

# The 'Elite Capture' Problem in Participatory Development

By

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*Abstract: A key problem today arises from the fact that most donor agencies, including governments from developed countries, are rushing to adopt with a lot of enthusiasm the so-called participatory approach to development. There is then a serious possibility that such an approach will be subverted and deflected from its intended purpose because of the risk of creating and reinforcing an opportunistic rent-seeking elite. This paper proposes a mechanism, labeled the leader-disciplining mechanism (LDM), to overcome the 'elite capture' problem and discusses the conditions under which it is most likely to fail or succeed.*

Keywords: participatory development, rural communities, elite capture, development aid, equity, developing countries

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## 1. Introduction

Community-Driven Development (CDD) has long been claimed to be at the heart of the aid approach of Non-Governmental Organizations (NGOs). It has also been attempted by some governments in developing countries in the hope of making rural development efforts more effective (think, for example, of the so-called community development programs implemented in India in the post-war decades), as well as by a few international agencies, –such as the Food and Agriculture Organization (FAO) and the International Fund for Agricultural Development (IFAD). The movement towards adoption of the CDD approach has recently accelerated as a result of strong disillusionment with top-down approaches, especially when aid resources are channeled through state agencies. The bilateral aid agencies of a large number of developed countries and some important international organizations such as the World Bank have thus radically changed their aid strategy to enhance aid effectiveness and better reach the rural poor.

The main argument in favour of CDD is that communities are deemed to have a better knowledge of the prevailing local conditions (such as who is poor and deserves to be helped, or the characteristics of the local micro-environment), and a better ability to enforce rules, monitor behaviour, and verify actions related to interventions (see, e.g., Hoddinott *et al.*, 2001). On the other hand, a more balanced appraisal stresses the point that communities or groups suffer from the disadvantage of not being as accountable as higher-level agencies to their members. More precisely, when the responsibility of allocating central resources is delegated to local organizations, village-level elites tend to appropriate for themselves whatever portion of the resources that they need and to let the poor have the leftovers only (Conning and Kevane, 1999; Galasso and Ravallion, 2000).

This problem of ‘elite capture’ is all the more serious as donor agencies are enthusiastically rushing to adopt the participatory approach because they are eager to relieve poverty in the most disadvantaged countries and/or because they need rapid and visible results to persuade their constituencies or sponsors that the new strategy works well. Clearly, such urgency runs against the requirements of an effective CDD since the latter cannot succeed unless it is based on a genuine empowerment of the rural poor (see, e.g., Rahman, 1993; Edwards and Hulme, 1995; Platteau and Abraham, 2001, 2002, 2003). If the required time is not spent to ensure that the poor acquire real bargaining strength and organizational skills, ‘ownership’ of the projects by the beneficiary groups is most likely to remain an elusive objective, such as has been observed in the case of the World Bank’s social funds program (Narayan and Ebbe, 1997; Tendler, 2000: 16-17).

The perverse mechanism that risks undermining participatory development is triggered by the temptation of donor agencies to skip the empowerment phase by asking intended beneficiaries to form groups or partner associations and to 'elect' leaders to direct them. In effect, such a method establishes a power relationship that is open to abuse, since the donor agency has little or no communication with the community except through these leaders who are typically its most prominent members and are usually adept at representing their own interests as community concerns expressed in the light of project deliverables (Mosse, 2001). As pointed out by Esman and Uphoff (1984: 249), "the shortcut of trying to mobilize rural people from outside through leaders, rather than taking the time to gain direct understanding and support from members, is likely to be unproductive or even counterproductive, entrenching a privileged minority and discrediting the idea of group action for self-improvement".

The risk of misappropriation of aid resources by unscrupulous leaders is aggravated when educated and well-connected persons usually with an urban background succeed in gaining access to leadership positions in village-level associations eligible for support under CDD. These persons, acting as 'development brokers', have been quick to understand that the creation of a local NGO has become one of the best means of procuring funds from the international community (Conning and Kevane, 1999: 20; Meyer, 1995; Bebbington, 1997; Bierschenk, de Sardan, and Chauveau, 2000). In the words of Chabal and Daloz (1999: 22-24): "a massive proliferation of NGOs ... is less the outcome of the increasing political weight of civil society than the consequence of the very pragmatic realization that resources are now largely channelled through NGOs". As a consequence, "the political economy of foreign aid has not changed significantly" because "the use of NGO resources can today serve the strategic interests of the classical entrepreneurial Big Man just as well as access to state coffers did in the past...".

Till the rural poor are sufficiently empowered, the 'elite capture' problem must be somehow overcome if the CDD is to prove more successful than previous development aid approaches. One can think of at least two mechanisms to achieve that end, viz. a leader-disciplining mechanism based on reputation effects, and a mechanism relying on competition among rival leaders. While not entirely ignoring the latter, the paper will essentially explore a mechanism of the former type.

Attention is focused on CDD supported by foreign donors which, by definition, want their financial efforts to be of limited duration: guided by the requirement of self-sustainability, aid efforts are indeed aimed at making rural communities eventually self-supporting.<sup>1</sup> Such a requirement complicates our

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<sup>1</sup> We therefore ignore the problem of fiscal decentralization whereby municipalities or local governments receive tax transfers from a central state for an endless round of games (for a

problem in so far as finitely repeated interactions between a donor agency and a local group or community, as we know, are doomed to end up in the foiling of reputation effects. In actual fact, we need to usher in a social norm (of intertemporal fairness) whereby the grassroots constrain the strategic behaviour of their leader to prevent him from misappropriating the entire aid budget. If such a norm does not exist, or some other social feature that has the same effect of enhancing the bargaining power of the grassroots, the leader-disciplining mechanism will simply fail to achieve its objective.

This being granted, it will be shown that, as expected, local leaders embezzle a positive amount of money at equilibrium. More interestingly, the extent of misappropriation varies not only with the preferences of the donor agency, –most notably, its degree of impatience in disbursing aid money in favour of the poor–, but also with the effectiveness of its fraud detection technology and with the characteristics of the aid environment. In particular, it will be proven that a lower share of the aid budget reaches the poor when the donor agency is more impatient, and when there is more active competition between agencies using the CDD approach. In the light of these two findings, the present rush for CDD-oriented aid efforts appears problematic, and the need for further institutional checks as well as for time-consuming processes of empowerment of the rural poor appears all the more pressing.

In the next section, we present an especially rich case study material that allows us to gain profound insights into the nature of the problem of misappropriation by local elites of externally provided funds (Section 2). Partly building on these insights, we then discuss the possibility of a leader-disciplining mechanism destined to surmount the ‘elite capture’ problem (Section 3), and thereafter present a formal model depicting how such a mechanism operates (Section 4). Comparative-static results are derived and discussed in the subsequent section (Section 5). Section 6 briefly discusses the possibility for foreign donors to rely on competition between local leaders to better reach the poor. Finally, Section 7 summarizes the findings and put them in perspective before suggesting some further steps to mitigate the ‘elite capture’ problem.

## **2. An illustrative case study**

That the above difficulties ought not to be underestimated is evident from the story below. In the late years of the 20<sup>th</sup> century, a Western European development NGO (whose identity is not disclosed for the sake of discretion) established a relationship with a village association in a Sahelian country. This

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discussion of the links between this issue and the model presented here, see Platteau, forthcoming).

association, which is a federation of several peasant unions, had been initiated by a young and dynamic school teacher, the son of a local chief. The NGO decided to follow a gradual participatory approach consisting of strengthening the association institutionally before channeling financial resources to it. This decision was the outcome of a carefully worked out diagnosis. It brought to light important weaknesses of the partner association that had to be corrected before genuine collaboration could take place: proclivity to view aid agencies as purveyors of money which can be tapped simultaneously, lack of analysis of local problems and of strategic vision for future action, loose and undemocratic character of the association (ill-defined objectives, ill-defined roles and responsibilities of the office bearers, absence of internal rules and reporting procedures, etc.).

After two years during which institutional support was provided in the form of guidance to improve the internal functioning of the partner association and to help define development priorities and the best means to achieve them, funds were made available for different types of investment. Within the limits of the budget set for each prioritized line of investment, the association could choose the project deemed most useful. A special committee was established to prepare rules regarding the use of the budget and enforce the abidance of such rules by different projects. In this way, the group could hopefully appropriate the process of decision-making, preparation of project proposals and programming of the activities involved (all aspects traditionally undertaken by the foreign donor agencies). Continued support at different levels (technical, administrative, organizational, and methodological) was found necessary to help in the effective implementation of the projects.

In spite of all these efforts to strengthen the partner association institutionally, things turned out badly. Thanks to the collaboration of two active members of the General Assembly (actually two animators) and the local accountant, the foreign NGO discovered serious financial and other malpractices that were committed by the main leader of the African association: falsifying of accounts and invoice over-reporting, under-performance by contractors using low-quality materials, etc. It reacted by calling on the local committee to sanction these manifest violations of the rules, yet at its great surprise no punishment was meted out and the general assembly even re-elected their leader in open defiance of its request. The two dissident animators were blamed for being driven by jealousy and envy, while the accountant was fired. Here is a clear illustration of the support that poor people are inclined to give to an elite member on the ground that they have benefited from his leadership efforts. That he appropriated to himself a disproportionate share of the benefits of the aid program is considered legitimate by most of them. They indeed think that without his efforts their own situation would not have improved at all. In particular, he created the village association which had to be formed in order to be eligible for external assistance.

In a context where the ability to deal with external sources of funding is concentrated in a small elite group, the bargaining strength of common people is inevitably limited, hence their ready acceptance of highly asymmetric patterns of distribution of programs' benefits. If the intervention of the elite results in an improvement of the predicament of the poor, however small is the improvement, the latter tend to be thankful to their leader(s): the new outcome represents a Pareto improvement over the previous situation and this is what matters after all. In the above example, it is thus revealing that the ordinary members of the association defended their leader on the ground that "everybody around him benefited from the project and, if he benefited [much] more than the others, it is understandable because he is the leader". They think it is highly unfair on the part of the foreign NGO to have withdrawn their support to the existing team and to have "humiliated their leader" by depriving him of all the logistical means (jeep, scooters, etc) previously put at his disposal.

As for the leader himself, he openly admitted (during a conciliatory meeting organized by the high commissioner of the province) to have used a significant portion of the money entrusted to him for his own personal benefit. Yet, he did not express any regret since it was his perceived right to appropriate a large share of the funds. Did he not devote considerable energies to the setting up of the local organization and the mobilization of the local resources as required by the foreign NGO? By attempting to curb his power to allocate funds in the way he deemed fit, the latter exercised an intolerable measure of neo-colonialist pressure. This criticism was voiced in spite of the fact that the NGO paid him a comfortable salary to reward his organizing efforts.

Stories like this one could be easily multiplied and the authors personally went through several similar experiences while working with local groups, NGOs and associations through Europe-based aid agencies. It is not hard to imagine that they can also happen when aid agencies are official organizations with much less experience in, and less well suited for, participatory development. What must be stressed is that the attitudes involved partake of the logic of clientelistic politics characteristic of the African continent. In the words of Chabal and Daloz, indeed, "For those at the very bottom of the social order, the material prosperity of their betters is not itself reprehensible so long as they too can benefit materially from their association with a patron linking them to the elites" (Chabal and Daloz, 1999: 42). As a result, abuses of power are tolerated so long as the patron is able to meet the demands made by his clients who are concerned above all with ensuring their daily livelihood.

It is ultimately because they overlook the genuine nature of the links between elites and commoners, rulers and ruled in Africa that international donor agencies overestimate the capacity of the participatory approach to deliver development gains more effectively and equitably. It is for the same reason that failures of local development associations are often attributed to a poor organizational ability of communities at local level without the reader being told

exactly what this means in concrete terms. Thus, for example, in the case of a failed community association for forest management in Palawan Island (Philippines), we learn that the local leader mishandled the community resource and eventually succeeded in embezzling an NGO-provided fund. It is striking that “no one had the nerve to defy” him, a fact blamed on “a lack of community capacity” (McDermott, 2001: 55).

### 3. A mechanism to discipline local leaders

Let us consider the following three-agent decision framework. At the top is an altruistically motivated donor agency (labelled *A* below) which wants to disburse a given amount of funds. At the bottom are the grassroots (labelled *G*) who are the intended beneficiaries of this aid effort. And between the two is a local leader (labelled *L*) who aims to organize the grassroots into a group or association for the sake of securing the funds on offer. As a matter of fact, the participatory character of the program makes it mandatory that beneficiaries are organized into a collective to be eligible for funds. In other words, the donor agency will not disburse funds unless it has received evidence that a cohesive group of intended beneficiaries exists through which these funds can be channelled. Yet, at the same time, it is ill-informed about what is happening at the level of the grassroots and this information gap is exploited by the local leader for his own benefit. More precisely, the latter can lie to the donor agency about the manner in which the funds have been disposed of, pretending that they have safely reached the grassroots while in fact he has largely appropriated them.

What is being played between the leader and the grassroots is a one-stage bargaining game. In dealing with *G*, *L* thus has a leadership role, meaning that he has the first move: to the *G* group which he has formed or helped to form, he makes a proposition about the way to share the funds offered by *A*. If *G* accepts the transfer proposed by *L*, they receive that amount. But if they disagree with *L*'s proposal, they create a situation in which both the leader and themselves have to forsake the money. Indeed, as explained above, it is in the nature of the game that *A* will not disburse the money unless an agreement has been struck between *L* and *G* to the effect that the former is empowered to represent the latter and act on its behalf. The prediction of economic theory in this sort of situation known as the ultimatum game is that the agent with the first move will make a proposal whereby he appropriates most of the funds on offer while the agent with the second move will accept it since getting something, however small, is always better than ending up with nothing. In the setting of a one-period interaction framework, anticipating that the local leader will embezzle most of the funds, the donor agency should then refrain from disbursing money if it has a good grasp of the game being played.

The outcome of such a game can be summarized as follows: knowing that the grassroots do not have any substantial bargaining power vis-à-vis their local leader, and expecting the latter to use his strategic advantage to misappropriate most of the aid money, the aid agency refuses to channel money through him. If in reality aid agencies do channel money through local leaders in the kind of circumstances just described, it is either because they do not have a good knowledge about the game that is played or because, in spite of their pro-poor rhetoric, their main concern is not that the grassroots benefit from most of the external funds but that such funds are disbursed anyway. The first possibility, imperfect knowledge of the game, typically arises when aid agencies tend to underestimate the leverage of the local leader within the group, or to overestimate his degree of altruism as a result of the leader's cunning ability to deceive them or of their own naivety.

In order to get out of this quandary, the local leader must be disciplined through an appropriate mechanism. Such a mechanism must involve the possibility of detecting embezzlements and punishing the leader in the event of a proven fraud. For punishment to be feasible, the game must be repeated, yet we know from repeated game theory that, unless some uncertainty exists regarding the payoffs or some doubts about the rationality of other players, the inefficient outcome (the leader embezzles the funds) is as unavoidable in a finitely repeated game as in a one-period game (Kreps and Wilson, 1982; Kreps, 1990 : 536-43 ; Friedman, 1990 : 190-4). In other words, the game must have an infinite or an indeterminate duration for the desirable outcome to become a possible equilibrium.

This result does not apparently solve our problem, however. As a matter of fact, because they aim at enabling beneficiaries to become eventually self-supporting, donors typically want their aid transfers to be of limited and definite duration. Consider a donor agency which, like the one referred to in the previous section, decides to spread its aid transfers over several successive periods and to make later disbursements explicitly conditioned by proper behaviour on the part of the local leader in handling the previous tranche of aid money. The lesson from game theory is that this mechanism is of no avail. The leader will embezzle the last tranche knowing that he cannot be punished at a later stage and, anticipating such an action, the aid agency will not disburse that last tranche. The cancellation of the last tranche means that the leader cannot be sanctioned in the last round, as a result of which he is also induced to misappropriate the money of the penultimate tranche. The strategic response of the donor is to cancel that penultimate tranche as well. By backward induction, it is evident that even the first tranche will not be disbursed by the donor with the consequence that the grassroots will not get any financial support.

An obvious way out of the deadlock would consist of requiring the leader to repay the aid money if he has been caught misappropriating the aid money. Unfortunately, there are insuperable problems with such a solution since



enforcing repayment from the leader is likely to prove extremely costly in the context of developing countries.

We have therefore not succeeded in escaping the deadlock with which we started. To do so necessitates that we give up the assumption of strategic rational behaviour imputed to agents by classical game theory. There is a good ground for thus departing from the common framework of repeated game theory inasmuch as the grassroots can be realistically assumed to adhere to a norm of fairness. To the extent that such a norm embodies long-term considerations in the sense of favouring the long-term interests of the grassroots, taking it into account is tantamount to transforming the game representing the leader-disciplining mechanism (LDM) from a finite to an infinite duration. In order to clarify this point, it is useful to describe in some detail a leader-disciplining mechanism representable as a two-period game. In this game, a donor agency,  $A$ , hands out two tranches of aid money to the leader,  $L$ , of a local association of villagers,  $G$ , yet the second tranche will be actually disbursed only if no fraudulent practice has been detected regarding the use of the first tranche.

The agency has to choose the manner in which the resources it wants to allocate to the targeted association will be divided between the first and the second tranches. There is an obvious trade-off to be confronted here. On the one hand,  $A$  would like to spend as much as possible during the first period because it is impatient to see the results of its intervention. Such a motive may actually arise from two different kinds of considerations.  $A$ 's behaviour may be guided by the desire to see the poverty of  $G$  alleviated as soon as possible. But  $A$  may also be eager to demonstrate the usefulness of its actions to the general public or the organizations (national or international) that are the ultimate purveyors of its financial resources, so as to be able to mobilize their support again in the future. On the other hand,  $A$  wants to defer disbursement of aid money as much as possible till the second period, since late payments serve to discipline  $L$ . In other words, the higher the relative amount of the second tranche the more  $L$  is encouraged to use the first tranche according to  $A$ 's prescriptions (that is, for the benefit of  $G$ ). Note that the amount granted under the first tranche must be positive so as to ensure that  $L$ 's behaviour can be effectively tested before making a decision about whether or not to disburse the second tranche.

Knowing the amounts of the first and the second tranches committed by  $A$  as well as the resources spent by  $A$  to detect fraud,  $L$  chooses the manner in which he will apportion the aid money between him and  $G$ , both during the first and the second periods. As for the grassroots, they decide the minimum shares that must accrue to them in the first and second periods. If these shares are not accepted by  $L$ , they quit the local association, thereby signalling to  $A$  that participatory development is not feasible in their village. During the first period,  $L$ 's choice of the division rule is 'disciplined' by the risk of detection of resource misappropriation and the ensuing threat of losing access to the second tranche.

As for  $G$ , they have no real bargaining power in this period since they remain confronted with a ‘take it or leave it’ choice. During the second period, a much lower share of aid money should accrue to  $G$  than during the first period since  $L$  is no more disciplined by the threat of losing access to future tranches of donated funds. According to the logic of the ultimatum game,  $G$  should accept a share close to zero.

This inescapable logic can however be defeated if  $L$  is not allowed to lower the share accrued to the grassroots between the first and the second periods. This is precisely the role that a social norm of intertemporal fairness can fulfil. It is indeed reasonable to assume that the intended beneficiaries will consider any reduction of their entitlement over time as unfair practice. To put it in another way, only an inter-temporally constant division rule will appear to them as a legitimate principle. As a consequence, the portion granted by  $L$  to  $G$  will be the minimum share compatible with an acceptably low risk of detection at the end of the first round, and this share will be applied again during the second round. Clearly, the norm of fair sharing serves the function of granting a genuine bargaining power to  $G$  during the second round. If the assumption of a prevailing fairness norm of sharing is deemed unreasonable, an alternative interpretation is that the grassroots think of their long-term interests while they oppose a reduction of their entitlements over time. The idea is then that they are keen to defend their future interests because they anticipate that other games are going to be played later.

Not only are the grassroots assumed to adhere to a norm of fair sharing of the sort just described, but also to be able to perfectly enforce  $L$ 's promise to pay them the agreed share of the aid transfer once the donor agency has released the money. This is evidently a debatable assumption, especially if  $G$  are largely illiterate and barely able to monitor their leader's actions as well as to express their discontent once a fraud is discovered. In the latter circumstances, the grassroots are obviously doomed to be seriously exploited by their leader and there is not much that can be done to relieve their poverty until they have acquired a better ability to defend their rights and to assert themselves in front of him.

It should now be clear that our two-period game is the reduced form of an infinitely repeated game. This is also true because of another feature of the mechanism, namely the fact that  $A$ 's threat of punishing an association led by a dishonest  $L$  is not automatically credible. Indeed, such punishment carries a cost for  $A$  since the funds earmarked for a failing community-based project can be re-allocated only at a cost, whereas the community concerned would in any event obtain the share promised by  $L$  in the first period thanks to the existence of the norm of fairness. To establish links with a community and its leader(s) involves significant set-up and other transaction costs and these will have to be incurred again if a new community is to be selected in the place of a failing one. For the threat of withdrawing funds to be credible, it must therefore be the case that  $A$

derives gains, presumably long-term gains, by strictly enforcing threats in the present circumstances. Again, this assumption amounts to embedding into our mechanism long-term considerations that are played over an infinite or indeterminate period of time<sup>2</sup>.

A final remark is in order. One important shortcoming of the aforementioned LDM is that not only the local leader but also the intended beneficiaries are sanctioned in the event of fraud detection. For this reason, it is not in the interest of  $G$  to report malpractices to  $A$  at the end of the first period lest they should lose any entitlement to the second tranche. (And, if we take heed of the story told in Section 2,  $G$  cannot be expected to be necessarily shocked by what appears to us as an exploitative behaviour of  $L$ ). Likewise, they have no incentive to complain about any violation of the agreed sharing rule by  $L$  during the first period.

To conceive of a mechanism that would punish the leader without sanctioning the grassroots is difficult. As has been pointed out above and illustrated in Section 2, compelling the former to return the misappropriated money is almost impossible under the conditions that prevail in many poor countries (see supra). And to ensure that the grassroots will have continued access to the aid flow would require the presence of an alternative local leadership through which the money could be channelled. Whether reliance on competition between several local leaders could enable aid agencies to better reach the poor will be briefly discussed after we have completed the analysis of the LDM.

#### 4. Modelling the LDM

The objective of the donor agency,  $A$ , is that as large a share as possible of a given amount of aid money earmarked for a particular community reaches the intended beneficiaries,  $G$ . We assume that the money at stake is intended for use by a particular group or community. As we shall show later, such an assumption is innocuous because making the number of target groups or communities endogenous leads to a corner solution. In other words, all important results are unaffected by our assumption that the exogenously given aid budget is earmarked for a particular community rather than for a variable number of communities to be determined by the model itself. This being clarified, the presence of an opportunist local leader,  $L$ , through whom the funds must be channelled, compels  $A$  to strive to discipline  $L$ 's behaviour. Two instruments are available to achieve this end. The first instrument is the decision regarding the intertemporal allocation of the money between two successive

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<sup>2</sup> Note that, if aid transfers to communities could be anchored in a framework of fiscal decentralization, there would be an endless round of disbursement periods. The situation would therefore be, explicitly, that of an infinitely repeated game.

periods of time. As a matter of fact, the more the disbursement is postponed to the second period, the more  $A$  will be able to discipline  $L$ . At the same time, however,  $A$  prefers the aid transfer to be made in the first rather than in the second period because it is eager to see the predicament of  $G$  to be improved as soon as possible.

The second instrument in the hands of  $A$  is the supervision effort devoted to detecting possible frauds by  $L$ . Here again there arises a dilemma which can be stated as follows: the higher the supervision effort made by the donor agency the more the local leader is induced to convey funds to the grassroots yet, on the other hand, since a greater supervision effort requires more money to be spent on fraud detection, the net amount of the aid budget remaining available for the intended beneficiaries will be consequently smaller.

Here is a classical principal-agent problem with  $A$  unable to observe  $L$ 's actions directly. In this set up,  $A$  maximizes its objective function under the constraint of  $L$ 's optimizing behaviour, it being understood that  $L$  considers as given the intertemporal distribution of the aid money between the two periods and the level of supervision effort exercised by  $A$ . Let us therefore start by writing the objective function of  $L$ , assuming for the sake of simplicity that he does not discount future incomes :

$$\text{Max}_a U^L(\mathbf{a}) = (1 - \mathbf{a})X_1 + (1 - \mathbf{a})X_2(1 - \mathbf{y}), \quad (1)$$

where  $X_1$  and  $X_2$  are the amounts of the first and second tranches of aid money, respectively;  $(1 - \mathbf{a})$  is the share of the aid transfer appropriated by  $L$  and  $\mathbf{a}$  is therefore the share accruing to  $G$ ;  $\mathbf{y}$  is the probability of detection of  $L$ 's embezzlement. The detection function can be simply defined as follows (note that it will be further justified at a later stage):

$$\mathbf{y} = s(1 - \mathbf{a})^2, \quad (2)$$

where  $s$  measures the effectiveness of the fraud supervision process. It corresponds to the level of the detection probability when  $L$  takes maximum risk by appropriating the entire amount of aid money ( $\mathbf{a} = 0$ ). This implies that  $s \leq 1$ . Moreover,  $\mathbf{y} = 0$  when  $L$  behaves in a perfectly honest manner ( $\mathbf{a} = 1$ ). Underlying the above function is the realistic assumption that the probability of detecting dishonest behaviour increases at a rising rate with the extent of the embezzlement:  $\partial^2 \mathbf{y} / \partial \mathbf{a}^2 = 2s$ . For example, if facilities intended for use by  $G$  have not been constructed, detection of fraud is easier than if technical standards for construction have been violated by the leader colluding with an entrepreneur with a view to economizing on the budgeted expenditures and surreptitiously pocketing the money thus saved (a commonly practiced kind of fraud).

The problem of  $L$  then becomes:

$$\text{Max}_{\mathbf{a}} U^L(\mathbf{a}) = (1-\mathbf{a})X_1 + (1-\mathbf{a})X_2[1-s(1-\mathbf{a})^2] \quad (1')$$

Differentiating (1') with respect to  $\mathbf{a}$  yields  $L$ 's reaction function:

$$-X_1 - X_2 + 3X_2s(1-\mathbf{a})^2 = 0 \Leftrightarrow (1-\mathbf{a})^2 = \frac{X_1 + X_2}{3sX_2} \quad (3)$$

Using (2) and (3), we also find that:

$$\frac{X_2}{X_1 + X_2} = \frac{1}{3\mathbf{y}} \quad (4)$$

In words, there is an inverse (proportional) relationship between the share of the net amount of the aid budget disbursed during the second period, on the one hand, and the probability of fraud detection, on the other hand.

From (4), it is evident that  $\mathbf{y}$  cannot be nil at equilibrium. In point of fact, it must be the case that  $\mathbf{y} > 1/3$ , since the ratio  $X_2/(X_1 + X_2)$  must be smaller than one ( $X_1$  may not be equal to zero, as detection of fraud would be infeasible in the absence of a positive aid flow in the first period). It then follows from (2) that  $\mathbf{a}$  must necessarily be smaller than one: the local leader will never find it in his interest to channel the whole aid budget to the grassroots.

There are thus two ways, the first one rather unfavourable and the second one rather favourable, to interpret the failure story reported in Section 2. Indeed, either the foreign NGO was acting ignorantly by disbursing money, in the sense that it was over-optimistic about the virtues of the local leader (a situation which would correspond to an out-of-equilibrium outcome of the game); or, it just happens that it detected the leader's fraud, maybe because its monitoring process was rather effective (a situation which can be rationalized as an equilibrium of the LDM game). In this instance, both interpretations appear to be valid in so far as (1°) there were varying assessments about the extent of trust that could be placed in the local leader among the different persons in charge in the foreign NGO; and (2°) the monitoring of the project was relatively serious (the same staff person was involved in the designing and the following up of the project from the beginning and he was regularly sent to the field for the purpose of accompanying and monitoring the organizational process of, and the use of funds by, the local partner association).

Applying the implicit function theorem to find  $L$ 's response to a change in  $X_2$ , the level of detection effectiveness being assumed to be constant, we find:

$$\frac{da}{dX_2} = \frac{1-a}{2X_2} = -\frac{da}{dX_1} > 0 \quad (5)$$

Here is the heart of the leader-disciplining mechanism: when the donor agency increases the amount of the aid transfer that is disbursed in the second period, the local leader is induced to raise the share accruing to the grassroots. Increasing the amount of the first tranche has the opposite effect. Such is the interpretation to be given to relationship (4) above: when the relative importance of the second tranche is increased, the probability of fraud detection is lower at equilibrium (along  $L$ 's best response curve), because the leader is willing to reduce this risk by limiting the extent of his appropriation of the aid funds.

Likewise, we derive  $L$ 's response to a change in  $s$ , the level of  $X_2$  being assumed to be constant:

$$\frac{da}{ds} = \frac{X_1 + X_2}{6s^2 X_2 (1-a)} > 0 \quad (6)$$

The direction of this effect is according to expectation: the more effective the detection procedure the higher the share of the aid fund that  $L$  conveys to  $G$ . We shall see below that the degree of effectiveness of the detection procedure can be somewhat manipulated by  $A$ , so that we will be able to write  $L$ 's reaction to a change in detection effectiveness as a reaction to a decision variable available to  $A$ .

We can now turn to the donor agency's problem. Its utility function reflects its altruism vis-à-vis the grassroots and can be written thus :

$$\begin{aligned} \text{Max}_{X_2, Z} U^A(X_2, Z) &= a X_1 + m a X_2 (1-y) + m a X_2 y h \\ \text{s.t.} \quad &\text{the FOC of } L, \\ &y = f(Z, k)(1-a)^2, \text{ and} \\ &X_1 + X_2 = X^* - Z, \end{aligned} \quad (7)$$

where  $X^*$  stands for the total aid fund (exogenously given) available for a given target community,  $Z$  is the amount of financial resources that  $A$  chooses to devote to fraud detection,  $m$  is the time rate of preference of  $A$  (with  $m < 1$  to reflect its impatience to help  $G$ ), and  $h$  is the cost for  $A$  of punishing  $L$  by withholding the second tranche of aid money.

It is assumed that the effectiveness of the fraud detection process increases with  $Z$ , but the impact of this financial effort on  $s$  and  $y$  declines as  $Z$  is increased. Fraud detection also improves when  $A$ 's organizational skills and experience in monitoring, measured by the parameter  $k$ , are more developed. Formally, we have  $s = f(Z, k)$ , with  $f(0, k) = 0$ ,  $f^1(Z, k) > 0$ ,

$f^{11}(Z, k) < 0$ , and  $f^2(Z, k) > 0$ , where  $f^i$  designates the first derivative, and  $f^{ii}$  the second derivative, of the function  $f$  with respect to the  $i^{\text{th}}$  argument. Finally, we assume the function  $f(-)$  to be quasi-concave, which implies that :

$$\frac{d^2k}{dZ^2} = \frac{d(-f^1 / f^2)}{dZ} \geq 0 \Rightarrow f^{12} \geq \frac{f^{11} f^2}{f^1}$$

Given the above assumptions, such a condition means that the sign of the cross derivative,  $f^{12}$ , can be either positive or negative. The detection function can therefore be written as:  $y = f(Z, k)(1 - a)^2$ . Also note that  $Z$  is a function of the desired level of supervision effectiveness, according to the reciprocal of the function  $f(-)$ :  $Z = f^{-1}(s, k) = Z(s, k)$  with  $Z^1(s, k) > 0$  and  $Z^{11}(s, k) > 0$ .

Turning now to  $h$ , a straightforward interpretation is to consider it as the proportion of  $X_2$  that  $A$  is able to recycle costlessly (and of which intended beneficiaries will receive a share  $a$ ). If  $h = 1$ , this means that the entire amount earmarked for the second tranche can be re-directed to another community without cost for  $A$ . This is nevertheless an unrealistic assumption since there are obvious fixed costs (set up costs) resulting from the establishment of partnership links with a local association. We therefore assume that  $0 < h < 1$ : the donor agency has an alternative use for its financial resources, yet this alternative use is less efficient than the original use planned.

In keeping with what has been said in Section 3, the loss incurred by  $A$  in the event of fraud detection,  $(1 - h)X_2$ , is assumed to be smaller than the loss of credibility it would have to bear in future endeavours if it would not punish  $L$  today. Of course, the closer  $h$  is to one, the more credible is the threat of punishment and, in the ideal case where  $h = 1$ , such a threat is totally credible. The fact remains that, when  $h < 1$ , the act of punishment entails a cost for  $A$  and there must exist a gain to offset it. This gain consists of a credibility gain that will enable  $A$  to better serve the grassroots in the future.

As is evident from (9), the utility function of  $A$  is the sum of three components: while the first term measures the utility obtained from the funds reaching  $G$  during the first period, and the second one that obtained from the funds reaching them during the second period in the case where no fraud has been detected, the third term measures the utility obtained from helping the grassroots of another community if the leader of the original community has been found guilty of embezzlement.

Using (2) and (3), we can rewrite (7) as follows :

$$\text{Max}_{X_2, Z} U^A(X_2, Z) = a(X^* - X_2 - Z) + ma X_2 - ma X_2 \left( \frac{X^* - Z}{3X_2} \right) (1 - h) \quad (8)$$

Or, equivalently,

$$\text{Max}_{X_2, Z} U^A(X_2, Z) = \mathbf{a} \left[ (X^* - Z) \left( 1 - \frac{\mathbf{m}(1-\mathbf{h})}{3} \right) - X_2(1-\mathbf{m}) \right] \quad (9)$$

Differentiating (9) with respect to  $X_2$  and taking account of  $L$ 's reaction function through (5), the FOC easily obtains as :

$$\frac{\partial U^A}{\partial X_2} = \frac{1-\mathbf{a}}{2X_2} \left[ (X^* - Z) \left( 1 - \frac{\mathbf{m}(1-\mathbf{h})}{3} \right) - X_2(1-\mathbf{m}) \right] - \mathbf{a}(1-\mathbf{m}) = 0, \quad (10)$$

from which it is easily inferred that:

$$(1-\mathbf{a}) \left[ 1 - \frac{\mathbf{m}(1-\mathbf{h})}{3} \right] \left( \frac{X^* - Z}{X_2} \right) = (1+\mathbf{a})(1-\mathbf{m}) \quad (11)$$

This equilibrium condition has the standard form of an equality between a marginal cost and a marginal benefit. Indeed, while the term on the RHS measures the utility loss resulting from the postponement of the aid transfer as  $X_2$  is increased (and  $X_1$  decreased) by one unit, the term on the LHS represents the utility gain caused by the rise of the share of aid flows that reach the grassroots as a consequence of this marginal increase of  $X_2$ . From (11), it is straightforward to obtain an expression for the relative weight of the second tranche in the amount of the aid budget net of supervision expenditures :

$$\frac{X_2}{X^* - Z} = \frac{(1-\mathbf{a})v}{(1+\mathbf{a})(1-\mathbf{m})}, \text{ where } v = \left[ 1 - \frac{\mathbf{m}(1-\mathbf{h})}{3} \right] \quad (12)$$

Let us proceed by considering the optimisation of  $U^A$  with respect to the second decision instrument available to the funding agency,  $Z$ . Before doing that, we must calculate  $d\mathbf{a}/dZ$  from  $L$ 's reaction function. Equation (3) can now be written:

$$(1-\mathbf{a})^2 = \frac{X^* - Z(s, k)}{3f(Z, k)X_2} \quad (3')$$

From (3'), we easily get:



$$\begin{aligned} \frac{d\mathbf{a}}{dZ} &= \frac{(1-\mathbf{a})f^1(Z)}{2f(Z)} + \frac{1-\mathbf{a}}{2(X^*-Z)} = \frac{1-\mathbf{a}}{2(X^*-Z)} \left[ 1 + \frac{f^1(Z)(X^*-Z)}{f(Z)} \right] \\ &= \frac{1-\mathbf{a}}{2(X^*-Z)} (1 - \mathbf{e}_{f,(X^*-Z)}) > 0 \end{aligned} \quad (13)$$

The sign of this derivative is as expected: an increase in the expenditures devoted by  $A$  to the monitoring of  $L$ , by raising the probability of detecting malpractices, drives the latter to reduce the extent of fraudulent appropriation of the aid funds ( $\mathbf{a}$  grows). Moreover, the disciplining effect of an increase in monitoring expenditures is directly proportional to the elasticity of supervision effectiveness with respect to the total amount of the aid budget net of these expenditures. The term  $(1 - \mathbf{e})$  is nothing else than the analogue of the mark-up coefficient in monopoly pricing. Note that, since  $\mathbf{e}$  is negative (as the amount devoted to helping the grassroots is reduced so that monitoring expenditures can be raised, the effectiveness of fraud detection is enhanced), this term is positive and greater than one.

Bearing (13) in mind, we can write the second FOC of  $A$ 's problem as follows:

$$\frac{\partial U^A}{\partial Z} = \left[ \frac{(1-\mathbf{a})f^1(Z,k)}{2f(Z,k)} + \frac{1-\mathbf{a}}{2(X^*-Z)} \right] [(X^*-Z)v - X_2(1-\mathbf{m})] - \mathbf{a}v = 0 \quad (14)$$

Substituting the value of  $X_2(1-\mathbf{m})$  as obtained from (14), we are able to derive an equilibrium condition expressed as a function of  $\mathbf{a}$  and  $Z$  only:

$$\left[ \frac{(1-\mathbf{a})f^1(Z,k)}{2f(Z,k)} + \frac{1-\mathbf{a}}{2(X^*-Z)} \right] (X^*-Z) \left( \frac{2\mathbf{a}}{1+\mathbf{a}} \right) v - \mathbf{a}v = 0 \quad (15)$$

The first term of (14) or (15) measures the marginal benefit following from the more effective monitoring of  $L$  as a result of a one unit increase of the fraud detection expenditures. As for the second term, it corresponds to the marginal loss arising from the fact that the aid budget available for  $G$  has been reduced by one unit. At equilibrium, the two must of course be equal.

Equation (15) can be further simplified into:

$$\left( \frac{2\mathbf{a}}{1+\mathbf{a}} \right) v \left[ \frac{(1-\mathbf{a})f^1(Z,k)}{2f(Z,k)} (X^*-Z) - \mathbf{a} \right] = 0 \quad (16)$$

Notice carefully that the first two terms are non-negative. On the one hand,  $\mathbf{a}$  must be positive as  $A$ 's utility would be nil if  $\mathbf{a}$  were equal to zero. On

the other hand,  $v$  may not have zero value since  $m(1-h) \neq 3$ . As a consequence, equation (16) finally reduces to:

$$\frac{f^1(Z,k)}{f(Z,k)}(X^* - Z) = \frac{2a}{1-a} \quad (17)$$

Equilibrium condition (17) can be transformed so as to give rise to an interesting interpretation. Defining  $s_{s,Z} = (ds/dZ)(Z/s)$  as the elasticity of the parameter measuring the effectiveness of fraud detection with respect to monitoring expenditures, and bearing in mind that  $X_1 + X_2 = X^* - Z$ , we get:

$$\frac{1}{2}s_{s,Z} = \frac{aZ}{(1-a)(X_1 + X_2)} \quad (18)$$

The numerator of the RHS of (18),  $aZ$ , is the loss suffered by  $G$  as a result of  $A$ 's monitoring expenditures that have the effect of diminishing the aid budget available for them. As for the denominator,  $(1-a)(X_1 + X_2)$ , it corresponds to the loss for  $G$  arising from the malpractices indulged by  $L$  in spite of  $A$ 's monitoring. What we learn from the second FOC of  $A$  is, therefore, that at equilibrium the ratio of the former to the latter loss must be equal to half the value of the elasticity  $s$ .

Turning to the FOC of  $L$  as given by (3'), we can write equivalently:

$$\frac{X_2}{X^* - Z} = \frac{1}{3f(Z,k)(1-a)^2}, \quad (3'')$$

which, combined with (12), yields:

$$\frac{(1-a)v}{(1+a)(1-m)} = \frac{1}{3f(Z)(1-a)^2}, \text{ or}$$

$$f(Z) = \frac{(1+a)(1-m)}{3(1-a)^3 \left[ 1 - \frac{m(1-h)}{3} \right]} \quad (19)$$

Again, we have succeeded in eliminating  $X_2$ . After successive transformations, the FOC of  $L$  and the two FOCs of  $A$  have thus eventually come to form the system (3''), (17) and (19). It is noteworthy that none of these equilibrium conditions can be written as an explicit function, which compels us to study the endogenous variables simultaneously to derive equilibrium values

and compute comparative-static derivatives. Fortunately, as we have just shown, whereas  $\mathbf{a}$ ,  $Z$  and  $X_2$  are all present in (3''), only  $\mathbf{a}$  and  $Z$  figure out as endogenous variables in (17) and (19). This feature enables us to solve the model by proceeding in two steps: first deriving the equilibrium values of  $\mathbf{a}$  and  $Z$  using the system (17)-(19), and then finding out the equilibrium value of  $X_2$  by resorting to (3'').

Before solving the model and deriving comparative-static results, however, it is useful to construct a slight variant with the purpose of demonstrating that the chosen form of the detection function,  $\mathbf{y} = s(1 - \mathbf{a})^2$ , is not arbitrary.

More precisely, we want to show that the explicit function  $\mathbf{y} = s(1 - \mathbf{a})^2$  can be endogenously derived as the optimal form of a more general function defined as  $\mathbf{y} = s(\mathbf{q} - \mathbf{a})^2$ , where  $\mathbf{q}$  stands for a norm of sharing set by  $A$ . In other words, the donor agency now has two decision variables: (1°) the intertemporal allocation of its aid fund earmarked for a given community, and (2°) the proportion of this fund that it wants  $L$  to channel to  $G$  or, in the other way around, the proportion that it allows  $L$  to keep for himself. In this variant of the original model, the FOC of the local leader becomes :

$$(\mathbf{q} - \mathbf{a})^2 = \frac{X^* - Z(s, k)}{3sX_2}$$

The problem of the donor agency is now written :

$$\text{Max}_{X_2, Z, \mathbf{q}} U^A(X_2, Z, \mathbf{q}) = \mathbf{a} X_1 + \mathbf{m} \mathbf{a} X_2 [1 - s(\mathbf{q} - \mathbf{a})^2] + \mathbf{h} \mathbf{m} \mathbf{a} X_2 s(\mathbf{q} - \mathbf{a})^2$$

$$\text{s.t. } \mathbf{q} \leq 1, s = f(Z, k), \text{ the FOC of } L, \text{ and } X_1 + X_2 = X^* - Z,$$

which is easily transformed into the form (8) obtained in the original model. Therefore, the FOCs with respect to  $X_2$  and  $Z$  are strictly unchanged. Bearing in mind that  $\partial \mathbf{a} / \partial \mathbf{q} = 1$ —since we know from the FOC of  $L$  that  $(\mathbf{q} - \mathbf{a})^2$  does not depend on  $\mathbf{q}$ —, the first derivative of  $U^A$  with respect to  $\mathbf{q}$  is simply given by :

$$\frac{\partial U^A}{\partial \mathbf{q}} = X^* - X_2 - Z(s, k) + \mathbf{m} X_2 - \frac{\mathbf{m}(1 - \mathbf{h})(X^* - Z(s, k))}{3}$$

When this expression is suitably decomposed, it becomes evident that it is unambiguously positive so that the equilibrium value of  $\mathbf{q}$  corresponds to the corner solution  $\mathbf{q}^+ = 1$  :

$$\frac{\partial U^A}{\partial \mathbf{q}} = \left( X_1 - \frac{\mathbf{m}X_1}{3} \right) + \left( \mathbf{m}X_2 - \frac{\mathbf{m}X_2}{3} \right) + \frac{\mathbf{m}h(X_1 + X_2)}{3} > 0 \Rightarrow \mathbf{q}^+ = 1$$

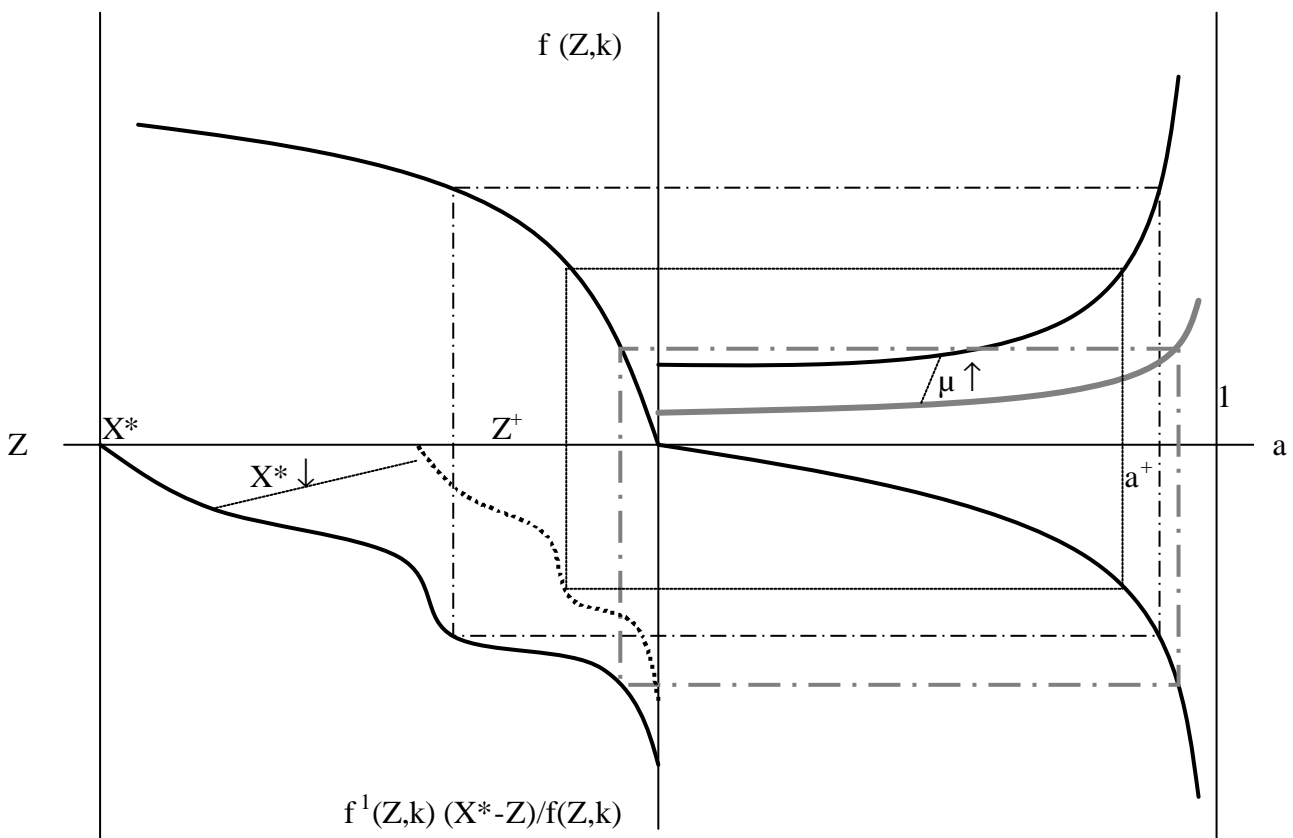
In other words, the norm of sharing that the local leader is asked to follow by the donor agency is one requiring him to channel the whole aid fund to the grassroots. This implies that the form of the original detection function given by (2) was not arbitrary. The fact of the matter is that it does not pay the donor to show leniency vis-à-vis a leader because the latter would exploit this lenient attitude by increasing the extent of his fraud. As a result, the same probability of punishment would apply in equilibrium. Graphically, the setting of a sharing norm smaller than one would cause the detection function to shift downwards, meaning that, for a given value of  $\mathbf{a}$ , the probability to detect fraud is lower. This is not in the interest of  $A$ .

It is worth noticing that the above expression for  $\partial U^A / \partial \mathbf{q}$  contains negative elements. This is because there are actually two forces running into opposite directions. On the one hand,  $A$  wants to set the sharing norm as close to one as possible so as to induce  $L$  to choose as high an  $\mathbf{a}$  as possible (this is the disciplining effect). Yet, on the other hand, if the norm is too requiring, the probability of detection increases for a given  $\mathbf{a}$  and with it the risk of having to recycle the aid budget, which is costly. As we know, however, the former effect outweighs the latter. It is revealing that, when  $h$  is equal to one (the cost of recycling funds is nil), we have simply that  $\partial U^A / \partial \mathbf{q} = X_1 + \mathbf{m}X_2$ , an expression from which all negative terms have vanished.

## 5. Results

To obtain the desired comparative-static results in a problem where two equilibrium conditions –equations (17) and (19)– are simultaneous functions that cannot be solved explicitly, the easiest way to proceed is to use the graphical approach in the hope of avoiding the tedious calculations of total differentials and the application of Cramer's rule. We thus draw a four-quadrant graph with  $\mathbf{a}$  measured rightwards and  $Z$  measured leftwards along a two-way horizontal axis (see Diagram 1 below). Bear in mind that the feasible space is bounded on the right as a result of the condition  $\mathbf{a} < 1$ , and on the left as a result of  $Z < X^*$ . The relationship given by (19) with  $f(Z, k)$  expressed as a function of  $\mathbf{a}$  is represented in the northeast quadrant while the function  $s = f(Z, k)$  is depicted in the northwest quadrant. As for the equilibrium condition (17), it is represented in the lower part of the diagram: the RHS of this condition, which is a function of  $\mathbf{a}$ , is depicted in the southeast quadrant while the LHS, which is a function of  $Z$ , is drawn in the southwest quadrant.

It is easily shown that the relationship given by (19) in the northeast quadrant is positively sloped and convex in the domain  $[0,1]$  (see Appendix A). It bears recalling that  $a < 1$  by virtue of the FOC of  $L$  (see supra). On the other hand, we know by assumption that  $f^1(Z,k) > 0$  and  $f^{11}(Z,k) < 0$ , hence the positively sloped but concave function represented in the northwest quadrant of the diagram. Next, it is the case that the first and second derivatives of the RHS of equilibrium condition (17) with respect to  $a$  are both positive, the latter because  $a$  is smaller than one (see Appendix A). The relationship drawn in the southeast quadrant has therefore a positive slope and a convex form. Finally, the function depicted in the southwest quadrant can be shown to have a negative slope (the first derivative is negative), yet the sign of its second derivative is indeterminate (see again Appendix A). Interestingly, this indeterminacy is not to be ascribed only to the unknown sign of the third derivative of the function  $f(Z,k)$ . As a matter of fact, even if we assume  $f^{111}(Z,k)$  to be nil or very small, the indeterminacy persists.



*Diagram 1: The determination of equilibrium values and comparative-static effects in the LDM*

The initial situation is represented by the black-coloured line drawn with dots and bars which links up all the equilibrium points corresponding to the four quadrants.

We first consider the effect of an exogenous increase in  $m$ . Such an increase translates itself into a downward shift of the curve located in the northeast quadrant of the diagram. Indeed, the sign of the first derivative of  $f(Z)$  with respect to  $m$ , as calculated from (19), is unambiguously negative.<sup>3</sup> As a result of this shift, we obtain a new set of equilibrium values determined by the grey-coloured line drawn with dots and bars. It is evident that  $a$  and  $Z$  have moved in opposite directions: while  $a$  has gone up,  $Z$  has declined. Moreover, deriving the equilibrium value of  $X_2$  from (3), it is easy to compute the total differential:

$$dX_2 = \frac{-3(1-a)^2 [f + (X^* - Z)f']}{9(1-a)^4 (f)^2} dZ + \frac{6(X^* - Z)(1-a)f}{9(1-a)^4 (f)^2} da, \quad (20)$$

which is a composite expression made of a negative term multiplied by  $dZ$  and a positive term multiplied by  $da$ . When  $dZ$  is negative and  $da$  is positive, we can therefore conclude that  $dX_2$  is always positive. In addition, it is apparent from (2) that  $y$  has diminished at the new equilibrium. It is also clear that, since  $Z$  decreases so that  $(X^* - Z)$  is larger, and since  $a$  increases,  $a(X_1 + X_2)$  rises. More significantly,  $A$ 's utility rises as a result of an increase in  $m$ . Indeed, using (9) and applying the envelop theorem, we get:

$$\frac{dU^A}{dm} = a \left[ X_2 - \frac{(X^* - Z)(1-h)}{3} \right] + [(X^* - Z)v - X_2(1-m)] \frac{da}{dm} > 0 \quad (21)$$

This derivative comprises two terms that turn out to be both positive. For one thing, the expression between brackets in the first term is positive in accordance with the FOC of  $L$ . As a matter of fact, (3) can be written  $yX_2 = (X^* - Z)/3$ , where  $y < 1$  so that  $X_2 > (X^* - Z)/3$ . It follows that, a fortiori,  $X_2 > (X^* - Z)(1-h)/3$ . For another thing, the expression between brackets in the second term is also positive since  $X^* - Z = X_1 + X_2 > X_2$ , and  $v > 1 - m$ . Finally, we have shown above that  $da/dm > 0$ .

To sum up, we can write this first set of results as follows:

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<sup>3</sup> The value of this derivative is indeed:

$$df(Z, k)/dm = \left[ \frac{1+a}{3(1-a)^3} \right] \left[ \frac{-1+(1-h)/3}{v^2} \right], \text{ which is negative since } h < 1 \text{ and } a < 1.$$

$$\frac{da}{dm} > 0; \frac{dZ}{dm} < 0; \frac{dX_2}{dm} > 0; \frac{d[\mathbf{a}(X_1 + X_2)]}{dm} > 0; \frac{dy}{dm} < 0; \frac{dU^A}{dm} > 0 \quad (22)$$

In words, when the aid agency is more patient, it spends less on monitoring but increases the amount of the transfer made in the second period: indeed, because the subjective cost of waiting is smaller, it is more ready to use the leader-disciplining mechanism and to postpone disbursement of aid funds. As a consequence, the leader is more effectively induced to behave during the initial period holding monitoring expenditures constant. In point of fact, at the new equilibrium the amount of these expenditures is being reduced. The net effect of these two contrary moves, –an increase in the second tranche accompanied by a decrease in the monitoring budget– is favourable to the grassroots since the share appropriated by the leader declines and the amount of aid money that will accrue to them if there is no detection of fraud by the aid agency is larger. Furthermore, the utility of the aid agency rises as a result of a more patient attitude on its part. This is a more significant result than that related to the increase in  $\mathbf{a}(X_1 + X_2)$ , since  $A$ 's utility is not only purely altruistic but also takes an explicit account of the risk of fraud detection and the possible necessity to reallocate funds to another community. Note that the probability of fraud detection actually decreases on two counts: the decline of the monitoring budget, on the one hand, and the smaller level of fund embezzlement by the leader, on the other hand.

The implication is serious and needs to be pondered over: showing more patience in disbursing money for the poor enables willing donors to reach them more effectively. Conversely, requiring quick results in the anti-poverty struggle is self-defeating in so far as its main effect is to enrich and consolidate local elites. Therefore, all characteristics of the aid institutional environment that cause donor agencies to rush to the help of local groups and associations can be considered as harmful. In particular, financial procedures and budgeting with a short-term horizon, intense competition among donors, or impatience of the general public or the taxpayers who are the ultimate purveyors of funds tend to compel aid agencies to work without the backing of proper leader-disciplining mechanisms.

The effect of an exogenous increase in  $h$  is strikingly similar to the above-analyzed effect yielded by an increase in  $m$ . This is because the former change is also reflected in a downward shift of the curve located in the northeast quadrant of the graph.<sup>4</sup> In addition, the derivative of  $U^A$  with respect to  $h$  is again found to be positive :

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<sup>4</sup> We indeed have that :

$$\frac{\partial U^A}{\partial h} = \mathbf{ma} \left( \frac{X^* - Z}{3} \right) + [(X^* - Z)v - X_2(1 - \mathbf{m})] \frac{d\mathbf{a}}{dh} > 0 \quad (23)$$

The terms between brackets whether in the first or the second term are positive while we know that  $d\mathbf{a}/dh > 0$ . Therefore, the above derivative is certain to have a positive value. The complete set of results is as follows :

$$\frac{d\mathbf{a}}{dh} > 0; \frac{dZ}{dh} < 0; \frac{dX_2}{dh} > 0; \frac{d[\mathbf{a}(X_1 + X_2)]}{dh} > 0; \frac{d\mathbf{y}}{dh} < 0; \frac{dU^A}{dh} > 0 \quad (24)$$

The lower the cost of recycling aid funds (or the higher the proportion of aid money earmarked for the second tranche of an initial project that can be costlessly redirected to another group or association in the event of detected fraud), the larger the amount of the second tranche, the higher the share accruing to the grassroots, the larger the amount of aid money accruing to them in the absence of fraud detection, and the higher the utility derived by the aid agency. Conversely, a donor agency which finds it more difficult to reallocate the funds intended for a particular project is less incited to defer their disbursement and, consequently, the local leader is in a better position to appropriate the aid money. Inasmuch as it makes re-orientation of aid flows costlier, acute competition on the ground in a context of scarcity of good projects therefore appears as an unambiguously regrettable feature of the aid environment<sup>5</sup>. Local leaders can indeed play on such competition since they know that the aid agency has a budget to spend that is more or less tied to the initially chosen project or community. For another thing, interventions in low density areas are also more vulnerable to the above risk if they imply higher set-up costs associated with longer distances to be travelled, lower education levels in remote areas, etc.

Clearly, the logic underlying the effects of a rise in  $h$  is, *mutatis mutandis*, the same as that described above for an increase in  $m$ . This is not surprising inasmuch as the effect of impatience on the part of the aid agency is identical to the effect of a high cost in the recycling of aid funds in the event of a failure: in both cases, the cost of using the LDM is high and the aid agency is therefore induced to disburse its available funds quickly.

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$$\frac{df(Z, k)}{dh} = -\frac{m(1-\mathbf{a})(1-m)}{9(1-\mathbf{a})^3 v^2}, \text{ which is negative since } \mathbf{a} < 1 \text{ and } m < 1.$$

<sup>5</sup> Interestingly, in 1996-97, £4.5m of the budget of DFID (Department For International Development, UK) for Africa was unallocated. In 2000-01, that rose to £18m (*The Economist*, November 2<sup>nd</sup>-8<sup>th</sup> 2002, p. 39)! As all agencies seriously concerned with genuine development know, scarcity of good projects and reliable groups and associations is probably the most important constraint on the effectiveness of aid programs.



Let us consider now the effect of an increase in  $X^*$ , the aid budget available for a given community. From (17), it is evident that such an increase causes the function  $(f^1/f)(X^*-Z)$  to move upwards since  $f^1/f$ , the first derivative with respect to  $X^*$ , is positive. Conversely, and this is the case represented in Diagram 1, a decrease in  $X^*$  translates itself into a downward shift of the above function, which is tantamount to an upward shift of the curve drawn in the southwest quadrant. As can be observed from the graph (see the dotted line with a rectangular contour), the new equilibrium position is characterized by lower values for both  $\mathbf{a}$  and  $Z$ . It is evident from (20), however, that  $dX_2$  cannot be signed. The same holds true for  $\mathbf{y}$  and  $\mathbf{a}(X_1 + X_2)$ . Of course, since  $X^*$  expresses the budget constraint, we know for sure that  $A$ 's utility must decline if  $X^*$  diminishes, and vice-versa if  $X^*$  rises. What is less evident is how the utility of  $A$  per unit of money evolves when the aid budget available is being reduced. The answer is provided below :

$$\begin{aligned} \frac{d(U^A/X^*)}{dX^*} &= \frac{(dU^A/dX^*)X^* - U^A}{(X^*)^2} = \frac{\left[ \left( \frac{d\mathbf{a}}{dX^*} \right) \left( \frac{U^A}{\mathbf{a}} \right) + v\mathbf{a} \right] X^* - U^A}{(X^*)^2} \\ &= \frac{1}{(X^*)^2} [\mathbf{I}_{\mathbf{a},X^*} U^A + \mathbf{a}vX^* - U^A] > 0 \end{aligned} \quad (25)$$

The elasticity of  $\mathbf{a}$  with respect to  $X^*$ , denoted  $\mathbf{I}_{\mathbf{a},X^*}$ , is known to be positive and the same holds true of the sum of the last two terms in the expression between brackets. Indeed, the definition of  $U^A$  as given in (11) can be written :  $U^A = \mathbf{a}vX^* - \mathbf{a}vZ - X_2(1 - \mathbf{m})$  which is obviously smaller than  $\mathbf{a}vX^*$ , so that  $\mathbf{a}vX^* - U^A$  is a positive quantity. Therefore, the derivative depicted in (25) has a positive sign.

The results concerning the comparative-static for  $X^*$  are summarized in (26) below :

$$\frac{d\mathbf{a}}{dX^*} > 0; \frac{dZ}{dX^*} > 0; \frac{dU^A}{dX^*} > 0; \frac{d(U^A/X^*)}{dX^*} > 0; \frac{\partial X_2}{\partial X^*}, \frac{\partial[\mathbf{a}(X_1 + X_2)]}{\partial X^*}, \frac{\partial \mathbf{y}}{\partial X^*} \text{ ambiguous} \quad (26)$$

There is an instructive lesson to draw from the above set of results, namely that the well-being of the grassroots as assessed from the altruistic utility function of the aid agency (on an aggregate or per money unit basis) is enhanced when the budget allocated to a given community is greater. This is essentially because a larger budget allows the agency to increase its monitoring expenditures and, as a result, to check the behaviour of the local leader more effectively. Dispersing aid on many communities is a bad strategy in so far as supervision of the use of funds is then bound to be loose, as exemplified by the experiences of those aid organizations that have chosen to spread their available

funds thinly over a large number of projects or communities instead of concentrating these funds on a few communities.

Since  $dU^A/dX^*$  in our model is positive, the aid agency is expected to limit its assistance to a single community. Such a result is actually confirmed by the extension of the model to the case where the number of target communities is endogenously determined (see Appendix B for a formal proof). Here, the aggregate budget in the hands of the agency is assumed to be given but the budget available for each community is decided by the agency since the number of communities to be helped is an unknown.

The above extreme prediction is evidently a simplification that results from the overtly naïve character of some of our assumptions. In the first place, the utility function of the aid agency has been supposed to depend on the aggregate amount of aid money reaching the grassroots conceived as an undefined aggregate mass. It does not therefore depend on the number of poor who have benefited. Because the number of grassroots resident in a given community is necessarily limited, it is not realistic to expect an agency to be content with dealing with only one community as a matter of principle. Second, it has been assumed that  $s = f(Z)$  does not decrease with  $X^*$ , which is obviously unrealistic: if the size of a project or a community becomes too big, it should be the case that the effectiveness of monitoring is negatively affected. This being reckoned, we would not learn much by rendering our model more realistic on these two scores and it is better to keep the focus on the disciplining of local leaders by not unduly complicating our analytical structure.

The last comparative-static effect that we want to investigate concerns the parameter  $k$  that stands for the degree of experience and skill of the aid agency in monitoring local leaders' behaviour. The expected result here is that a higher  $k$  ought to allow a larger share of aid funds to reach the grassroots, and perhaps to reduce the amount of expenditures devoted to fraud detection. It may therefore come as a surprise that these two effects cannot be shown to hold on the basis of Diagram 1, a consequence of the fact that the impact of  $k$  manifests itself through varied and complex channels. More precisely, we know by assumption that the curve  $s = f(Z, k)$  depicted in the northwest quadrant shifts upwards as  $k$  rises. The curve drawn in the southwest quadrant is also affected by a change in  $k$ , yet unfortunately the direction of the impact cannot be determined. This is because, if we denote the LHS of (17) by  $f$ , the first derivative of  $f$  with respect to  $k$  cannot be signed. As a matter of fact,

$$\frac{df}{dk} = \frac{(X^* - Z)(ff^{12} - f^1 f^2)}{(f)^2}, \quad \text{where } f = f(Z, k) \quad (27)$$

Bearing in mind that  $f, f^1, f^2$ , are positive while the sign of  $f^{12}$  is indeterminate, it is evident that the second term in the numerator cannot be

signed. Thus ignoring the direction of the shift undergone by the curve represented in the southwest quadrant of the diagram, we are unable to say how  $\mathbf{a}$ ,  $Z$ , and therefore  $X_2$  change following a rise in  $k$ . In order to get out of this difficulty and identify the conditions under which the above effects could possibly be signed, the standard approach consists of differentiating the equilibrium conditions written as simultaneous implicit functions and then applying the Cramer rule so as to obtain the derivatives of the endogenous variables with respect to  $k$ .

The results are as follows (see Appendix C for proof). First, we find that :

$$\frac{d\mathbf{a}}{dk} > 0 \quad \text{iff} \quad f^{12} > \frac{f^2 f^{11}}{f^1} - \frac{f^2}{(X^* - Z)} \quad (28)$$

The above condition is automatically fulfilled in accordance with our assumption that the  $f(-)$  curve is quasi-concave. Bear in mind, indeed, that such an assumption implies that  $f^{12} \geq f^{11} f^2 / f^1$ , with the consequence that the above condition is met *a fortiori*. We can therefore conclude that  $d\mathbf{a}/dk > 0$ . This is the expected result: when an aid agency has more skills and experience in detecting fraud, the share of the funds transferred eventually reaching the grassroots is higher.

From the above, it is possible to immediately derive another important result, namely that :

$$\frac{dU^A}{dk} = \frac{d\mathbf{a}}{dk} [(X^* - Z)v - X_2(1 - \mathbf{m})] = \left( \frac{U^A}{\mathbf{a}} \right) \frac{d\mathbf{a}}{dk} > 0 \quad (29)$$

Again, as expected, the well-being of the grassroots as can be assessed from the altruistic utility function of the aid agency is higher when the agency is better endowed with skills and experience in detecting fraudulent use of aid funds by unscrupulous local leaders.

Let us now look at the impact of a change in the fraud detection parameter on the equilibrium amount of monitoring expenditures. Application of the Cramer's rule yields the following condition :

$$\frac{dZ}{dk} \leq 0 \Leftrightarrow \frac{f^{12}}{f^2} \leq \left( \frac{2\mathbf{a}^2 + 5\mathbf{a} + 1}{(1 - \mathbf{a})(2 + \mathbf{a})} \right) \left( \frac{1}{X^* - Z} \right) = t > 0 \quad (30)$$

Such a result is according to intuition: an aid agency that is comparatively effective in detecting fraud (for a given amount of monitoring expenditures,  $Z$ , it better detects fraud than a less effective agency) will choose to spend less on monitoring at equilibrium only if its ability to improve fraud detection by increasing its monitoring expenditures at the margin (as measured by

$f^{12} = d(ds/dZ)/dk$  ) is not too high in relation to its comparative advantage resulting from better skills and experience in detection ( $f^2 = ds/dk$  ). Note that, if  $f^{12} \leq 0$ , condition (30) would be automatically fulfilled. Yet, there exist some positive values of the cross derivative which are also compatible with the above-stated condition.

If  $(f^{12}/f^2)$  is thus sufficiently low to be smaller than the threshold value denoted by  $t$ , we can also be assured, on the basis of (3''), that  $X_2$  will rise as a result of an increase in  $k$ . The same holds true of the share of the total aid transfer accruing to the grassroots in the event of no fraud detection,  $\mathbf{a}(X_1 + X_2)$ . On the other hand, the evolution of the probability of fraud detection,  $\mathbf{y}$ , cannot be determined since there are two effects calling for a decrease, the higher value of  $\mathbf{a}$  and the lower value of  $Z$ , and one effect driving an increase, the higher value of  $k$ . To sum up, the comparative-static regarding  $k$  yields the following effects :

$$\frac{d\mathbf{a}}{dk} > 0; \frac{dU^A}{dk} > 0; \frac{dZ}{dk} < 0; \frac{dX_2}{dk} > 0; \frac{d[\mathbf{a}(X_1 + X_2)]}{dk} > 0 \text{ if } (f^{12}/f^2) < t; \frac{d\mathbf{y}}{dk} \text{ ambiguous} \quad (31)$$

One instructive lesson from the above results is that a better endowment in skills and experience in fraud detection causes an agency to prefer to defer disbursement of the aid money and simultaneously decrease monitoring expenditures, but only if its ability to improve detection by increasing such expenditures is not too high. If the latter turns out to be too high, the monitoring budget will be raised and the amount of the second tranche might increase or decrease depending on the relative strengths of the factors impinging on (3''). Whatever happens, the good news is that the share accruing to the grassroots rises and their well-being increases.

In terms of Diagram 1, the situation that is easiest to figure out is the one in which  $f^{12}$  has a rather high value. As is evident from (27), the curve shown in the southwest quadrant then shifts outwards  $-f$  increases as a result of a rise in  $k$ . Moreover,  $f^{12}$  is assumed to be high enough for the outward (downward) move of this curve to be more important than the outward (upward) move of the curve  $s = f(Z)$  in the northwest quadrant. When this is the case, it appears that both  $\mathbf{a}$  and  $Z$  have a larger value at the new equilibrium. By contrast, if  $f^{12}$  is low, the  $f$  curve undergoes a small outward shift or even an inward shift, and  $\mathbf{a}$  rises in parallel with a decrease in  $Z$ .

## 6. Relying on competition among local leaders?

Understanding the interaction of competing local leaders (say,  $L_1$  and  $L_2$ ) requires a thorough modification of the model. The new game does not result from the simple addition of one intermediary stage, in which the additional leader would decide how much he would leave to the grassroots if he were appointed by them, plus a final stage where the grassroots would pick up one of the two leaders. In such a model, indeed, both leaders would have a zero payoff at any candidate equilibrium, making them indifferent between being appointed or not and depriving them of any incentive for assuming leadership.

A better insight is gained by the further addition of a move of nature before the leaders begin to play. Such a move is a draw of the leader's relative skill (say  $m_2 = 1$  and  $m_1$  is drawn in a distribution centred on 1), assuming that a leader's skill multiplies the effect of funds raised in the grassroots' utility. The skill does not enter the leader's utility directly, but it exerts an indirect influence through the election process. In addition, we need to spell out what will happen in the case where the fraudulent behaviour of one leader (say,  $L_i$ ) is being detected. The assumption here is that in such an event the other leader ( $L_j$ ) takes over during period 2, which implies that he will be in charge of the amount  $X_2$  allocated by  $A$  to the community. Moreover,  $L_j$  will be bound by his own promise,  $a_j$ , made to  $G$  before they chose to elect  $L_i$  in period 1.

In order to find the subgame-perfect equilibrium of this new game, it must first be noticed that no equilibrium can arise where the elected leader makes an offer,  $a$ , lower than what he would bid in the one-leader version of the model. In other words, the LDM is effective enough to prevent the appearance of subgames with very low bids. Formally, this condition can be expressed by writing that the elected leaders will act in such a way that  $dU^L / da \leq 0$ , which implies, bearing (2) and (3) in mind, that  $f(Z, k)(1-a)^2 \left( \frac{X_2}{X_1 + X_2} \right) \leq 1/3$ . While in the one-leader version of the model this constraint holds with equality, competition between two leaders may actually compel them to offer a larger  $a$  than what obtains in the absence of competition.

Let us now consider the second step of the new game in which it is sufficient to look at  $G$ 's utility function. In any candidate equilibrium, it is the grassroots' best response to appoint leader  $L_1$  if  $a_1 m_1 > a_2 m_2$ , where  $a_1$  and  $a_2$  stand for the shares conveyed to  $G$  by the first and by the second leader, respectively. In the opposite case, their interest is in electing  $L_2$ . And if  $a_1 m_1 = a_2 m_2$ , they are indifferent between the two leaders. The better skilled leader (the one with the higher level of  $m$ ) anticipates that his competitor is willing to offer  $a$  as high as 1, since being elected is always at least as good as

being rejected. As a consequence, the more competent leader must consider a bid  $a_i^* = a_j m_j / m_i = m_j / m_i$ , by the usual argument of Bertrand competition.

To summarize, if  $a_i^*$  is strictly higher than the level of  $a$  that would be optimal under the LDM with no rival, then the only equilibria of the game are those in which the more competent leader offers  $a_i^*$  and gets elected. On the other hand, if  $a_i^*$  is smaller than the equilibrium level of  $a$  in the one-leader version of the model, then competition for leadership has no bite and the game is played as if  $L_i$  were the only playing leader. In the sequel, we discuss the first case, i.e.,  $a_i^*$  is played in equilibrium.

In the first-stage of the game, the funding agency anticipates that  $a_i^*$  does not depend on the relative apportionment of funds between the two periods. It is not necessary to know the value of  $s_1$  in order to make that deduction. If, *ex post*, the agency will come to know the identity of the more competent leader (since the latter will have been elected by the grassroots), it bears emphasis that, *ex ante*, it does not, and does not need to, have complete information on  $s_1$ . In the presence of leadership competition, therefore, the leader-disciplining mechanism may be dropped altogether. Since  $a_i^*$  is a constant from the donor agency's viewpoint, the optimal response is to set  $X_1 = X^*$  and to leave no further fund for the second period, no matter how patient the agency is (provided it is less than perfectly patient). It may be surprising, albeit ultimately intuitive, that the equilibrium does not depend on the parameters of the players' utility functions.

This clear-cut result implies that, as soon as two parties (individuals, or groups of candidates) compete, the LDM is ineffective, yet unnecessary anyway since the problem of 'elite capture' is greatly diminished. Nevertheless, it is evident from the above analysis that, as long as the competing parties are not equally proficient, some 'elite capture' will subsist in equilibrium, regardless of the willingness of the funding agency to effectively reach the grassroots. The wider the gap between the competences of the two leaders, the greater the misappropriation observed under the competitive equilibrium.

Moreover, and more importantly, whenever several competing leaders are present, there is a serious possibility of collusion between them. If the candidates do effectively collude, the LDM becomes necessary again lest the grassroots should be strongly exploited. And if collusion is not feasible owing to the intense rivalry between the leaders, the negative externalities of a mechanism that fosters intra-elite competition rather than cooperation are to be counted as a possibly serious shortcoming of that mechanism. The existence of such a dilemma –not-too-good relations between local leaders are necessary for the competitive mechanism to be effective, yet they are a liability threatening collective action at village or community level– seriously undermines the case for relying on intra-elite competition as a way to protect the poor's entitlement

to external assistance. In many real world circumstances, the LDM is probably a more useful mechanism.

## 7. Conclusion

In the presence of a potential ‘elite capture’ problem, participatory development is more likely to be successfully implemented—in the sense of reaching the poor more effectively—if it is carried out by donor agencies which are patient, endowed with a good amount of skills and experience in project monitoring, and not subject to intense competition from rival agencies on the ground. In these circumstances, indeed, the share of aid money unduly appropriated by local leaders declines, and the amount of money available to the intended beneficiaries normally increases as a result of falling monitoring expenditures (this is not necessarily true, however, if aid agencies are very good at improving fraud detection through a larger monitoring budget). Unfortunately, the present rush for community-based development, a massive entry into the field of agencies with very little experience in participatory approaches, as well as the pressing need for quick and visible results, especially on the part of new entrants, are ominous trends that contribute to undermine the prospects of poverty alleviation.

By disbursing significant amounts of money too quickly, donor agencies enable local leaders to gain increasing legitimacy from the outside world rather than from their own people. Moreover, they contribute to create an unhealthy situation in which excessively high value is placed on the sort of skills needed to attract money from abroad, skills which tend to be heavily concentrated in the hands of a narrow educated elite. Outside money corrupts the process of local institutional development if it allows indigenous leaders to eschew negotiation with members for support and material contributions, thereby preventing autonomous organization-building.

Clearly, competition between donor agencies in a context of scarcity of good projects may yield perverse results when they engage in participatory development. This is so not only because competition is likely to make reallocation of funds more costly in the event of project failure, but also because, in the same way that “bad money chases good money”, impatient agencies may drive patient ones to attach a greater weight to more immediate results. The situation is actually made worse by the fact that many donor agencies do not actually implement the sort of two-stage, leader-disciplining mechanism discussed in the paper. This irresponsible attitude stems either from ignorance—they do not understand the game that is being played—or from cynicism—they have a good grasp of the game but are ready to lie to their finance purveyors in order to stay in business whatever the risks incurred in the long run. An awkward situation arises if the work of serious donor agencies is

undermined because they are tempted to give up gradual and conditional disbursement procedures and opt for the easy way of trusting whichever collective structures spring up to mobilize externally provided financial resources.

Such perverse evolutions unavoidably lead to an erosion of the share accruing to the poor and to the strengthening of a rentier class inimical to development. In addition, they have the effect of slowing down learning processes whereby the grassroots acquire experience over time about how to defend their rights, monitor the actions of their leaders, compel them to enforce their promises and, hopefully, spawn new, alternative leadership figures able to compete with the existing elite. Those learning effects as well as the impact of training and capacity-building programs ought not to be underestimated since, the more illiterate the poor and the less able to watch the leader and to force him to behave, the smaller will be their actual share from the aid money compared to the mutually agreed one. (Bear in mind that the leader-disciplining mechanism is based on the optimistic assumption that the grassroots can perfectly enforce the leader's promise to pay them the agreed share).

This deleterious process could be inverted if good donor agencies were encouraged to resist competition arising from agencies with bad characteristics, thereby forcing the latter to adjust their behaviour in a direction favourable to the poor. One way of achieving this outcome is by introducing a rating of donor agencies that would be used by the ultimate purveyors of financial resources. This rating ought not to be based on failures (fraud detection) since agencies would then be encouraged to conceal them from the scrutiny of auditors. On the other hand, resorting to measures of outputs, such as improvements in the levels of living of the poor inside the communities chosen, may turn out to be costly to realize. Moreover, such measures could introduce biases in the selection of communities by the rated agencies. As a matter of fact, the latter would be induced to choose communities in which poverty can be more easily reduced for other reasons than the prevailing power structure (e.g., easy accessibility). The disbursement procedure used by the donor agencies, the duration of their participatory projects, and their monitoring procedures appear to provide a more convenient yardstick. Not only are such characteristics rather easy to observe but they also offer the advantage of not creating perverse incentives for the rated agencies.

This is an imperfect solution, admittedly. A much better one would involve a multilateral reputation or sanction mechanism of the kind documented by Greif (1989, 1994), and Aoki (2001). Operating within a repeated-game framework, donor agencies would follow the strategy consisting of refusing to deal with any intermediary or local leader who has been found cheating any donor agency in the past. Before embezzling funds, a local leader would thus be incited to think twice. As a matter of fact, he would be sanctioned not only in the short run by the agency which he has deceived, but also in the longer run by



all the other agencies which would have become informed about his misdeeds. The problem with this mechanism, however, is that it has a considerable informational requirement: information must circulate perfectly between donor agencies to make it work. In real world conditions, such a requirement is impossible to meet, if only because donor agencies are in large numbers, scattered around the developed world, and very heterogeneous in terms of several key characteristics (size, ideology, methods, time horizon, etc.).

## APPENDIX A : Derivation of the shapes of the curves drawn in Diagram 1

First, the relationship given by (20) in the northeast quadrant of the diagram is positively sloped and convex because :

$$d\left[\left(\frac{1-m}{3v}\right)\left(\frac{1+a}{(1-a)^3}\right)\right]/da = \left(\frac{1-m}{3v}\right)\left(\frac{2(2+a)}{(1-a)^4}\right) > 0$$

and

$$d^2\left[\left(\frac{1-m}{3v}\right)\left(\frac{1+a}{(1-a)^3}\right)\right]/da^2 = \left(\frac{1-m}{3v}\right)\left(\frac{6(3+a)}{(1-a)^5}\right) > 0 \quad \text{since } 0 < a < 1.$$

Second, the first and second derivatives of the RHS of (18) with respect to  $a$  are both positive as is evident from the expressions below :

$$d\left[\frac{2a}{1-a}\right]/da = \frac{2}{(1-a)^2} > 0 \quad \text{and} \quad d^2\left[\frac{2a}{1-a}\right]/da^2 = \frac{4}{(1-a)^3} > 0 \quad \text{since } 0 < a < 1.$$

Third, the function depicted in the southwest quadrant of the diagram has a negative slope. Indeed, simplifying the notation by writing  $f$  for the function  $f(Z, k)$ , the first derivative is found to be :

$$d\left[\frac{f^1(X^* - Z)}{f}\right]/dZ = \frac{[f^{11}(X^* - Z) - f^1]f - [f^1]^2(X^* - Z)}{[f]^2} < 0.$$

The negative sign obtains because of the assumptions made regarding the signs of  $f^1(Z, k)$  and  $f^{11}(Z, k)$  and because  $X^* > Z$ , lest the grassroots would not get any aid and the agency's utility should be zero. The second derivative is a much more complex thing that cannot be signed:

$$d^2\left[\frac{f^1(X^* - Z)}{f}\right]/dZ^2 = \frac{-1 \left\{ f^2 [f^1 (f^{11}(X^* - Z) - f^1) + f (f^{111}(X^* - Z) - 2f^{11}) - 2f^1 f^{11}(X^* - Z) + (f^1)^2] \right\}}{f^4 \left\{ -2ff^1 [f^{11}(X^* - Z) - f^1] - (f^1)^2 (X^* - Z) \right\}}$$

## APPENDIX B : A variant of the model with an endogenous number of communities or projects

In this variant of the model presented in the text, we assume that  $A$  has available to it a given amount of money,  $X^*$ , to be distributed among  $N$

different but identical projects or communities. The number  $N$ , or the amount of money allocated per community  $X^*/N$ , is a choice variable in the hands of  $A$ , together with  $Z$  and  $X_2$ .

Let us start with  $L$ 's problem, which is now written :

$$\begin{aligned} \text{Max}_{\mathbf{a}} U^L(\mathbf{a}) &= (1-\mathbf{a})X_1 + (1-\mathbf{a})X_2[1-s(1-\mathbf{a})^2] \\ \text{s.t. } X_1 + X_2 &= (X^*/N) - Z(s), \text{ or} \\ s &= f(Z, k) \end{aligned} \quad (1'')$$

The reaction function becomes :

$$(1-\mathbf{a})^2 = \frac{(X^*/N) - Z(s, k)}{3sX_2} \quad (4')$$

In the expressions obtained for  $d\mathbf{a}/dX_2$ ,  $d\mathbf{a}/dZ$ , and  $d\mathbf{a}/ds$ ,  $X^*$  must be simply replaced by  $X^*/N$ , which leaves the signs unchanged. On the other hand, we have :

$$\frac{d\mathbf{a}}{dN} = -\frac{-X^*/N^2}{-6f(Z, k)(1-\mathbf{a})X_2} < 0$$

This means that  $A$  can discipline  $L$  not only by increasing  $X_2$ , but also by increasing the budget allocated for each community or project, which implies that the number of beneficiary communities is reduced.

The problem of  $A$  is now :

$$\begin{aligned} \text{Max}_{X_2, Z, N} U^A &= N\mathbf{a}[X_1 + \mathbf{m}X_2(1-f(Z, k)(1-\mathbf{a})^2) + \mathbf{m}hX_2f(Z, k)(1-\mathbf{a})^2] \\ &= N\mathbf{a}\left[\left(\frac{X^*}{N} - Z\right)v - X_2(1-\mathbf{m})\right] \\ \text{s.t. } N &\leq 1 \text{ and the FOC of } L \end{aligned}$$

The FOC with respect to  $N$  is :

$$\begin{aligned} \frac{dU^A}{dN} &= \mathbf{a}\left[\left(\frac{X^*}{N} - Z\right)v - X_2(1-\mathbf{m})\right] + N\frac{d\mathbf{a}}{dN}\left[\left(\frac{X^*}{N} - Z\right)v - X_2(1-\mathbf{m})\right] + N\mathbf{a}\left[\left(-\frac{X^*}{N^2}\right)v\right] \\ &= -\mathbf{a}Zv - \mathbf{a}X_2(1-\mathbf{m}) + N\frac{d\mathbf{a}}{dN}\left[\left(\frac{X^*}{N} - Z\right)v - X_2(1-\mathbf{m})\right] < 0 \end{aligned}$$

This expression can be said to be unambiguously negative since all the three terms comprising it are smaller than zero. As a matter of fact, we know that  $v$  is positive,  $m \leq 1$ ,  $da/dN$  is negative (see supra), while the expression between brackets in the third term is positive. The latter holds true because  $(X^*/N) - Z = X_1 + X_2$ ,  $(X_1 + X_2)$  is greater than  $X_2$ , and  $v$  is greater than  $(1 - m)$ . We therefore have a corner solution in which  $N$  is at its minimum value of one : unless otherwise constrained (see text),  $A$ 's interest is in assisting only one community. The other equilibrium conditions are unaffected.

### APPENDIX C : Comparative-static regarding the effect of a change in $k$

For the sake of computing total differentials, let us rewrite the equilibrium conditions (18)-(20) as follows :

$$F(\mathbf{a}, Z, k) = (1 - \mathbf{a})f^1(Z, k)(X^* - Z) - 2\mathbf{a}f(Z, k) = 0 \quad (18')$$

$$G(\mathbf{a}, Z, k) = 3f(Z, k)(1 - \mathbf{a})^3 v - (1 + \mathbf{a})(1 - m) = 0, \quad \text{where } v = \left[ 1 - \frac{m(1-h)}{3} \right] \quad (20')$$

Assuming that  $k$  is the only exogenous variable that undergoes a change, and dividing the total differentials of these two equations by the variation of  $k$ , we obtain, in matrix notation :

$$\begin{bmatrix} -\frac{dF}{dk} \\ -\frac{dG}{dk} \end{bmatrix} = \begin{bmatrix} \frac{\partial F}{\partial \mathbf{a}} & \frac{\partial F}{\partial Z} \\ \frac{\partial G}{\partial \mathbf{a}} & \frac{\partial G}{\partial Z} \end{bmatrix} \begin{bmatrix} d\mathbf{a} \\ dZ \\ dk \end{bmatrix} = J \begin{bmatrix} d\mathbf{a} \\ dZ \\ dk \end{bmatrix}$$

Applying the Cramer's rule, we get expressions for  $d\mathbf{a}/dk$  and  $dZ/dk$ . Starting with the former, we find :

$$\frac{d\mathbf{a}}{dk} = \frac{|J_1|}{|J|} = \frac{\begin{vmatrix} -[(1 - \mathbf{a})(X^* - Z)f^{12} - 2\mathbf{a}f^2] & (1 - \mathbf{a})f^{11}(X^* - Z) - (1 - \mathbf{a})f^1 - 2\mathbf{a}f^1 \\ -3f^2(1 - \mathbf{a})^3 v & 3f^1(1 - \mathbf{a})^3 v \end{vmatrix}}{\begin{vmatrix} -f^1(X^* - Z) - 2f & (1 - \mathbf{a})f^{11}(X^* - Z) - (1 - \mathbf{a})f^1 - 2\mathbf{a}f^1 \\ -9f(1 - \mathbf{a})^2 v - (1 - m) & 3f^1(1 - \mathbf{a})^3 v \end{vmatrix}},$$

Replacing  $(1 - m)$  by its value as given by (20') and simplifying, the Jacobian determinant can be rewritten thus :

$$|J| = \begin{vmatrix} -f^1(X^* - Z) - 2f & (1-a)f^{11}(X^* - Z) - (1+a)f^1 \\ -6f(1-a)^2v(2+a/1+a) & 3f^1(1-a)^3v \end{vmatrix}$$

$$3(1-a)^3v \left[ -(f^1)^2(X^* - Z) - 2ff^1 + 2ff^{11}(X^* - Z) \left( \frac{2+a}{1+a} \right) - 2ff^1 \left( \frac{2+a}{1-a} \right) \right] < 0$$

All the terms in the Jacobian determinant being negative in accordance with our assumptions regarding the function  $f(Z, k)$ , we can sign it in an unambiguous manner and look at the numerator of  $da/dk$ , denoted by  $J_1$ . After some algebraic manipulations, we get the following expression:

$$\begin{aligned} |J_1| &= 3(1-a)^3v \left[ -(1-a)f^1f^{12}(X^* - Z) + 2af^1f^2 + (1-a)f^2f^{11}(X^* - Z) - (1+a)f^1f^2 \right] \\ &= 3(1-a)^4v \left[ f^2f^{11}(X^* - Z) - f^2f^1 - f^{12}f^1(X^* - Z) \right] \end{aligned}$$

It is evident that the sign of  $|J_1|$  is going to depend on the value of the cross derivative  $f^{12}$ . More precisely, we have that :

$$|J_1| < 0 \text{ and } \frac{da}{dk} = \frac{|J_1|}{|J|} > 0 \Rightarrow f^{12} > \frac{f^2f^{11}}{f^1} - \frac{f^2}{(X^* - Z)}$$

Yet, we know that this condition is automatically fulfilled in accordance with our assumption that the  $f(-)$  curve is quasi-concave. Bear in mind, indeed, that such an assumption implies that  $f^{12} \geq f^2f^{11}/f^1$ , with the consequence that the above condition is met *a fortiori*. We can therefore conclude that  $da/dk > 0$ .

Let us now calculate the second comparative-static derivative :

$$\frac{dZ}{dk} = \frac{|J_2|}{|J|} = \frac{\begin{vmatrix} -f^1(X^* - Z) - 2f & -[(1-a)(X^* - Z)f^{12} - 2af^2] \\ -6f(1-a)^2v(2+a/1+a) & -3f^2(1-a)^3v \end{vmatrix}}{\begin{vmatrix} -f^1(X^* - Z) - 2f & (1-a)f^{11}(X^* - Z) - (1+a)f^1 \\ -6f(1-a)^2v(2+a/1+a) & 3f^1(1-a)^3v \end{vmatrix}}$$

We know already that the Jacobian determinant is negative. The determinant of the numerator can be developed as follows :

$$|J_2| = 3v(1-a)^3 \left[ f^1 f^2 (X^* - Z) + 2ff^2 - 2ff^{12} \left( \frac{2+a}{1+a} \right) (X^* - Z) + 4ff^2 a \left( \frac{2+a}{1+a} \right) \left( \frac{1}{1-a} \right) \right]$$

Using (18) to replace  $f^1(X^* - Z)$  by  $f(2a/1-a)$  in the first term in the expression between brackets, and then arranging the terms, we get :

$$|J_2| = f \left\{ f^2 \left[ \left( \frac{2a}{1-a} \right) + 2 + 4a \left( \frac{2+a}{1+a} \right) \left( \frac{1}{1-a} \right) \right] - 2f^{12} \left( \frac{2+a}{1+a} \right) (X^* - Z) \right\}$$

It is therefore evident, after some simple algebraic transformations, that :

$$|J_2| \geq 0 \text{ and } \frac{dZ}{dk} = \frac{|J_2|}{|J|} \leq 0 \Leftrightarrow \frac{f^{12}}{f^2} \leq \left( \frac{2a^2 + 5a + 1}{(1-a)(2+a)} \right) \left( \frac{1}{X^* - Z} \right)$$

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