

# Disciplining Local Leaders in Community-Based Development

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*Abstract: Largely as a response to critiques of top-down development and of a growing awareness of the low effectiveness of aid absorption in poor countries, the international donor community has recently adopted with enthusiasm and determination a new approach to fight poverty, called the community-based development approach (CBD). Such an abrupt shift in aid strategies is questionable, not because the approach is wrong (the opposite is actually the case), but because massive injections of aid funds in CBD projects, the entry into the field of numerous agencies with little or no experience in participatory development, as well as the pressing need for quick and visible results, threaten to undermine its effectiveness in reducing poverty. The cause for worry comes from the 'elite capture' problem that risks deflecting a large portion of the resources devoted to CBD into the hands of powerful groups dominating target communities. On the basis of a game-theoretical model, the main aim of the paper is to discuss the use of sequential and conditional disbursement procedures as a way of surmounting such a problem, and to examine how the share of CBD aid reaching the poor is influenced by various elements of the aid environment, including the pressure of competition among donor agencies and the availability of aid funds. Multilateral reputation mechanisms and intra-community competition for leadership are also assessed as possible alternatives to sequential disbursement procedures.*

Keywords: participatory development, conditional transfers, elite capture, aid effectiveness

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## Introduction

Community-Based Development (CBD) has long been claimed to be at the heart of the aid approach of Non-Governmental Organizations (NGOs). It has also been attempted as early as during the 1950s by the Ford Foundation and US foreign assistance programmes (by 1960, as many as sixty countries were concerned by this community development thrust) before being abandoned (Holdcroft, 1984). Today, largely as a response to critiques of top-down development and of a growing awareness of the low effectiveness of aid absorption in poor countries<sup>2</sup>, most bilateral donors and big international organizations have started to include participatory elements in the design of their large-scale development assistance programmes (think, e.g., of the World Bank's Social Investment Funds, or of participatory development programmes sponsored by IFAD, the International Fund for Agricultural Development), or to channel substantial amounts of aid money through international or local NGOs (Stiles, 2002). The move to put participation and empowerment of the poor squarely on the agenda is especially noticeable in the case of the World Bank which has made it one of the cornerstones of its Comprehensive Development Framework. This shift of approach is duly reflected in the World Development Report 2000/2001 ("Attacking Poverty") and in the massive increase in the amount lent by the Bank for CBD from \$325 million in 1996 to a conservatively estimated figure of \$2 billion in 2003 (Mansuri and Rao, 2003).

The main argument in favour of CBD 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, and contrary to an idealized view accrediting everything that is local with 'naturally democratic' qualities (Platteau and Abraham, 2002; Watson, 2003: 299), communities or municipalities may be more vulnerable to capture by local elites because local power groups can easily collude beyond the control of higher-level institutions and the attention of the media (Bardhan, 2002: 192-94).

Recent works based on the 'political economy' approach have explored the above trade-off and attempted to identify important determinants of the relative desirability of decentralised versus centralised systems of service provision and delivery (Bardhan and Mookherjee, 1999, 2000a, 2000b; Foster and Rosenzweig, 2002; Ravallion and Galasso, forthcoming). One critical

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<sup>2</sup> Over the 1990s, ODA commitments of the European Union exceeded gross disbursements by more than US\$1.6 billion each year, peaking at US\$2.2 billion in 1994 (Heller and Gupta, 2002: 137). In particular, 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)!

determinant is the extent of elite capture at local level relative to that occurring at central level, which is itself dependent on the degree of relative inequality at local level. The present paper will not pursue this line of inquiry but will instead focus on ways to improve CBD performances from a poverty alleviation perspective. Until the rural poor are sufficiently empowered to effectively participate in decision-making and claim their rightful dues, the elite capture problem is, indeed, bound to seriously undermine the capacity of CBD programs to attain their objective. What we want to argue, therefore, is that CBD will fall far short of the high expectations placed on it by the international donor community if no measures are taken to overcome or mitigate this problem.

In fact, we do not know whether CBD is more or less cost-effective than conventional top-down approaches. Empirical evidence, as it emerges from several recent surveys (Carroll 1992; White and Eicher 1999; Conning and Kevane, 2002; Bardhan, 2002; Mansuri and Rao, 2003; Platteau, 2003), turns out to be quite ambiguous on this delicate question. Yet, when different systems of channelling resources are being compared, it is important to keep in mind that they may not have achieved their maximum potential under the prevailing conditions. This holds true for both the centralised and the decentralised approaches to development, even if we have chosen to limit our attention to ways of enhancing the potential of only the latter.

Several mechanisms come to mind as possible devices to surmount or mitigate the elite capture problem in participatory development. These are: a leader-disciplining mechanism (LDM) based on a bilateral reputation system, a multilateral reputation and sanction network, or a mechanism relying on competition among rival local leaders. Recourse to externally-enforced legal sanctions is ruled out because the judicial system is unreliable in most developing countries where poverty is widespread.

The first of the above mechanisms involves conditional transfers of money disbursed in successive tranches and, as such, it obviously evokes the use of macro-conditionality in international lending programmes (see, e.g., Svensson, 2000). In the latter case, it is central governments rather than local leaders that need to be 'disciplined'. The central lesson is thus that, contrary to what seems a widespread view, the community-based approach does not dispense donors from the need to use conditionality mechanisms. In the following, it must be noted, emphasis is put on CBD projects supported by foreign donor agencies and not on fiscal decentralization programmes whereby municipalities or local governments receive tax transfers from a central state for an endless round of games (for a discussion of the links between this issue and the model presented here, see Platteau and Gaspart, 2003).

The problem of elite capture is likely to be especially difficult to solve under these circumstances. By definition, indeed, donors 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. Since reputation effects are thwarted in a framework characterized by finitely repeated interactions between donor agencies and target communities, some other device must be in existence to complement the policing role of these agencies in the absence of democratic control by the intended beneficiaries themselves.

Bearing in mind that local leaders embezzle a positive amount of money at equilibrium, a central aim of our theoretical endeavour is to explore how the share of aid funds ultimately reaching the grassroots is influenced by various factors such as the preferences of the donor agency, the effectiveness of the fraud detection technology, and characteristics of the aid environment, more specifically the degree of competition prevailing in the “aid market”. The key result is that pushing CBD too far too quickly is self-defeating. In other words, by rushing to help the poor, donor agencies will end up reaching them less effectively. This is because donors’ impatience drives them not only to skip the crucial steps of empowering the poor but also to underutilize conditional transfer mechanisms. Such a conclusion actually echoes that of Kanbur (forthcoming) when he argues that structural adjustment programmes largely fail because macro-conditionality is often not rigorously applied at the level of central governments.

The outline of the paper is as follows. Section 1 starts by telling a rich story of CBD of which one of the authors (J.P. Platteau) has got first-hand knowledge through direct experience. The story allows us to gain profound insights into the nature of the problem of misappropriation by local elites of externally provided funds, and will serve as a major inspiration for the ensuing theoretical exercise. Thereafter, the theme is pursued by drawing attention to the pervasive presence of ‘development brokers’ who come into being encouraged by the lenient practices of many donor agencies. Partly building on these insights, Section 2 considers the possibility of a LDM using sequential and conditional disbursement of aid funds in the context of decentralized bilateral relationships of limited duration. Section 3 proceeds by proposing a sequential game-theoretical model depicting how such a mechanism operates when supply of aid funds is scarce and donor agencies behave as local monopolies. Comparative-static results are derived and interpreted in Section 4. Section 5 turns to an alternative formulation of the model in which supply of CBD aid is abundant and monopolistic competition characterizes the “market for aid”. Richer conclusions are reached that are then discussed.

Taking stock of the inherent limitations of bilateral reputation mechanisms, Section 6 examines the feasibility of more sophisticated, multilateral mechanisms whereby information about malefactors is circulated and acted upon within the donor community. The potential role of the ultimate purveyors of aid funds, as distinct from aid operating agencies, is assessed in this new context. Section 7 briefly discusses the possibility for foreign donors to rely on competition between local leaders, rather than on fraud detection and

sanction mechanisms, in order to better reach the poor. Section 8 summarizes the main findings of the whole analysis.

## **1. Elite Capture at Local Level**

### *A Case Study from West Africa*

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 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. Things were left there and the local radio even echoed the leader's viewpoint. Of course, suing him before a court was not deemed to be a realistic option.

Stories like this could be easily multiplied<sup>3</sup>. What must be stressed is that the attitudes involved partake of the logic of clientelistic politics characteristic

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<sup>3</sup> 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).

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. On the other hand, devolving powers to communities may be resisted by members themselves if such devolution is thought to threaten the immediate supply of emergency aid (Watson, 2003: 304-5).

### *Elite capture and Development Brokers*

The problem of ‘elite capture’ is especially 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. Yet, quick disbursement of aid is problematic in so far as an effective CBD demands a genuine empowerment of the rural poor (see, e.g., Rahman, 1993; Edwards and Hulme, 1996; 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 (Narayan and Ebbe, 1997; Tandler, 2000: 16-17)<sup>4</sup>.

A perverse mechanism is set into motion when donor agencies skip the empowerment phase by asking intended beneficiaries to form groups or partner associations, and to ‘elect’ leaders to lead 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 usually its most prominent members. 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,

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<sup>4</sup> A recent evaluation report thus concludes that “building capacity and social capital at the community level are time- and human resource-intensive processes, making disbursements potentially slower and less predictable”. Social funds, therefore, “may lose the strengths on which their reputation has been built” when their focus is gradually shifted from emergency response mechanisms to longer-term welfare and institutional development objectives (World Bank, 2002 : 48).

entrenching a privileged minority and discrediting the idea of group action for self-improvement”<sup>5</sup>.

Confirming the prediction of Esman and Uphoff, several studies have concluded that the formation and training of village groups in community-based projects have the effect of encouraging the entry of wealthier and more educated people into leadership positions because of the attractiveness of outside funding (Gugerty and Kremer 1999, 2000; Rao and Ibanez 2001). In point of fact, a major problem confronted by the community development movement of the 1950s (which had been attempted by the Ford Foundation and US foreign assistance programs) lay in its inability to effectively counter the vested interests of local elites (Holdcroft 1984: 51). Being adept at representing their own interests as community concerns expressed in the light of project deliverables, local leaders often succeed in deluding the donors into thinking that their motivations are guided by the collective good (Mosse 2001; Harrison 2002; Ribot 1996, 2002; Eversole 2003). Their demands are replete with the sort of pleas and vocabulary that strongly appeal to the donors and, in order to create the appearance of participation, they may go as far as spending resources to build community centers, hold rallies, and initiate showcase labor-intensive activities (Conning and Kevane 2002: 383).

Traditional elites are not the only category of persons to benefit from the newly channeled resources since they are frequently involved in tactical alliances with educated persons and politicians operating outside the village domain. Urban elites may actually be responsible for initiating the process that deflects CBD from its intended purpose. Witness to it is the proliferation of national NGOs that are created at the initiative of educated unemployed individuals, politicians, or state employees who may have been laid off, or deprived of access to key logistical resources, as a result of structural adjustment measures. Acting as ‘development brokers’, political entrepreneurs have been quick to understand that the creation of an NGO has become one of the best means of procuring funds from the international community (Meyer, 1995; Bebbington, 1997; Bierschenk, de Sardan, and Chauveau 2000)<sup>6</sup>. In the words of Chabal and Daloz (1999: 22-24): “a massive proliferation of NGOs ... is less

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<sup>5</sup> In the light of this diagnosis, Cernea’s contention that “NGOs insert themselves not as a third and different/independent actor, but as an emanation and representation of the community” (Cernea 1988: 10), appears almost surrealist.

<sup>6</sup> Thus, in the case of Benin, a West African country especially spoiled by the donors, local NGOs and associations, which are often “empty shells established with the sole purpose of capturing aid”, have multiplied within a short period of time to number several thousands. Many others wait to receive the approval of the ministry of interior (Le Monde, 26 February 2001). In Mali, there were 1,467 NGOs registered locally in December 2001 (Coulibaly 2003: 24). In non-African countries, also, NGOs often constitute “an opportunistic response of downsized bureaucrats, with no real participation or local empowerment” and, inevitably, program officers themselves become involved in the creation of community institutions (Conning and Kevane 2002: 383-84).

the outcome of the increasing political weight of civil society than the consequence of the very pragmatic realization that resources are now largely channeled 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...”.

Of course, not all local leaders are opportunists ready to divert foreign aid from the intended beneficiaries. Several studies actually point to substantial variations in targeting effectiveness across villages (Ravallion 2000; Jalan and Ravallion, forthcoming). Interestingly, intra-village inequality is often found to be inversely related to this effectiveness (Galasso and Ravallion, forthcoming), confirming theoretical predictions (see *supra*) and suggesting that the local elite tend to appropriate a larger share of the transfers in communities that are highly unequal to begin with.

Future evidence will settle the issue of whether cases of embezzling behaviour outweigh cases where leaders are either unable (owing to sufficient empowerment of the grassroots) or unwilling (because they somehow share the ethical code of aid agencies) to cheat fellow villagers. Results are likely to vary from one region to another, depending on the strength of social movements, levels of rural literacy, etc. Yet, we believe that anecdotal evidence about the misdeeds of local elite is plentiful enough, at least in poor countries such as those of SubSaharan Africa, to justify a cautious attitude about the possible impact of the CBD approach. While thinking about mechanisms aimed at keeping fraudulent behavior in check, we will therefore assume that leaders do not share the values of foreign aid agencies and that the grassroots are not empowered to dispute their decisions.

## **2. A mechanism to discipline local leaders**

Let us consider the following three-agent decision framework. At the top is a donor agency (labelled *A* below) which wants to disburse a given amount of funds with the purpose of alleviating poverty. 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 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 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 the right of the first move: to the  $G$  group which he has formed or helped to form,  $L$  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 their 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, in reality, aid agencies do channel money through local intermediaries in the kind of circumstances just described, it is either because they do not have a good knowledge about the game that is being 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 effectively disbursed within a rigid time framework (the so-called 'fiscal year' concern). 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. Although the second possibility is most often mentioned with respect to official aid agencies (Tarp, 2000; Svensson, 2002; Kanbur, forthcoming), its role ought not to be underestimated when considering private donor agencies such as NGOs.

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. Since punishment cannot be meted out through a judicial procedure (courts are unreliable), the game must be repeated. Nevertheless, 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). The game must have an infinite or an indeterminate duration for the desirable outcome to become a possible equilibrium.

Yet, because they aim at enabling beneficiaries to become eventually self-supporting, donors typically want their aid transfers to be of limited and definite duration. It seems obvious that granting funds for a finite but indeterminate period is not a realistic option since it would create perverse incentives to underperform in order to lengthen the project's duration. We therefore 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. By so doing, however, the agency deprives itself of the possibility to use a credible threat to punish the leader during the previous period, as a result of which the latter misappropriates the money of the previous tranche as well. The strategic response of the donor is to cancel that 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, especially so because no judicial system is effectively working for such offences at least (see *supra*).

To escape the deadlock with which we started, the assumption of strategic rational behaviour imputed to agents by classical game theory must be called into question. There is actually good ground for doing so since it is unrealistic to consider that the leader of a community is able to freely vary the share destined for the grassroots as successive tranches of aid money are being disbursed. As a matter of fact, how could a leader conceivably decrease this share in an abrupt manner at the time of the last disbursement while he will have to continue to interact with fellow villagers in the future? His image of a 'good patron' must be preserved if he is to enjoy their continuous support in other walks of life, for example, in situations where his political career is at stake. In other words, the very logic of the patronage system commands that the patron abides by certain rules or norms which have the effect of constraining his actions and thereby grant a genuine bargaining power to his clients (see, e.g., Scott, 1985).

For essentially the same reason, *L* is assumed to stick to his promise to pay to *G* the agreed share of aid money once the donor agency has actually released it. The story told in Section 1 seems to attest that enforcement was not the real problem since villagers did not feel cheated by their predatory leader and actually voted for him again even after his malpractices had been fully

revealed and confessed<sup>7</sup>. Based on this story, we therefore assume that  $G$  are empowered enough to enforce  $L$ 's promise but not enough to actively debate the sharing rule with him. If the grassroots were not empowered enough even in the first sense, they would be doomed to be seriously exploited by their leader and there is not much that could be done to relieve their poverty until they will have acquired a better ability to defend their rights and assert themselves. On the other hand, if they were empowered enough in both senses, our underlying model would become inadequate since the sharing rule would be determined as the outcome of a bargaining process between  $L$  and  $G$ , and not by  $L$  only<sup>8</sup>. Clearly, our definition of the relevant communities has an analytical rather than a substantive content. Which concrete societies fit into our definitional scheme is a complex question that is not explicitly addressed here.

In order to clarify our framework, it is useful to represent the leader-disciplining mechanism 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  $L$ , that is, to encourage him to use the first tranche according to  $A$ 's prescriptions (for the benefit of  $G$ ). Note incidentally that the amount granted under the first tranche must be positive so as to ensure that  $L$ 's behaviour can be effectively put to test before making a decision about whether to disburse the second tranche.

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<sup>7</sup> That is also why we did not follow the alternative modeling strategy consisting of depicting the interaction between  $G$  and  $L$  as a principal-agent relationship (with  $G$  as the principal and  $L$  as the agent). In such a framework, indeed,  $G$  would be unable to perfectly enforce what  $L$  does and would therefore be cheated by him.

<sup>8</sup> Assuming that the grassroots' share resulting from such a bargaining process is large enough, the LDM would be of no avail: indeed, disciplining the local leader with the help of an external device would not have the effect of raising the share of aid money accruing to the intended beneficiaries. To achieve its objective, the aid agency could therefore rely on the bargaining strength of the latter. To be sure, some embezzlement would still occur, but the agency would not be able to do better by using a LDM.

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* has to choose the manner in which to apportion the aid money between him and *G*. The latter decide the minimum shares that must accrue to them. If these shares are not accepted by *L*, they quit the local association, thereby signalling to *A* that *L* does not represent them. 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. Now, remember that *G* would consider any reduction of their aid entitlement over time or any breach in the agreed rule for division of the aid proceeds as unfair practices that violate a sort of social norm. 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 (instead of falling to a minute amount).

Before we embark upon the formal analysis, two remarks are in order. First, an immediate implication of the foregoing discussion is that a leader who does not belong to the community targeted by *A* will not feel tied by local rules and norms. Given the choice and information, *A* will therefore prefer to deal with a local leader than with a "development broker" who is expected to embezzle a comparatively large share of the aid funds. With imperfect information regarding the leader's type, *A* can still choose to work with a community if the probability that its leader genuinely belongs to it is sufficiently high.

Second, an important shortcoming of the 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 1, *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<sup>9</sup>.

### **3. Modelling the LDM under conditions of monopolistic supply of CBD aid**

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<sup>9</sup> To conceive of a mechanism that would punish *L* without sanctioning *G* is difficult. As has been pointed out above and illustrated in Section 1, compelling the former to return the misappropriated money is almost impossible under the conditions that prevail in many poor countries.

We begin by assuming that supply of aid funds is scarce relative to the numerous communities in poor countries that are eligible for CBD support. In the framework of our model, a donor agency,  $A$ , is posited to be in the position of a local monopolist vis-a-vis a given community of rural people,  $G$ , implying that the latter have no alternative source of external funding should the transaction with  $A$  fail. In Section 5, we will consider the opposite situation in which numerous aid agencies compete for access to rural communities.

The objective of  $A$  is that as large a share as possible of a given amount of aid money earmarked for a particular community reaches the intended beneficiaries,  $G$ . As we shall show later, such an assumption is innocuous because making the number of target 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 inter-temporal allocation of the money between two successive periods of time. We know from Section 2 that this decision involves a difficult trade-off for  $A$ . The second instrument in the hands of  $A$  is the supervision effort devoted to detecting possible frauds by  $L$ . A new trade-off arises here. Indeed, the higher the supervision effort made by  $A$  the more the local leader is induced to convey funds to  $G$  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  $G$  will be consequently smaller.

What we have is a classical principal-agent problem with  $A$  unable to observe  $L$ 's actions directly. In such a 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 :

$$\underset{\alpha}{Max} U^L(\alpha) = (1-\alpha)X_1 + (1-\alpha)X_2(1-\psi), \quad (1)$$

where  $X_1$  and  $X_2$  are the amounts of the first and second tranches of aid money, respectively;  $(1-\alpha)$  is the share of the aid transfer appropriated by  $L$  and  $\alpha$  is therefore the share accruing to  $G$ ;  $\psi$  is the probability of detection of  $L$ 's embezzlement. In accordance with our discussion in Section 2,  $\alpha$  is assumed to prevail throughout the two periods. The detection function can be simply defined as follows (note that it will be further justified at a later stage):

$$\psi = s(1 - \alpha)^2, \quad (2)$$

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 ( $\alpha=0$ ). This implies that  $s \leq 1$ . Moreover,  $\psi=0$  when  $L$  behaves in a perfectly honest manner ( $\alpha=1$ ). 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:  $\partial_2\psi/\partial\alpha_2=2s>0$ . 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:

$$Max_{\alpha} U^L(\alpha) = (1-\alpha)X_1 + (1-\alpha)X_2 [1 - s(1-\alpha)^2] \quad (1')$$

Differentiating (1') with respect to  $\alpha$  yields  $L$ 's reaction function:

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

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

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

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  $\psi$  cannot be nil at equilibrium. In point of fact, it must be the case that  $\psi > 1/3$ , 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  $\alpha$  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 to interpret the West African failure story reported in Section 1. Either the foreign NGO was acting candidly by disbursing money, in the sense that it was over-optimistic about the local leader's personal traits (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, plausibly 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:

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

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:

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

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 concern to help the grassroots. It can be written thus<sup>10</sup> :

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<sup>10</sup> If  $A$  is confronted with the risk of dealing with a "development broker" rather than with a genuine local leader, if leader types are undetectable, and if we denote by  $p$  the probability of meeting a genuine local leader and by  $(1-p)$  that of meeting a "development broker",  $A$ 's

$$\begin{aligned}
& \text{Max}_{X_2, Z} U^A(X_2, Z) = \alpha X_1 + \mu \alpha X_2(1 - \psi) + \mu \alpha X_2 \psi \eta \\
& \text{s.t. } \text{the FOC of } L, \\
& \psi = f(Z, k)(1 - \alpha)^2, \text{ and} \\
& X_1 + X_2 = X^* - Z,
\end{aligned} \tag{7}$$

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,  $\mu$  is the time rate of preference of  $A$ , and  $\eta$  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  $\psi$  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. Thus, one can think that more professional aid agencies have higher  $k$  than comparatively inexperienced ones. 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 :

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

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:  $\psi = f(Z, k)(1 - \alpha)^2$ . 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  $Z^{11}(s, k) > 0$ .

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optimization problem consists of maximizing an expected utility where the expression given in (7) is simply multiplied by  $p$ . In the eventuality of meeting a “development broker”, indeed,  $A$  derives no utility because the whole amount of aid money is embezzled. Precisely because embezzlement is then complete, no self-selection mechanism can be used by  $A$ : there is no alternative contract that could be offered to  $L$  that would promise a higher payoff than the gain obtained by behaving as a “development broker”. Our analytical framework is therefore left essentially unchanged. Alternatively, it is conceivable that  $A$  incurs search costs in order to detect the leaders' type, if that cost is lower than the benefit of detection. The benefit of detection will itself depend upon the extent to which search costs –which are subtracted from  $X^*$  in the same way as  $Z$ – increase the probability  $(1-p)$  of detecting a “development broker”. In order to keep our model as simple as possible, this path will not be pursued here. Note that, analytically, the treatment of search costs is analogous to that of monitoring expenses (a detection function needs to be assumed in both cases).

Turning now to  $\mu$  and  $\eta$ , we assume that the values of both parameters are less than unity. The value of  $\mu$  is smaller than one because  $A$  is concerned that  $G$ 's livelihood improves as rapidly as possible and the ultimate purveyors of funds, the taxpayers or the general public mobilized in fund-raising campaigns are eager to see the results of their financial effort (see supra). The value of  $\eta$  is smaller than one because any re-direction of CBD aid fund entails the transaction cost of making contact, and establishing partnership links, with a new community. The most straightforward interpretation is to consider  $\eta$  as the proportion of  $X_2$  that  $A$  is able to recycle costlessly (and of which intended beneficiaries will receive a share  $\alpha$ ).

It must be remarked that, if  $\eta < 1$ , punishing a community led by a dishonest  $L$  carries a cost for  $A$  since the funds earmarked for it can be re-allocated only at a cost. Since the initially targeted community would in any event obtain the share promised by  $L$  in the first period thanks to the existence of the norm of fairness,  $A$ 's threat of punishment is not automatically credible. (Of course, the closer  $\eta$  is to one, the more credible such a threat would be). For it 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. To put it in another way, the loss incurred by  $A$  in the event of fraud detection,  $(1-\eta)X_2$ , must be outweighed by the loss of credibility  $A$  would have to bear in future CBD projects if it would not punish  $L$  today, that is, it must be outweighed by the credibility gain that will enable  $A$  to better serve  $G$  in the future. This amounts to embedding into our mechanism long-term considerations that are played over an infinite or indeterminate period of time.

As is evident from (7), 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 :

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

Or, equivalently,

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

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

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

from which it is easily inferred that:

$$(1-\alpha) \left[ 1 - \frac{\mu(1-\eta)}{3} \right] \left( \frac{X^* - Z}{X_2} \right) = (1+\alpha)(1-\mu) \quad (11)$$

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 :

$$\frac{X_2}{X^* - Z} = \frac{(1-\alpha)v}{(1+\alpha)(1-\mu)}, \text{ where } v = \left[ 1 - \frac{\mu(1-\eta)}{3} \right] \quad (12)$$

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  $d\alpha/dZ$  from  $L$ 's reaction function. Equation (3) can now be written:

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

From (3'), we easily get:

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

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 ( $\alpha$  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  $(1-\varepsilon)$  is nothing else than the analogue of the mark-up coefficient in monopoly pricing. Note that, since  $\varepsilon$  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:

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

Substituting the value of  $X_2(1-\mu)$  as obtained from (12), we are able to derive an equilibrium condition expressed as a function of  $\alpha$  and  $Z$  only:

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

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. The second term 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:

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

The first two terms are obviously non-negative. On the one hand,  $\alpha$  must be positive as  $A$ 's utility would be nil if  $\alpha$  were equal to zero. On the other hand,  $v$  may not have zero value since  $\mu(1-\eta) \neq 3$ . As a consequence, equation (16) finally reduces to:

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

Equilibrium condition (17) can be transformed so as to give rise to an interesting interpretation. Defining  $\sigma_{s,Z} = (ds/dZ)(Z/s)$  as the elasticity of the

effectiveness of fraud detection with respect to monitoring expenditures, and bearing in mind that  $X_1 + X_2 = X^* - Z$ , we get:

$$\frac{1}{2}\sigma_{s,Z} = \frac{\alpha Z}{(1-\alpha)(X_1 + X_2)} \quad (18)$$

The numerator of the RHS of (18),  $\alpha Z$ , 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. The denominator,  $(1-\alpha)(X_1 + X_2)$ , corresponds to the loss for  $G$  arising from the aid fund appropriated 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  $\sigma$ .

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

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

which, combined with (12), yields:

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

$$f(Z) = \frac{(1+\alpha)(1-\mu)}{3(1-\alpha)^3 \left[ 1 - \frac{\mu(1-\eta)}{3} \right]} \quad (19)$$

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  $\alpha$ ,  $Z$  and  $X_2$  are all present in (3''), only  $\alpha$  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  $\alpha$  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,  $\psi = s(1 - \alpha)^2$ , is not arbitrary.

More precisely, we want to show that the explicit function  $\psi = s(1 - \alpha)^2$  can be endogenously derived as the optimal form of a more general function defined as  $\psi = s(\theta - \alpha)^2$ , where  $\theta$  stands for a norm of sharing set by  $A$ . In other words, the donor agency has an additional decision variable, namely the proportion of the aid fund that it prescribes  $L$  to channel to  $G$ . In this variant of the original model, the FOC of the local leader becomes :

$$(\theta - \alpha)^2 = \frac{X^* - Z(s, k)}{3sX_2}$$

The problem of the donor agency is now written :

$$\begin{aligned} \underset{X_2, Z, \theta}{Max} U^A(X_2, Z, \theta) &= \alpha X_1 + \mu \alpha X_2 [1 - s(\theta - \alpha)^2] + \eta \mu \alpha X_2 s(\theta - \alpha)^2 \\ \text{s.t. } \theta &\leq 1, s = f(Z, k), \text{ the FOC of } L, \text{ and } X_1 + X_2 = X^* - Z, \end{aligned}$$

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  $\partial \alpha / \partial \theta = 1$  –since we know from the FOC of  $L$  that  $(\theta - \alpha)^2$  does not depend on  $\theta$ –, the first derivative of  $U^A$  with respect to  $\theta$  is simply given by :

$$\frac{\partial U^A}{\partial \theta} = X^* - X_2 - Z(s, k) + \mu X_2 - \frac{\mu(1 - \eta)(X^* - Z(s, k))}{3}$$

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

$$\frac{\partial U^A}{\partial \theta} = \left( X_1 - \frac{\mu X_1}{3} \right) + \left( \mu X_2 - \frac{\mu X_2}{3} \right) + \frac{\mu \eta (X_1 + X_2)}{3} > 0 \Rightarrow \theta^+ = 1$$

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  $\alpha$ , the probability to detect fraud is lower (see equation (2)). This is not in the interest of  $A$ .

It is worth noticing that the expression for  $\partial U^A / \partial \theta$  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  $\alpha$  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  $\alpha$  and with it the risk of having to recycle the aid budget, which is costly. As shown above, however, the former effect outweighs the latter. It is revealing that, when  $\eta$  is equal to one (the cost of recycling funds is nil), we have simply that  $\partial U^A / \partial \theta = X_1 + \mu X_2$ , an expression from which all negative terms have vanished.

#### 4. Results of the basic model

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  $\alpha$  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  $\alpha < 1$ , and on the left as a result of  $Z < X^*$ . The relationship given by (19) with  $f(Z, k)$  expressed as a function of  $\alpha$  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  $\alpha$ , 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  $\alpha < 1$  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  $\alpha$  are both positive, the latter because  $\alpha$  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



moved in opposite directions: while  $\alpha$  has gone up,  $Z$  has declined. Moreover, deriving the equilibrium value of  $X_2$  from (3), it is easy to compute the total differential:

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

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

$$\frac{dU^A}{d\mu} = \alpha \left[ X_2 - \frac{(X^* - Z)(1-\eta)}{3} \right] + [(X^* - Z)v - X_2(1-\mu)] \frac{d\alpha}{d\mu} > 0 \quad (21)$$

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  $\psi X_2 = (X^* - Z)/3$ , where  $\psi < 1$  so that  $X_2 > (X^* - Z)/3$ . It follows that, a fortiori,  $X_2 > (X^* - Z)(1-\eta)/3$ . For another thing, the expression between brackets in the second term is also positive since  $X^* - Z = X_1 + X_2 > X_2$ , and  $v > 1 - \mu$ . Finally, we have shown above that  $d\alpha/d\mu > 0$ .

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

$$\frac{d\alpha}{d\mu} > 0; \frac{dZ}{d\mu} < 0; \frac{dX_2}{d\mu} > 0; \frac{d[\alpha(X_1 + X_2)]}{d\mu} > 0; \frac{d\psi}{d\mu} < 0; \frac{dU^A}{d\mu} > 0 \quad (22)$$

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  $\alpha(X_1 + X_2)$ , 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. As for the probability of fraud detection, it 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, much in the same way as windfall incomes from natural resources can be a curse because they give rise to greater rent-seeking activity (see, e.g., Tornell and Lane, 1998). At the limit, if  $A$  is very impatient, the share accruing to  $G$  will tend to a value as low as that obtained under a one-shot disbursement procedure.

The effect of an exogenous increase in  $\eta$  is strikingly similar to the above-analyzed effect yielded by an increase in  $\mu$ . 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>12</sup> In addition, the derivative of  $U^A$  with respect to  $\eta$  is again found to be positive :

$$\frac{\partial U^A}{\partial \eta} = \mu \alpha \left( \frac{X^* - Z}{3} \right) + [(X^* - Z)v - X_2(1 - \mu)] \frac{d\alpha}{d\eta} > 0 \quad (23)$$

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

$$\frac{d\alpha}{d\eta} > 0; \quad \frac{dZ}{d\eta} < 0; \quad \frac{dX_2}{d\eta} > 0; \quad \frac{d[\alpha(X_1 + X_2)]}{d\eta} > 0; \quad \frac{d\psi}{d\eta} < 0; \quad \frac{dU^A}{d\eta} > 0 \quad (24)$$

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

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<sup>12</sup> We indeed have that :

$$\frac{df(Z, k)}{d\eta} = -\frac{\mu(1-\alpha)(1-\mu)}{9(1-\alpha)^3 v^2}, \text{ which is negative since } \alpha < 1 \text{ and } \mu < 1.$$

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. In particular, interventions in low density areas are more vulnerable to such a risk since they tend to involve higher set-up costs associated with longer distances to be travelled, lower education levels in remote locations, etc.

Clearly, the logic underlying the effects of a rise in  $\eta$  is, *mutatis mutandis*, the same as that described above for an increase in  $\mu$ . 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.

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  $\alpha$  and  $Z$ . In this case, as is evident from (20),  $dX_2$  cannot be signed. The same holds true for  $\psi$  and  $\alpha(X_1+X_2)$ . 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 :

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

The elasticity of  $\alpha$  with respect to  $X^*$ , denoted  $\lambda_{\alpha, X^*}$ , 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 (9) can be written :  $U^A = \alpha v X^* - \alpha v Z - \alpha X_2(1-\mu)$  which is obviously smaller than  $\alpha v X^*$ , so that  $\alpha v X^* - U^A$  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 :

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

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 aid agency's utility function (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 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, or the number of communities or locations, who have benefited from external support. 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 its 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  $\phi$ , the first derivative of  $\phi$  with respect to  $k$  cannot be signed. As a matter of fact,

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

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  $\alpha$ ,  $Z$ , 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 :

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

The above condition is automatically fulfilled if the  $f(-)$  curve is (strictly) quasi-concave. In this case, indeed,  $f^{12} > f^{11} f^2 / f^1$ , with the consequence that the above condition is met *a fortiori*. We can therefore conclude that  $d\alpha/dk > 0$ . This is the expected result: when an aid agency has more skills and experience in detecting fraud, say as a result of best practice dissemination, 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 :

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

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 :

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

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,  $\alpha(X_1 + X_2)$ . On the other hand, the evolution of the probability of fraud detection,  $\psi$ , cannot be determined since there are two effects calling for a decrease, the higher value of  $\alpha$  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 :

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

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 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 –  $\phi$  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  $\alpha$  and  $Z$  have a larger value at the new equilibrium. By contrast, if  $f^{12}$  is low, the  $\phi$  curve undergoes a small outward shift or even an inward shift, and  $\alpha$  rises in parallel with a decrease in  $Z$ .

## **5. Modelling the LDM under conditions of monopolistic competition**

So far, we have considered a situation where the supply of CBD aid is scarce relative to potential demand by poor communities. We now turn to the opposite case where such supply is abundant. If perfect competition prevails among donor agencies, and these agencies are selfish in the sense that they are concerned with relieving poverty but only to the extent that poverty reduction is achieved through their own efforts, the share of CBD aid eventually reaching the poor will tend towards zero. This disastrous result obtains because all agencies try their best to lure communities so as to be able to spend their aid budget. Local leaders can then play on this acute competition to extract larger portions of aid funds.

Their bargaining strength will be tamed only if donor agencies are (genuinely) altruistic, that is, if their concern with poverty reduction is unconditional: their aim is to see poverty reduced and they do not mind if relief is brought by others' efforts rather than by their own. Their dedication to the objective of poverty reduction is so sincere that they are not ready to make compromises with dubious leaders in order to gain a foothold in a community. To put it in another way, with equal ability to reach the poor, an unambiguously altruistic agency leaves room to a rival agency whenever competition is liable to harm the interests of the intended beneficiaries of aid efforts. The assumption of unambiguous altruism on the part of donor agencies is too strong, however. In the real world, many of them pay at least some significant attention to their own interests, if only because continuing employment of their staff depends on the CBD projects that they are able to win on the ground. This is bad news for the poor of the world.

Fortunately, it is probably not realistic to depict the “market for CBD aid” as perfectly competitive or subject to Bertrand competition. A more reasonable

approach is to view donor agencies as producing differentiated, multi-attribute services. Monopolistic competition therefore appears as a more suitable framework to analyze the interactions between donor agencies and local leaders. To accommodate this new framework, our basic model presented in Section 3 needs to be adjusted accordingly.

First, since local leaders now enjoy access to alternative sources of CBD funds in case of fraud detection, an exit option, the value of which is labelled  $W$ , must be introduced into  $L$ 's payoff function. To the extent that exit options depend on portions of funds appropriable by leaders in other projects, it would seem natural to treat  $W$  as an endogenous variable. Yet, on the one hand, endogeneity of  $W$  would make the problem quite tricky to solve analytically and, on the other hand, donor agencies are likely to be heterogeneous in terms of preferences and effectiveness of fraud detection technology. For these reasons, we prefer to assume that  $W$  is exogenous and, say, represents some average exit option as perceived by local leaders.

Second, new interpretations can now be given to parameters  $\mu$  and  $\eta$ . Thus,  $\mu$  reflects the impatience of donor agencies, which is at least partly determined by the competitive pressure of rival agencies: they are in a hurry to establish a partnership relationship with a local community lest the latter should be attracted by another offer. As for  $\eta$ , it measures the difficulty of relocating a CBD project which is especially serious when communities are the object of much attention on the part of donor agencies.

Note that we do not consider the possibility for communities to choose amongst competing aid agencies on the basis of their ability to detect fraud, for example. The reason is that it is not realistic to assume that communities have access, *ex ante*, to the requisite information.

Since  $W$  is the leader's payoff in case of fraud detection,  $L$ 's problem becomes:

$$\text{Max}_{\alpha} U^L(\alpha) = (1-\alpha)X_1 + (1-\alpha)X_2[1-s(1-\alpha)^2] + s(1-\alpha)^2W,$$

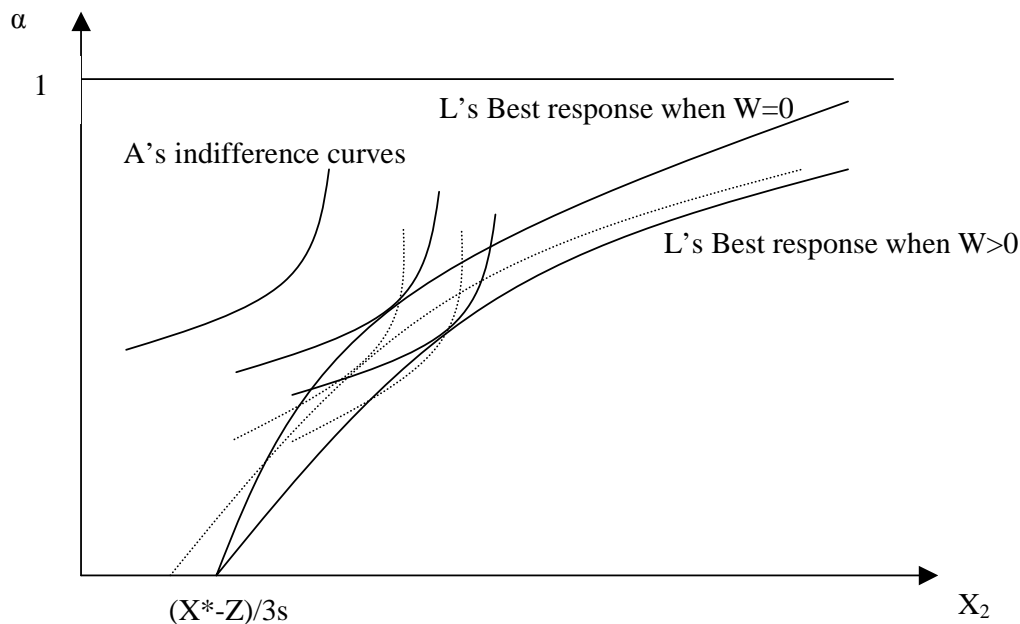
where  $W = EU^L$  in the presence of a heterogeneous population of donor agencies with different  $k, \mu, \eta$ , and  $X^*$

The leader's first-order condition remains quadratic in  $(1-\alpha)$ , yet the aid agency's problem cannot be reduced any more in a meaningful way. We have, indeed, that:

$$dU^L / d\alpha = -X_1 - X_2 + 3(1-\alpha)^2 f(Z, k)X_2 - 2(1-\alpha)f(Z, k)W = 0 \Leftrightarrow \\ 1-\alpha = W / 3X_2 \pm \sqrt{W^2 / 9X_2^2 + (X_1 + X_2) / 3X_2 f(Z, k)}, \text{ and only one root allows } \alpha > 0$$

Note incidentally that, when  $W = 0$ , the first-order condition above reduces itself to (3), obtained under the basic model.

Fortunately, the structure of the agency's preferences may be exploited to understand the impact of a positive  $W$ , compared to a situation where  $W = 0$ . Fix the cost of supervision at the level  $Z$ . Consider the following graph, which represents the agency's choice problem in the  $(\alpha, X_2)$  space.



*Diagram 2: Comparative-statics under conditions of monopolistic competition*

When  $X_2$  increases, for given  $Z$  and  $\alpha$ ,  $A$ 's indifference curve in the  $(\alpha, X_2)$  space becomes steeper. Simple algebra shows that  $L$ 's best response curve still starts from the point of abscissa  $(X^* - Z)/3s$  when  $W$  increases to a positive value, but it becomes less steep. It follows that the new optimum ( $W > 0$ ) lies southeast to the previous one ( $W = 0$ ), that is,  $\alpha$  is lower and  $X_2$  is higher (of course,  $X_1$  is correspondingly lower).

Of course, in  $A$ 's optimization,  $Z$  is allowed to vary. Since  $\alpha$  has been lowered,  $Z$  will increase, at the expense of  $X_1$  too. This makes  $A$ 's indifference curves still steeper and shifts  $L$ 's best response curve to the left. The outcome is depicted by dotted lines. The result can only be a lower  $\alpha$  at equilibrium and, therefore, the initial impact on  $\alpha$  cannot be reversed. As for the total impact on  $X_2$ , it is ambiguous.

As a conclusion, in a neighbourhood of  $W = 0$ , at least two results of comparative statics about  $W$  can be stated:  $d\alpha/dW < 0$ , and  $dZ/dW > 0$ . As expected, the availability of exit options for local leaders who have been caught embezzling funds in a CBD project has the effect of reducing the bargaining

strength of the grassroots and, therefore, to lower their share of CBD funds at equilibrium. Competition among donor agencies is harmful for the poor if it translates itself into an intense and selfish search for communities to support. It has the additional effect of inducing agencies to increase their supervision effort in order to counter the greater temptation of leaders to cheat. The net budget available for distribution is correspondingly decreased. There are thus two factors lowering the benefits accruing to  $G$  under conditions of monopolistic competition among donor agencies: a decrease in the absolute amount of CBD aid available for distribution, on the one hand, and a decline in their relative share in this amount, on the other hand.

In fact, in so far as competition also results in a decrease of both  $\mu$  and  $\eta$  (see supra), the relative share of  $G$  is lowered on two more grounds (the results obtained under the basic model hold here). For one thing, competition makes donor agencies more eager to obtain quick results and, for another thing, it tends to make re-orientation of aid flows costlier, thus creating a new margin of manoeuvre for local leaders aware that the donor agency has a budget to spend that is more or less tied to the initially chosen community or location. Clearly, an increased aggregate supply of CBD funds is not an unmixed blessing. If it increases the number of communities that can be reached thanks to the multiplication of CBD aid operators and/or the expansion of their activities, it also causes the share appropriable by the poor to decline inasmuch as it results in more acute competition among such operators.

As a final remark, it is worth noting that, when all donor agencies are (genuinely) altruistic, the values of  $\mu$  and, perhaps also  $\eta$  are not increased compared to the situation of a monopolistic agency. The detrimental effect ascribed to a change in these parameters does not therefore materialize. But the detrimental effect arising from a positive  $W$  still exists. In other words, local leaders know that, if their fraud is detected, alternative sources of CBD funding are available to which they could possibly turn. In order to prevent that effect from occurring, a reputation mechanism should exist to link up the decisions of donor agencies. It is this issue that is addressed in the next section.

## 6. The role of multilateral reputation mechanisms

In the previous section, a bilateral reputation or sanction mechanism has been implicitly assumed to be at work. As a matter of fact, a local leader caught embezzling funds is punished only by the donor agency that he has flouted. The LDM is precisely aimed at deterring  $L$  from appropriating too large a share of CBD aid and shifting agencies in case his fraud is detected. (In the basic monopoly model, there were no alternative agencies to which a fraudulent leader could turn owing to the scarcity of aid funds). The problem is that this result is obtained at a high price:  $L$  must, indeed, be allowed by  $A$  to retain a possibly

large share of the funds to be induced to stay with the same agency all throughout the project's life rather than using the exit option as a deliberate strategy. From the standpoint of the poor, a much more favourable situation would clearly be achieved if donor agencies could mutually inform each other about fraudulent behaviours in CBD projects and act upon that information to sanction fraudulent leaders. The existence of such a multilateral reputation and sanction mechanism, it may be noted, would make the recourse to a sequential and conditional disbursement procedure unnecessary. Unfortunately, mechanisms of that kind are fraught with so many practical difficulties that their feasibility can be seriously doubted.

*Circulation of fraud-related information among aid agencies*

Documented by Greif (1989, 1994) with respect to relationships between traders (see also Platteau 2000: Chap. 6; Aoki 2001: Chap. 4), the multilateral reputation mechanism can be applied to our problem in the following way. Operating within a repeated-game framework, an aid agency would adopt the strategy whereby its grants money to a local leader, but only provided that he is not known to have cheated another agency some time in the past. If money is thus disbursed and the benefiting leader is later found to have cheated the agency, the latter dutifully reports the fraud and communicates the name of the malevolent leader to the other members of the donor community. Before embezzling funds, a leader would thus be incited to think twice because by cheating today he would spoil his reputation for future interactions with the whole donor community. The multilateral reputation strategy can be shown to be an equilibrium strategy. That is, if a leader expects every donor agency to adopt such a strategy, his interest is to share the aid fund equitably among the intended project beneficiaries. Knowing that reaction, the interest of all aid agencies is to cling to the multilateral reputation strategy. Honest behaviour therefore gets established as a (Nash) equilibrium.

There are several problems with the multilateral reputation mechanism, however. The first one stems from the fact that the information conditions that must be fulfilled for it to work are extremely stringent: information must circulate perfectly between donor agencies. This is unlikely to be the case in reality, because they are in large numbers, scattered around the developed world, and very heterogeneous in terms of several key characteristics (size, ideology, methods, time horizon, etc.). These are hardly ideal conditions for a dense information network to exist.

Is the establishment of a private third party charged with centralizing information (as suggested, for example, in the Law Merchant system analyzed by Milgrom, North, and Weingast (1990) the solution to the problem caused by the costliness of generating and communicating information? Such a system can effectively work only if donors have an incentive to detect fraud and report

fraudulent experiences to the third party, so that the black list of dubious intermediaries in its hand is exhaustive and regularly updated (otherwise, donors would not be induced to consult it). Yet, in so far as the detection and reporting of a fraud once it has occurred entails costs but brings no benefits to the individual agency which has been cheated, such an incentive does not exist. Unless, of course, aid agencies are unambiguously altruistic so that they do not feel concerned about whether poverty is reduced by themselves or by another aid agency.

To create the adequate incentive, the third party should be able to exercise pressure on the detected fraudulent leader to return the stolen money. A provision that unless an aid agency makes appropriate queries with the third party about the reliability of its current partner, it will not be entitled to use the system to obtain compensation would also make it in the interest of donors to query about past dealings of the partner-leader considered before disbursing money. As a result, so the theory goes, the threat against potential leaders would be effective and, if caught, a fraudulent leader would be prompted to comply with the third party by returning the money stolen (so that his name is removed from the black list). Milgrom, North and Weingast have nevertheless shown that honesty will be established as a (symmetric sequential) equilibrium under the above mechanism only if a number of conditions are met, in particular, the cost of information query, the cost of appeal to the third party, and the cost for the latter to recover the stolen money from fraudulent local leaders ought not to be too high. Unfortunately, these assumptions are likely to be violated in the case under concern, especially because the headquarters of aid agencies are located at great distances from one another, and all kinds of information are costly to acquire, including evidence of fraud in the opaque context of alien cultural environments. The mechanism is therefore not self-enforcing.

A second, equally important problem lies in the fact that local leaders may not be actually concerned with preserving their reputation because their time horizon is short and they could be quite happy with running away with the money stolen from one single project. In other words, the payoff from dishonest behaviour is so large compared to the payoff from honest behaviour that honesty cannot be induced at equilibrium.

#### *Rating of aid agencies by ultimate fund purveyors*

Up until now, one key actor has been missing from our discussion, namely the ultimate purveyors of funds from which aid agencies obtain their financial resources. These ultimate fund-providers create a further link in the game, giving rise to a new space of strategic relationships. As far as disciplining of local leaders is concerned, their contribution may be positive or negative depending on the way they interact with aid agencies.

Bad prospects arise if donor agencies expect the ultimate purveyors of aid funds to react adversely to news of embezzlement, for instance, through revocation of funds. In such circumstances, an aid organization has no incentive to report the acts of malfeasance detected in its projects. In the words of Alnoor Ebrahim (2003: 818), evaluations that reward successes while punishing failures “encourage NGOs to exaggerate successes, while discouraging them from revealing and closely scrutinizing their mistakes”. What we have here is a genuine Prisoner’s Dilemma: an aid agency refrains from disclosing cases of embezzlement because it entertains the hope that other agencies would candidly reveal their own bad experiences, or because it fears that, should it convey the information, others might not have done it and would then exploit the situation to their own advantage. That the above risk is real is evident from the atmosphere of secrecy that surrounds the activities of many donor organizations, including NGOs. This atmosphere of secrecy is obviously detrimental to the effective functioning of a multilateral reputation mechanism such as discussed above.

On the contrary, ultimate fund-purveyors can play a positive role if their understanding of the complexity of CBD processes is sophisticated enough to make them aware of the inevitability of failures. Honest aid agencies which openly admit of cases of cheating would then not be unfairly sanctioned to the benefit of more opportunistic ones. They could even be induced to reveal embezzlement cases if the disbursement and monitoring procedures used by donor agencies, as well as the duration of their CBD projects, were used by fund-providers as a yardstick upon which ratings of these agencies are based. In this perspective, self-reported cases of fraud detection could be considered as indirect evidence of the effectiveness of monitoring activities rather than as signs of failure. Not only are such characteristics rather easy to observe, but they also offer the advantage of not creating perverse incentives for the rated agencies.

The same cannot be said of other, more conventional criteria used to evaluate the work of aid agencies. Resorting to measures of outputs, such as improvements in the levels of living of the poor inside the communities chosen, is an ideal procedure but is likely to be too costly to be feasible, especially in the case of NGOs with their typically diverse and long-term objectives (see Edwards and Hulme 1996; Ebrahim 2003). 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 need for a proper evaluation of aid agencies is all the more pressing as, side by side with serious agencies, there exist careless organizations that do not implement sequential disbursement mechanisms with a view to disciplining local leaders. Such organizations tend to disburse funds quickly either because they do not have a proper understanding of the one-period game being thus

played<sup>13</sup>, or because, in spite of all their pro-poor rhetoric, they are not single-mindedly pursuing the objective of poverty alleviation. Their presence further complicates the problem of ‘elite capture’ not only because it has the effect of increasing the exit options available to local intermediaries but also because it makes the establishment of a multilateral reputation mechanism among all donor agencies impossible. In fact, in the same way that “bad money chases good money”, the operation of these opportunistic aid agencies risks driving ‘good’ agencies out of business or, else, it will force them to relax or altogether give up their gradual and conditional disbursement procedures. Indeed, if offered the choice, local leaders will normally prefer to work with ‘bad’ agencies. And if the latter are numerous enough, ‘good’ agencies will not be able to attract partner communities unless they soften their approach to aid disbursement.

A crucial difficulty remains. As a matter of fact, it is easier for central funding bureaucracies (such as the European Community or the Cooperation administrations of national governments) than for the scattered contributors to fund-raising campaigns organized by NGOs, to use the sort of evaluations envisaged above and to condition their financial support on the results of these evaluations<sup>14</sup>. The crux of the problem lies in the fact that many donors in the general public have a poor understanding of development issues, partly as a result of distortions carried through the media and the deceiving messages conveyed by aid agencies themselves. There generally prevails the simplistic idea that failures in development projects are necessarily the outcome of incompetence and mismanagement on the part of the aid agency concerned, all the more so if many other agencies claim repeated successes.

Development aid is seen by many as a simple transfer of equipment and know how to those in need. The important role of institutional arrangements, power relations, and organizational learning tends to be underestimated. Therefore, failing projects are seen as an anomaly. Such a lack of proper understanding of the complexity of community-based development processes is actually worrying in so far as leakages about even a few cases of failure may

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<sup>13</sup> 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 or her degree of altruism as a result of the leader’s cunning ability to deceive them or of their own naivety.

<sup>14</sup> It could be argued that, of late, there has been a tendency among some aid agencies to organize collectively with a view to ensuring better conduct in the profession (Edwards and Hulme, 1996). Problems with such endeavours ought not to be underestimated, however. As a matter of fact, codes of conduct are typically statements about general principles that are not easily translated into operational guidelines and enforceable standards. It is hard to deny that lack of satisfactory evaluative mechanisms is a serious drawback when it comes to NGO accountability, and that indicators of the quality of their work are very rare, especially if their main aim is the empowerment of the poor (Edwards and Hulme, 1996: 11). This situation often arises because it is easier to agree on general ideas than to converge on strict and externally verifiable rules. And if a satisfactory agreement is eventually reached, it is most likely adopted by only a restricted number of operating agencies.

cause public opinion to easily swing from an attitude of general optimism to one of general pessimism and distrust in aid agencies. If that happens, all aid agencies will lose. To get out of this dangerous situation created by the versatility of public opinion, there is no other way than to educate the public about the real challenges and difficulties involved in CBD. Development education is clearly a public good. Aid agencies that free ride on this effort by claiming easy successes may undermine the work of the whole aid sector.

## 7. Relying on competition among local leaders?

Given the above-explained difficulties arising from the use of reputation mechanisms, whether bilateral or multilateral, can reliance on competition between local leaders provide a more satisfactory way of overcoming the elite capture problem? Understanding the interaction of competing local leaders (say,  $L_1$  and  $L_2$ ) actually 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 centered 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,  $\alpha_j$ , 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 a an offer,  $\alpha$ , 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  $dU^L/d\alpha \leq 0$ , which

implies, bearing (2) and (3) in mind, that  $f(Z, k)(1 - \alpha)^2 \left( \frac{X_2}{X_1 + X_2} \right) \leq 1/3$ . 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  $\alpha$  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  $\alpha_1 m_1 > \alpha_2 m_2$ , where  $\alpha_1$  and  $\alpha_2$  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  $\alpha_1 m_1 = \alpha_2 m_2$ , 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  $\alpha$  as high as 1, since being elected is always at least as good as being rejected. Consequently, the more competent leader must consider a bid  $\alpha_i^* = \alpha_j m_j / m_i = m_j / m_i$ , by the usual argument of Bertrand competition.

To summarize, if  $\alpha_i^*$  is strictly higher than the level of  $\alpha$  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  $\alpha_i^*$  and gets elected. On the other hand, if  $\alpha_i^*$  is smaller than the equilibrium level of  $\alpha$  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.,  $\alpha_i^*$  is played in equilibrium.

In the first-stage of the game,  $A$  anticipates that  $\alpha_i^*$  does not depend on the relative apportionment of funds between the two periods. It is not necessary to know the value of  $m_1$  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  $m_1$ . In the presence of leadership competition, therefore, the LDM may be dropped altogether. Since  $\alpha_i^*$  is a constant from  $A$ '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.

Such a 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  $A$ 's willingness to effectively reach  $G$ . 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 risk of collusion between them. If the candidates do effectively collude, the LDM becomes necessary again lest  $G$  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 possible 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– may undermine the case for relying on intra-elite competition as a way to protect the poor’s entitlement to external assistance. When the above dilemma does not exist, channeling aid through several local organizations or groupings which are potentially competing with each other may prove a more reliable or less costly solution to the elite capture problem than the LDM discussed in this paper.

## 8. Conclusion

When communities have well-established organizations where the poor are sufficiently empowered, the CBD approach is on safe grounds. The problem arises when local organizations do not exist or when they are dominated by strong elites driven by their peculiar interests. Unfortunately, this situation is more frequent than currently assumed by the proponents of CBD. Till the poor are sufficiently empowered to effectively participate in decision-making and claim their rightful dues, the elite capture problem must be somehow overcome if CBD is to prove more successful than the top-down approaches applied so far by many donor agencies. One realistic manner of addressing that problem is for donor agencies to follow sequential and conditional disbursement procedures so as to substitute for the poor’s lack of power in the target communities.

When the supply of CBD aid is rather scarce with the result that donor agencies find themselves in the position of local monopolies, such a solution may yield promising results in the sense that the share accruing to the poor at equilibrium will be sufficiently large. However, this will depend on various factors, including the effectiveness of fraud detection methods, the degree of impatience of donor agencies, and the transaction cost of relocating a CBD project when a local leader has been caught embezzling funds. The latter consideration points to a serious limitation of a conditional disbursement mechanism since populations located in remote areas, which tend to be the poorest, are then likely to be bypassed by aid agencies. As for the influence of

the agency's inter-temporal preferences, the implication is that rushing to help the poor is a self-defeating strategy.

When the supply of CBD aid is abundant, reaching the poor becomes more difficult because (monopolistic) competition between donor agencies causes the multiplication of exit options for fraudulent local leaders, increases the pressure to establish partnerships with communities quickly, and raises the cost of re-directing CBD funds. As a consequence, an increased supply of CBD aid is unlikely to be an unmixed blessing. On the one hand, it enlarges the number of communities that can be reached thanks to the multiplication of CBD aid operators and/or the expansion of their activities. Yet, on the other hand, it also causes the share appropriable by the poor to decline inasmuch as it results in more acute competition among such operators.

In the light of these findings, the present rush on CBD appears especially worrying, not because the approach is wrong (the opposite is actually the case), but because massive injections of aid funds in CBD projects, the entry into the field of numerous agencies with little or no experience in participatory development, as well as the pressing need for quick and visible results threaten to undermine its effectiveness for poverty alleviation. By disbursing significant amounts of money too rapidly, donor agencies enable local leaders to gain increasing legitimacy from interactions with the outside world rather than with 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 clearly 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.

If donor agencies could coordinate their actions in favour of CBD by creating a sort of multilateral information network, or if the ultimate purveyors of aid funds could reward donor agencies that have succeeded in developing effective mechanisms for money disbursement and fraud detection, the problem of elite capture could, in theory, be somehow surmounted even in the context of plentiful supply of CBD funds and numerous operating agencies. Unfortunately, such solutions are fraught by many practical difficulties. Relying on intra-community competition for leadership provides another attractive alternative for an effective implementation of CBD. But, here too, the balance of advantages and shortcomings is far from clear.

If CBD is not to become another magic formula that will fail to live up to expectations, it is therefore essential that the approach is followed in an experimental and gradual fashion, and that its impact on poverty reduction is systematically assessed before more drastic steps are taken. Moreover, working through local communities rather than through central governments does not dispense external agencies from the need to use conditional transfer

mechanisms, especially if effective multilateral sanction mechanisms are not in use.

## 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 :

$$d\left[\left(\frac{1-\mu}{3\nu}\right)\left(\frac{1+\alpha}{(1-\alpha)^3}\right)\right]/d\alpha = \left(\frac{1-\mu}{3\nu}\right)\left(\frac{2(2+\alpha)}{(1-\alpha)^4}\right) > 0$$

and

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

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

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

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:

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

## 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 :

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

The reaction function becomes :

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

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

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

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 :

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

The FOC with respect to  $N$  is :

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

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,  $\mu \leq 1$ ,  $d\alpha/dN$  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  $(1 - \mu)$ . 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 :

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

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

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 :

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

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

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

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

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

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

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  $d\alpha/dk$ , denoted by  $J_1$ . After some algebraic manipulations, we get the following expression:

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

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 :

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

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  $d\alpha/dk > 0$ .

Let us now calculate the second comparative-static derivative :

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

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

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

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

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

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

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

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