for which (9) no longer binds in the fully cooperative equilibrium, welfare is constant along the equilibrium path. Thus, if it is profitable to deviate at some $y(\theta) < y(\theta_1)$, it must be profitable to deviate for all $y(\theta)$. In this case, of course, there exists no equilibrium. Hence, $\hat{\theta} > \theta_1$. It is straightforward to generalize the model so that rent-seeking and aid can co-exist in the SBE. As shown in Svensson (1998b), a sufficient condition is that the donor's utility function over the domestic activity is concave rather than linear.

5.1.2. Foreign aid with commitments

Now consider instead an environment in which the donor can enter into a binding policy commitment before the social groups choose rent-seeking outlays. That is, suppose the timing is such that the donor first chooses aid as a function of θ and $z_i \ldots z_n$. Then, observing $a(\theta_t, \mathbf{z}(\theta_t))$, the social groups choose $z_i(\theta), \ldots, z_n(\theta)$. To simplify the exposition we now assume that aid is given as untied program support. Consequently, aggregate government income in each period is $y(\theta_t) + a(\theta_t, \mathbf{z}(\theta_t))$, where $\mathbf{z}(\theta_t)$ is the vector of rent-seeking outlays.

The equilibrium can be computed by backward induction. We need to consider

[7] Note that this result differs from the Samaritan's dilemma problem explored in the literature on altruism and transfers (see, e.g., Svensson, 1997), in which the recipient strategically tries to free-ride on the donor's concern. Here, on the contrary, the linkage is more subtle: expectation of aid undermines the mechanism enforcing the control of rent dissipation.

[8] The paradox is that whilst micro-level evaluations have been, by and large, positive, those of the macro evidence have, at best, been ambiguous.

aid disbursement under two different institutional settings: when the social groups cooperate and when they interact noncooperatively. In both cases, the last stage of the game is identical to that described in Section 3, with $y(\theta_t)$ replaced by $y(\theta_t) + a(\theta_t, \mathbf{z}(\theta_t))$. These conditions act as incentive constraints on the donor's maximization program in the first stage of the game. The first-order condition of the donor's problem is

$$w'\left(a(\theta_t, \mathbf{z}(\theta_t)) + \sum_{i=1}^{n} u_i^c(\theta_t)\right) - \varphi \leq 0 \tag{11}$$

when the social groups cooperate and

$$w'\left(\frac{1}{n}a(\theta_t, \mathbf{z}(\theta_t)) + \sum_{i=1}^{n} u_i^n(\theta_t)\right)\frac{1}{n} - \varphi \leq 0 \tag{12}$$

when they interact noncooperatively. As evident, the donor now internalizes the cost of rent dissipation. The political competition over the common resources creates a wedge, $1/n$, between the marginal utility of the recipients' consumption and the opportunity cost of foreign aid. In other words, the rent-seeking contest results in a ''tax'' on foreign aid. If the tax effect dominates, more aid will be given in the cooperative setting for each θ, implying that the mechanism enforcing cooperation is strengthened.

Proposition 5.2. *A donor with access to a binding policy commitment generally strengthens the mechanism that enforces cooperation, thereby increasing the threshold value* $\hat{\theta}_t$.

Proof. See Appendix D. ■

6. Some preliminary evidence

6.1. Empirical prediction

In this section we take a first step to empirically test the prediction of the model. The test, however, is bound to be only suggestive. First, time series observations for sufficiently long periods are only available for a small subset of the relevant variables, implying that we are constrained to analyze the medium-term implications of the model. Second, since manipulations of the political system are seldom done in the open and are almost never recorded, we cannot directly measure the degree of competition among powerful social groups. As an alternative, we try to identify characteristics of the political and socio-political structure of a country which are plausibly correlated with the existence of influential social groups. Finally, since we cannot a priori determine the cutoff value $\hat{\theta}$ and as actual

disbursements of aid are likely to be (highly) correlated with expectations of future assistance, we are not able to distinguish between the two mechanisms summarized in Propositions 4.3 and 5.1.

With these limitations in mind, the model's main prediction can be stated as: *discretionary aid (or expectations thereof) and windfalls, in countries suffering from competing social groups, will on average increase the level of rent-seeking activities.*

To test this implication, we specify the following equation

$$z_{it} = \beta^z \mathbf{x}_{it} + \gamma^z d_{it} + \zeta^z \mathbf{w}_{it} + \theta^z (\mathbf{w}_{it} d_{it}) + \varepsilon^r_{it}, \tag{13}$$

where z_{it} is a measure of the average level of rent-seeking activities in period t for country i, d_{it} is a proxy of the existence of powerful social groups, $\mathbf{w}_{it}$ is a vector of windfalls proxies including the level of aid disbursed to country i, denoted by a_{it}, and $\mathbf{x}_{it}$ is a vector of other variables that affect the level of rent dissipation. The model suggests that a should be treated as an endogenous variable. For this reason we also specify an aid-determinants equation

$$a_{it} = \beta^a \mathbf{v}_{it} + \phi^a z_{it} + \varepsilon^a_{it}, \tag{14}$$

where $\mathbf{v}_{it}$ is a vector of other variables influencing the amount of aid disbursed to country i. Once we properly instrument for aid, we can test our null hypothesis that the marginal impact of aid and windfalls on z depends on the political equilibrium.

6.2. Data and base specification

Following Easterly and Levine (1997), we choose a measure of ethnic diversity (*ethnic*) as proxy for the likelihood of competing social groups in a country. A vast political science literature links ethnic groups with redistributive policies in developing countries, particularly in Africa. *ethnic* measures the probability that two randomly selected individuals in a country will belong to different ethnolinguistic groups. The raw data for *ethnic* refers to 1960. *ethnic* increases with the number of groups and the more equal is the size of the groups. Since coalitions with power to extract transfers from the rest of society may be formed along many other lines, ethnic fractionalization is obviously not a necessary, and much less a sufficient, condition for the existence of competing social groups. Consequently, we do not claim that *ethnic* is a valid measure for all countries.

To proxy for the dependent variable rent-seeking, we employ an index of corruption drawn from ICRG (see Knack and Keefer, 1995). The index is on a scale from 0 to 6. We reverse the scale so that 0 indicates least corrupt and 6 most corrupt and denote the re-scaled variable by *cor*. Obviously, rent-seeking can take many other forms than corruption, e.g. protection costs, resources employed to seize, or attempt to seize, power and restrict opponents' political activities.

However, this type of data is not readily available. Moreover, it is hard to see why increased pressure for redistribution would manifest itself only through certain channels (e.g., costs of political competition) and not through all different types available for the social groups (e.g., corruption). Presumably the social groups are equalizing the marginal costs and benefits of the different forms of rent-seeking.

We use aid data from a new World Bank data base on foreign aid. The data combines the grant component of each concessional loan with outright grants to provide a more accurate measure of foreign assistance. The data, denoted by *aid*, is converted into constant dollars and scaled by real GDP.

We also employ two additional proxies of windfalls: term of trade shocks (*tt*), and the share of exports of primary products in GDP (*sxp*). The latter measure captures discoveries of natural (mineral) resources that are important sources of windfall gains in many developing countries.

The level of rent-seeking is also a function of the discount factor δ. A lower δ leads to a higher expected *z*. To proxy for δ we employ regional-specific dummy variables for Sub-Saharan Africa (*africa*), and Central America (*centam*), and the log of initial per capita GDP (*lgdp*).

Motivated by the theory we assume that aid is driven both by donors' interests and recipients' needs. In the base specification we include the log of population (*lpop*) to proxy for donors' interests, and (*lgdp*) to control for recipients' needs motives. We also include *tt*. According to the model, a negative income shock will result in increased aid flows.

We are able to collect data for 66 aid recipient countries starting from 1980. To increase the size of the sample, but also to explore the time dimension in the data, we divide the cross-country data into three 5-year periods. Thus, each country has three observations, data permitting. The system of equations is estimated by 2SLS, with standard errors adjusted for country-specific random effects.[9] Data sources and summary statistics are reported in Appendix A.

6.3. Results

As a benchmark, the simple regression of corruption on *ethnic* is highly significant, with a *t*-statistic of 3.71. If we add the vector of windfall proxies and *aid* to this regression we obtain the equation system reported in Table 1, columns (1a) and (1b). If we do not control for the political equilibrium, there is no significant correlation between *cor* and the regressors *aid*, *sxp* and *tt*. In the aid regression, both initial income and the log of population are highly significant. *cor* and *tt* enter with negative signs in (1b), but are insignificant. If the donor could credibly commit to a policy rule we would expect the coefficient on *cor* to be different from zero. However, in the model of aid with discretion, *a* is constant for

[9]Because we use 2SLS we must also specify an equation for the interaction term *a*d*. See the discussion in the text below.

Table 1
IV-regressions on corruption and aid[a,b]

Equation	(1a)[c]	(1b)[d]	(1c)[c]	(1d)[e]	(1e)[c]	(1f)[c]	(1g)[c]
Dep. var.	*cor*	*aid*	*cor*	*aid*	*cor*	*cor*	*cor*
ethnic	0.734		−1.20		−0.679	−1.67	−1.01
	(2.56)		(−1.83)		(−1.56)	(−2.31)	(−2.19)
aid	0.018		(−0.406)			−0.433	
	(0.24)		(−2.47)			(−2.27)	
sxp	0.4E−3		−0.024		−0.026	−0.035	−0.043
	(0.05)		(−1.65)		(−2.14)	(−1.59)	(−2.46)
tt	−0.61	−0.133	−0.194	−0.066		−0.171	
	(−1.25)	(−0.98)	(−2.47)	(−0.61)		(−1.95)	
lgdp	−0.081	−2.36	−5.10	−2.17	−0.552	−0.582	−0.551
	(−0.38)	(−10.7)	(−2.16)	(15.4)	(−3.74)	(−2.49)	(−3.30)
*aid*ethnic*			0.833			0.785	
			(3.66)			(3.05)	
*sxp*ethnic*			0.057		0.065	0.075	0.088
			(2.52)		(3.14)	(2.40)	(3.23)
*tt*ethnic*			0.233			0.215	
			(1.34)			(1.22)	
(*aid* + *tt*)*ethnic*					0.520		0.466
					(4.36)		(3.69)
aid + *tt*					−0.278		−0.255
					(−4.04)		(−3.21)
africa			−1.24		−1.09	−1.20	−1.12
			(−5.49)		(−5.33)	(−5.38)	(−5.35)
centam			−0.064		−0.200	−0.131	−0.236
			(−0.24)		(−0.80)	(−0.51)	(−1.00)
cor		−0.815		−0.096			
		(−1.33)		(−0.38)			
lpop		−0.828		−0.829			
		(−8.87)		(−9.23)			
time[f]	5%	No	No	1%	5%	No	No
Observations	182	182	182	182	182	162	162

[a] 2SLS estimation on pooled data (1980–84, 85–89, 90–94), with *t*-statistics adjusted for country-specific random effects in parentheses.
[b] Each regression includes a constant and two time dummies not reported here.
[c] The instruments for *aid* are given in (1b).
[d] The instruments for *cor* in (1b) are given in (1a).
[e] The instruments for *cor* in (1d) are given in (1c).
[f] *time* indicates if the time dummies are jointly significant at the 5 (1)% level.

all z if $\theta > \hat{\theta}$. Hence, the data suggests that the donor community acts with discretion and does not systematically allocate aid to countries with less corruption. Overall, our instruments for aid are rather powerful. The R^2 in the first-stage regression of *aid* increases from 0.10 to 0.60 when *lgdp* and *lpop* are included.

Adding the regional dummies and the interaction terms yield the base specification reported in columns (1c) and (1d). We instrument for *aid*ethnic* by

including *ethnic* interacted with several of the regressors in Eq. (14).[10] In column (1c), *aid***ethnic* and *sxp***ethnic* are positive and highly significant, while *tt***ethnic* enters insignificantly, although with the predicted sign. The joint hypothesis that the coefficients on all interaction terms are zero is rejected by a wide margin (F-statistic 4.40). In accordance with the prediction of the model, the partial derivatives of corruption with respect to *aid* and *sxp* are positive for high levels of *ethnic*. The marginal impact of *aid* (*sxp*) on *cor* is positive for $ethnic > 0.49$ ($ethnic > 0.42$) implying that for 31 (33) out of 66 countries in the sample, increased aid (discovery of exploitable resources) is associated with higher corruption. The magnitude of the correlation between aid and corruption is considerable. For the most fractionalized country ($ethnic = 0.93$), a one standard deviation increase in predicted aid (2.0 percentage points) is associated with a 0.8 standard deviation increase in the corruption index (0.8 points).

As reported above, there is no significant relationship between the level of aid and *tt*. However, a closer look at the data reveals that changes in aid during sub-periods, Δaid, is responsive to terms of trade shocks, particularly in fractionalized countries. The simple correlation between *tt* and Δaid for the most fractionalized countries (top 20%) is -0.27.[11] If terms of trade shocks are (partly) counterbalanced by aid flows, it is not surprising that *tt***ethnic* is insignificantly different from zero. In column (1e) we try to circumvent the multicollinearity problem by including the sum of *aid* and *tt* as a regressor. Note that both variables are measured as a share of GDP. $aid + tt$ then provides a measure of the flow of ''windfalls'' into the country. As shown in (1e), the result improves with this specification. Using $aid + tt$ as regressor, the cutoff point for the derivative of *cor* with respect to $aid + tt$ is 0.54, implying that for 53 percent of the countries in the sample, an increase in ''adjusted'' aid is associated with higher corruption. Note also that the marginal effect of aid on corruption in countries less likely to suffer from competing social groups is significantly negative.

It is reasonable to assume that the mechanism described in the model is more relevant for countries with a sufficiently high level of aid. Therefore, we estimated the effect of aid on corruption for countries with a share of aid to GDP above 0.1 percent.[12] The results of this exercise are shown in (1f) and (1g). As evident, the results are very similar to those reported above.

Summarizing the preliminary findings, when properly instrumenting for aid, the

[10] In the base specification *ethnic* is interacted with the time and regional dummies. These interaction terms are highly correlated with *ethnic***aid* (the F-statistic on the joint hypothesis that the coefficients on the interaction variables are zero in the first-stage regression is 5.28), but uncorrelated with *aid* (F-statistic in the first-stage regression is 1.20), which make them good candidates for instruments. *ethnic* interacted with the additional regressors in Eq. (14), *lpop*, *lgdp*, are less suitable as instruments since they are highly correlated with *aid* (F-statistic in the first-stage regression is 12.18).

[11] If Nigeria is excluded the correlation jumps to -0.36.

[12] There are 12 countries with a share of aid to GDP below 0.1 percent in at least one of the three sub-periods.

interaction term neatly separates the effects of aid on corruption. On average, foreign aid is positively associated with corruption in countries more likely to suffer from competing social groups. This partitioning fits the prediction of the model and underlies the general idea that the effects of aid critically depend on the political equilibrium in the recipient country. Additional proxies of windfalls show a similar pattern. We find a weakly robust negative relationship between aid and corruption in countries less likely to suffer from competing social groups, while there is no evidence that the donors systematically allocate aid to countries with less corruption.

6.4. Sensitivity analyses

We conducted several robustness checks. We have already shown that the results are robust to the sample of countries. Another important question is whether the findings are robust to alternative specifications. To check this we included additional controls in both the aid regression (infant mortality rate at the start of the period, arms imports as a share of total imports lagged one period), and the corruption regression [regional dummies for South America and East Asia, share of trade to GDP, and a composite measure of openness from Sachs and Warner (1995)]. The original rent-seeking literature emphasized trade restrictions as the primary source of (government-induced) rents (Krueger, 1974). More generally, protection from international competition generates rents that business may be willing to pay for. Overall, once we control for *ethnic* in the corruption regression, the additional controls have only a minor effect on *cor*. Sachs and Warner's openness measure enters significantly in some specifications, but the result is not robust. The share of trade to GDP and the additional regional dummies enter insignificantly. The results of the other regressors, in particular *aid***ethnic*, remain qualitatively unaffected. We find no evidence that the level of aid is significantly correlated with arms imports or infant mortality rate, even though arms imports enters with the predicted sign and a *P*-value of around 0.10 in most specifications.

We also experimented with other proxies of wasteful rent-seeking activities. In Table 2, column (2a), we report the base specification with black-market premium (*bmp*) as dependent variable. *bmp* is a measure of (trade) distortions/regulations in the economy. With the presumption that (trade) regulations are mechanisms for redistribution to special interests, *bmp* should be positively correlated with *z*. An additional proxy of regulations is the ''Freedom from Government Regulation'' (*fgr*) rating from the Fraser Institute (1997), reported in column (2b). We also combined the two variables to create a composite measure of regulations, denoted by *regulation*, column (2c). As evident from Table 2, the interaction term, (*aid* + *tt*)**ethnic*, enters significantly [at the 10% level in (2b)] and with right sign in all three specifications and the partial derivatives of rent-seeking with respect to *aid* + *tt* are positive for high levels of *ethnic*. Thus, the result reported above is

Table 2
IV-regressions on corruption[a,b]

Equation Dep. var.	(2a)[c] *bmp*	(2b)[c] *fgr*	(2c)[c] *regulation*	(2d)[c] *cor*	(2e)[c] *cor*
ethnic	−0.151	−4.70	−2.01	−0.430	0.630
	(−0.68)	(−2.76)	(−2.68)	(−1.04)	(1.12)
aid + *tt*	−0.080	−0.859	−0.401	−0.241	−0.111
	(−2.31)	(−2.75)	(−3.08)	(−3.25)	(−0.82)
sxp	0.020	0.072	0.026	−0.022	0.008
	(3.26)	(1.36)	(1.17)	(−1.85)	(1.12)
lgdp	−0.142	−1.81	−0.671	−0.398	−0.358
	(−2.09)	(−4.05)	(−3.64)	(−2.40)	(−1.29)
(*aid* + *tt*)**ethnic*	0.103	−0.859	0.424	0.485	
	(2.06)	(1.76)	(2.14)	(4.23)	
*sxp*ethnic*	0.019	−0.042	−0.003	0.056	
	(1.97)	(−0.48)	(−0.07)	(2.69)	
africa	0.014	1.08	0.474	−1.20	−0.940
	(0.11)	(1.28)	(1.16)	(−5.73)	(−3.76)
centam	0.478	−1.53	0.376	−0.160	−0.306
	(2.36)	(0.81)	(0.75)	(−0.70)	(−1.21)
dem				−0.114	−0.174
				(−2.26)	(−2.86)
(*aid* + *tt*)**ethnic*dem*					0.080
					(2.38)
*sxp*ethnic*dem*					0.4E−3
					(0.05)
time[d]	No	No	No	No	No
Observations	188	167	160	182	182

[a] 2SLS estimation on pooled data (1980–84, 85–89, 90–94), with *t*-statistics adjusted for country-specific random effects in parentheses.
[b] Each regression includes a constant and two time dummies not reported here.
[c] The instruments for *aid* are given in (1b).
[d] *time* indicates if the time dummies are jointly significant at the 5 (1)% level.

robust to other proxies of rent-seeking activities. The main difference from Table 1 is that *sxp*ethnic* is no longer significantly different from zero.

Another feature which might influence the link between aid and rent-seeking is the nature of the political system. To control for this we include an index of democracy (*dem*) from Freedom House (1997). *dem* enters with a negative sign in (2d), and is significantly different from zero. Thus, more democratic countries tend to experience lower corruption. Note that *dem* is not simply proxying for income levels, since *lgdp* remains significant, and that the interaction term (*aid* + *tt*)**ethnic* as well as the partial derivative remain qualitatively unaffected. Interacting *dem* with the two interactions terms in (1e) yields the specification reported in (2e). The partial derivative of *cor* with respect to *dem* is significantly negative, even for a country with *ethnic* = 1 (evaluated at the mean level of *aid*).

Thus, the mechanism explored in the paper seems to be of less importance in democratic countries.[13]

Finally, we did a Hausman test of the over-identifying restrictions on the base specification reported in columns (1c) and (1d). We cannot reject the over-identifying restrictions, i.e. we find no evidence that the instruments for *aid* (*cor*) belong in the corruption (*aid*) regression.[14]

7. Discussion

We have shown that foreign aid and windfalls are associated with higher corruption in countries more likely to suffer from powerful competing social groups. We believe this result is supportive of the theory. The model we have laid out is built around a standard rent-seeking specification. Admittedly, this is a black box approach to policy formation. It should be viewed as a reduced form of a more structural model in which organized social groups can capture a large share of government income, either by means of direct appropriation, or by manipulating the political system to implement favorable transfers, regulations and other redistributive policies.

In the empirical section we use corruption as a proxy of rent-seeking. We believe that corruption is likely to be highly correlated with other forms of discretionary redistribution, and therefore able to capture more than the empirical relationship between aid, corruption and the political equilibrium. This assertion also finds support in the data – the empirical results are robust to other proxies of wasteful rent-seeking.

The key insights we want to capture in the model are that ''economically irrational'' responses to windfalls that has been noted in the literature may be ''politically rational'', and that foreign aid may affect the outcome (and the political equilibrium) through a less tangible mechanism.

These results rely on four general assumptions. First, economic policy is determined jointly by a number of powerful social groups. In the long run, the groups are better off if they cooperate than if the act noncooperatively. There is a large literature both in economics (see, e.g., Easterly and Levine, 1997; Rodrik, 1998) and in political science that links interest/social groups with redistributive policies in developing countries. Problems of coordination and cooperation are at the heart of this literature. Thus, we believe that our reduced form model captures an important aspect of reality.

[13]The specification in column (2e) is restricted, in that the various two-way interactions are excluded. When adding all two-way interactions to (2e), they enter insignificantly. To minimize the loss of degrees of freedom, we choose to drop them from the specification.

[14]The test statistics are 5.37 and 10.17, respectively. The 5 (1) percent critical values from the χ^2 distribution are 7.82 (11.34) for regression (1c), and 16.92 (21.67) for regression (1d).

Second, we assume that the deviating group can capture the entire government budget. An objection to this is that a slight increase in rent-seeking by one group when all others refrain yields a very large payoff. While technically correct, this critique takes the model's structure too much at face value. Rent-seeking is a composite variable of both direct cost of redistribution (e.g., bribes), and indirect costs of political competition (e.g., resources employed to seize or attempt to seize power). In these dimensions, deviating from a cooperative code of conduct is likely to yield high short-run payoffs.

Third, the larger the government budget, the larger the incentives to deviate. An objection to this assumption is that it implies that the richer the economy, the more rent-seeking, and the type of discretionary redistribution analyzed in the model is not associated with policies in many rich developed countries. In response, it is important to make clear that the focus in the paper is on the relationship between rent-seeking, windfalls and foreign aid, and we have purposely assumed away other incentives to engage in rent-seeking.[15] An intuitive way to think about the setup is that government income takes two forms, a constant flow and a stochastic flow. $y(\theta_t)$ is the stochastic part, and there are pre-existing institutional arrangements determining the distribution of the constant flow. The constant part could vary between countries, implying that rich countries are not necessarily more prone to rent-seeking. The focus of this paper is the conflict arising when a country receives income above the level that its pre-existing institutional arrangements can handle, i.e. windfalls, and how expectations of foreign aid influence this response.

Finally, we assume that the donor (partly) cares about the recipient's welfare. There is plenty of empirical support for this assertion.

8. Concluding remarks

The present model has abstracted from a number of issues influencing public policy in developing countries. The analysis may therefore be biased and it would be inappropriate to draw any definite conclusions. Nevertheless, some important insights emerge from the analysis. First, we have shown that the provision of public goods does not need to increase with government income, thus providing a political-economy rationale for why large windfall gains in revenue, or large inflows of foreign aid, do not necessarily result in general welfare gains. Second, we have shown that expectations of aid in the future may suffice to increase rent dissipation and reduce the expected level of public goods provision.

From a policy perspective, there are four main implications of these findings. First, the model points to the importance of studying the interaction between the political process shaping public policy and foreign aid. Second, concessional

[15] One can imagine other situations in which rent-seeking is intensified when the cake starts to shrink (see, e.g., Rodrik, 1998).

assistance may influence policy in the recipient country even without any resources actually being disbursed, implying that evaluations of project and sector assistance may overestimate the total impact of foreign aid. Third, the analysis stresses the important issue of commitment in foreign aid policy. If the donor community can enter into a binding policy commitment, aid may mitigate the incentives for social groups to engage in rent-seeking activities. However, such a regime shift would involve an aid policy that in the short run provides more assistance to countries in less need, and less assistance to those in most need. Enforcing such a regime shift may be difficult (Svensson, 1997). Finally, the fact that democracies seem to be less subjective to the perverse effect of aid on corruption suggests that political liberalization should have an important priority in the donors' policy agenda.

We provide some empirical evidence supporting the mechanism we propose. Foreign aid and windfalls are associated with increased corruption in countries more likely to suffer from competing social groups. We find a weakly robust negative relationship between aid and corruption in countries where these conditions are less likely, while there is no evidence that the donors systematically allocate aid to countries with less corruption. These results are robust to a number of statistical problems.

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Appendix A. Data description, sources and summary statistics (Table A.1)

africa, dummy variable for Sub-Saharan African countries; *aid*, grants and grant equivalents of concessional loans (Chang et al., 1997) deflated by import unit value index (US$) 1985=100 (IFS) to real GDP (1985=base year) (Penn World Tables 5.6), averages over 1980–84, 85–89, 90–93; *bmp*, log of 1+black-market premium (black-market xrate/official xrate−1) (World Bank National Accounts, World's Currency Yearbook, average over 1980–84, 85–89, 90–92; *centam*, dummy variable for Central American countries; *cor*, indices of corruption from ICRG (Knack and Keefer, 1995), where 0 indicates least corrupt and 6 most corrupt, averages over 1982–84, 85–89, 90–94; *dem*, ranking of political liberties on a scale from 0 to 6, where 6 is most free (Freedom House, 1997); *ethnic*, index

Table A.1
Summary statistics

	Mean	Median	Max	Min	St. dev.
aid	2.31	1.36	17.9	0	2.62
cor	3.36	3.00	6.00	0.62	1.03
ethnic	0.48	0.56	0.93	0	0.30
sxp	16.9	13.3	62.1	1.62	13.0
tt	−0.54	−0.43	2.63	−4.69	1.16
lgdp	7.46	7.51	9.33	5.70	0.75
dem	2.75	2.45	6.00	0	1.78
fgr	4.17	2.00	10.0	0	3.52
bmp	0.38	0.15	4.77	−0.03	0.58
regulation	0	−0.58	8.88	−1.83	1.65

of ethnolinguistic fractionalization, 1960. Measures the probability that two randomly selected people in a country belong to different ethnolinguistic groups (Easterly and Levine, 1997); *fgr*, freedom from government regulations. Component of the Fraser Institute's index of Economic Freedom, from 0 to 10, with 10 least regulations (Fraser Institute, 1997); *lgdp*, log of initial real per capita GDP (Penn World Tables 5.6); *lpop*, log of total population in 100.000 units at the start of sample period (World Bank, 1998); *regulation*, the sum of BMP and FGR after each variable has been standardized; *sxp*, share of exports of primary products in GDP measured in nominal US$, units percentage points at the start of the sample period (World Bank Trade Statistics); *tt*, the average growth rate of dollar export prices times initial share of exports in GDP minus the average growth rate of import prices times initial share of imports to GDP (World Bank, 1998).

Appendix B. Sufficient conditions for the existence of a fixed point

Let θ_t' be a candidate for a fixed point and define

$$\Omega(\theta_t') = y(\theta_t') - (n/(n-1))P(\theta_t'). \tag{B.1}$$

Since $\Omega(\theta_t')$ is continuous, a sufficient condition is that $\Omega(\underline{\theta}) < 0$ and $\Omega(\bar{\theta}) > 0$. Using (1), (4) and (6), Eq. (7) can be written as

$$P(\hat{\theta}_t) = \beta\left[\frac{(n-1)}{n^2}\int_{\underline{\theta}}^{\hat{\theta}} y(\theta_t)\mathrm{d}F(\theta_t) + (1-F(\hat{\theta}_t))\frac{1}{n}y(\hat{\theta}_t) - \frac{1}{n^2}\int_{\hat{\theta}}^{\bar{\theta}} y(\theta_t)\mathrm{d}F(\theta_t)\right], \tag{B.2}$$

where $\beta \equiv \delta/(1-\delta)$. By inserting (B.2) into (B.1) and simplifying we obtain

$$\Omega(\underline{\theta}) = y(\underline{\theta})\left[1 - \frac{\beta}{(n-1)}\right] + \frac{\beta}{n^2}\int_{\underline{\theta}}^{\bar{\theta}} y(\theta_t)\mathrm{d}F(\theta_t) < 0. \tag{B.3}$$

Hence, condition (i). The other necessary condition is given by the following equation:

$$\Omega(\bar{\theta}) = y(\bar{\theta}_t) - \frac{\beta}{n^2}\int_{\underline{\theta}}^{\bar{\theta}} y(\theta_t)\mathrm{d}F(\theta_t) > 0. \tag{B.4}$$

A sufficient condition for (B.4) is that condition (ii) is satisfied, in which case the difference between the first two terms is positive.

Appendix C. Proof of Proposition 5.1

The equilibrium with aid is denoted by subscript a. For convenience, time and group subscripts are dropped. Let $y(\theta_1)$ denote the cutoff value of $y(\theta)$ for which (9) no longer binds in the fully CE, i.e. $y(\theta_1) = w_c^{-1}(\varphi) - ny_c$, and $y(\theta_2)$ the corresponding cutoff value in the NE. Comparing with the equilibrium without aid we see that welfare of the social groups in the fully CE is constant $\forall y(\theta_t) \in [y(\underline{\theta}), y(\theta_1)]$, implying that a deviation must occur when $y(\theta_t) > y(\theta_1)$. Moreover, $a^c(\theta_t) = 0\ \forall y(\theta_t) \in [y(\theta_1), y(\theta)]$. Hence, the gain of a deviation is not affected by the inclusion of a donor. At the same time $P_a(\theta') \leq P(\theta')$ since

$$P_a(\theta') = \beta\left[\int_{\theta_1}^{\theta_2} [u^c(\theta_t) - u^c(\theta_1)]\mathrm{d}F(\theta_t) + \int_{\theta_2}^{\bar{\theta}} [u^c(\theta', \theta_t) - u^n(\theta_1)]\mathrm{d}F(\theta_t)\right] \tag{19}$$

is strictly smaller than $P(\theta')$ given in (7), where $u^c(\theta', \theta_t)$ is the utility in the SBE. Hence, $\Omega_a(\theta') > \Omega(\theta')$. Consequently, $\hat{\theta}$ must fall.

Appendix D. Proof of Proposition 5.2

This can be seen by the following two-part argument. First, the gain of a deviation is not affected by the inclusion of a donor (see main text). Second, solving for the equilibrium aid flows in the two institutional settings we have

$$a^c(\theta_t) = w_c^{-1}(\varphi) - \sum_{i=1}^{n} u_i^c(\theta_t), \tag{D.1}$$

$$a^n(\theta_t) = n\left[w_c^{-1}(n\varphi) - \sum_{i=1}^{n} u_i^n(\theta_t)\right]. \tag{D.2}$$

There are two opposite forces determining the amount of aid disbursed in (D.1) and (D.2). First, utility is lower in the NE which tends to increase aid flows in the noncooperative setting. Second, a larger amount of aid will be wasted in rent dissipation in the NE which tends to lower aid flows. Using a CES function with constant elasticity of substitution equal to $1/\sigma$ to solve explicitly for the equilibrium aid flows we can show that $a^c(\theta_t) \geq a^n(\theta_t)\ \forall y(\theta_t)$ provided that

$$y_i \geq \left[\frac{(n^{1-1/\sigma}-1)}{n(n-1)}\right]\varphi^{-1/\sigma}. \tag{D.3}$$

A sufficient condition for (D.3) is that $\sigma \leq 1$ in which case the term in bracket is negative.

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