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The Impact of Media and Monitoring on Corruption in Decentralized Public Programs:

Evidence from Madagascar

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Abstract

This paper investigates the role of media and monitoring in reducing corruption. We analyze data on capture of public expenditures by local officials in Madagascar. Our findings indicate important constraints on decentralization of public service delivery, in particular in remote areas. Corruption can be successfully constrained through a combination of media programs and monitoring. Intensive monitoring and access to media reduce capture. However, the impact of media is conditional on characteristics of the population. With high illiteracy in poor regions, the effectiveness of newspaper and poster campaigns is limited, and radio and television programs are more important to reduce capture.

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1.   Introduction

Corruption and poverty are strongly related. Corruption reduces growth (e.g., Mauro, 1995; Shleifer and Vishny, 1993) while corruption itself reduces with income and education (e.g., Glaeser *et al.*, 2004; Glaeser and Saks, 2004). Recently, the importance of limiting corruption to reduce poverty has been emphasized; among other things to improve the efficiency of public service delivery programs.[1] In a well-documented study, Reinikka and Svensson (2004a) find that in the early 1990s in Uganda only 13 percent of non-wage public expenditures on primary education actually reached the primary schools. The bulk of the public grants was captured by local government officials and politicians who were supposed to disburse the funds to the local schools. Similar analyses for other African countries, including Tanzania, Ghana, and Zambia, confirm that local capture is a serious problem in educational programs as between 50% and 75% of non-wage funds were diverted (Reinikka and Svensson, 2004a).

These findings suggest that anticorruption programs should be a crucial part of poverty reduction strategies as to increase the efficiency of public spending on services for the poor. Fighting corruption of local officials and politicians can be done in a variety of ways (Stapenhurst and Kpundeh, 1999). However, some of the more standard approaches may not be effective. Some argue that the reliance on legal institutions, such as the policy and the judiciary, may be ineffective, as these institutions themselves tend to be corrupt in countries

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[1] The 2004 World Development Report emphasizes the importance of "making services work for poor people" in achieving the Millennium Development Goals. Developing countries typically spend little of their government budgets on education, health and infrastructure services that poor people need. Furthermore, even when public spending is earmarked for poor people, for example by allocating funds for the poor's primary education and health care, the money does not always reach the frontline service providers.

characterized by extensive capture of public funds (e.g., Klitgaard and Baser, 1998; Ahrend, 2002). An alternative approach, analyzed by Reinikka and Svensson (2004a,b), is to rely on monitoring by the beneficiaries of the services. Increasing the information flow on the disbursement of public funds to the intended beneficiaries is expected to empower citizens at the bottom of the service delivery chain in their interactions with local officials and politicians and, thereby, to increase pressure on them to pass on the funds.

The media can play an important role in this process. In general, Besley and Burgess (2001, 2002) show that an electorate better informed by mass media strengthens incentives for a government to be responsive. In their analysis, newspaper circulation plays a substantial role in increasing political accountability. Strömberg (2004a,b) shows how radio access influences redistributive programs. Djankov *et al.* (2003) conclude that government ownership of the media is generally associated with less press freedom, fewer political and economic rights and inferior social outcomes in the areas of education and health. Drèze and Sen (1990) state that India, which has a free media, has avoided famines more successfully than China, which lacks free media. Mazharul and Saidul (2000) show that radio and television are two important mass media for disseminating family planning information in Bangladesh. Stapenhurst (2000) and Ahrend (2002) find evidence that a lack of press freedom leads to higher levels of corruption. More specifically, Reinikka and Svensson (2004b) find that in Uganda a newspaper campaign to boost citizens' awareness of public spending on educational programs had a dramatic effect in reducing local capture, and that proximity to newspaper outlets was positively related to schools' reception of public funds, consistent with a positive impact of the media.

In this paper we analyze the impact of the media on local capture of public expenditures on education in Madagascar. Our analysis is based on data collected in a budget tracking survey in 2002-2003. The survey measured the extent to which public spending on

education reached the local schools. We compare cash flows from the central government to 24 decentralized district facility levels and from these district levels to 185 public primary schools. This unique dataset allows us to study the level and determinants of local capture.

Our study contributes to the literature in the following ways. First, the analysis shows that corruption in public programs can be successfully constrained. We find that a large share of the funds arrived at the school level in the 2002-2003 program in Madagascar. While there was a significant delay, 98% of the total budget allocated by the central government arrived at district level and 90% of the total sum of intended grants mentioned by all district officers arrived at school level. Still, in one fifth of the schools the amount received did not correspond with the amount declared as sent by the district facility. Anecdotal evidence suggests that the diverted funds were used for purposes unrelated to education or for private gain of local district officials.

Second, we show that the media can have an important impact on corruption, but that the impact of the media is conditional upon characteristics of the population. Our analysis confirms the impact of mass media on reducing corruption. However, we find that the impact is conditional on characteristics of the population. When many poor are illiterate, the impact of newspaper and poster campaigns is limited, and radio and television are more important media tools. Moreover, we find that the impact of local radio and television access on reducing capture is more important when illiteracy is more widespread.

Third, while Reinikka and Svensson (2004a,b) focus their attention on the role of monitoring by the beneficiaries (i.e. monitoring "from below"), we also analyze the importance of monitoring "from above", i.e. by the central agencies, which are implementing the public policy. We find that monitoring from above – which is measured by distance from the centre – also has a strong impact on capture. Our findings also provide evidence of the

importance of "remoteness" or geographical isolation in development, an issue emphasized in contributions by e.g. Krugman (1991) and Gallup *et al.* (1998).[2]

Finally, our findings taken together have implications for the debate on decentralization of public service delivery in developing countries (e.g., Bardhan and Mookherjee, 1999, 2000, 2006; Faguet, 2000; Fisman and Gatti, 2002; King and Özler, 2002). In Madagascar, public services are heavily concentrated at the central level with about 88% of expenditures executed at that level (World Bank, 2004). However, the sector of education is more decentralized than others, with 55% of recurrent expenditures allocated to the provincial and district levels. Besides, the government – with the support of several international donors[3] – increasingly relies on decentralized interventions and entities to improve educational services. A key institutional player in this respect is the district facility level. Our findings indicate important constraints on decentralization of public service delivery, in particular in the most remote areas.

The paper is organized as follows. The policy framework is described in Section 2. Section 3 provides information on the monitoring policy in the education sector of Madagascar and focuses in particular on the role of the mass media as a monitoring tool. Section 4 describes the methodology used to measure capture and its determinants. The conceptual and empirical models are depicted in Section 5 and 6 respectively. Section 7 presents the econometric estimation results and Section 8 concludes the paper.

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[2] They show that geographical isolation implies large welfare costs. Krugman (1991) addresses the relationship between geography and international trade. Gallup *et al.* (1998) investigate the ways in which location may have a direct impact on growth. Fafchamps and Shilpi (2003) find that geographical isolation significantly reduces subjective welfare. Fafchamps and Moser (2003) and Fafchamps and Minten (2006) show that remoteness is positively correlated with crime in Madagascar.
[3] E.g. the World Bank, the Swiss Agency for Development and Cooperation (SDC) and the Agence Française de Développement (AFD).

2.   The Policy Framework

Following a series of institutional reforms that started in 1995, the education ministry is today the most decentralized government service in Madagascar with three different levels of governance (World Bank, 2005). First, the central authority is the Ministry of Education (MINESEB[4]) which is located in the capital, Antananarivo. Second, each of the six provinces of Madagascar has its own education administration (DIRESEB[5]). Their main task is to regulate, supervise and design policies for the sector. However, in practice the central level retains major delivery functions and DIRESEB officials cannot alter budget or material allocations. Third, there are 111 districts (also referred to as "regions" or "*fivondronana*") and 1392 communes (or communities).[6] Each district has a district education office (CISCO – *Circonscription Scolaire*), which is responsible for the distribution of money and material to the public primary schools situated in the communes of their district.

Madagascar has low school enrolment rates, even by African standards (e.g., Glick *et al*., 2000; Razafindravonona *et al*., 2001; Larson *et al*., 2006). According to a recent World Bank (2002) study, only 60% of the urban children completed primary school. In rural areas, where most people live, the rate is even much lower as only 12% of children in rural areas completed primary school.[7]

In the aftermath of a political crisis in 2002, the new government, in collaboration with the donor community, decided to introduce a significant public investment program in education to increase enrolment in schooling. The new government decided to use part of the Heavily Indebted Poor Countries (HIPC) Initiative funds to pay the tuition fee of all students

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[4] MINESEB = Ministère de l'Education Secondaire et de l'Education de Base
[5] DIRESEB = Direction Provincial de l'Education Secondaire et de l'Education de Base
[6] Hence, on average there are 18 districts per province and 13 communes per district.
[7] In 2002, education, like all public services, was further negatively affected by a dispute on the outcome of presidential elections in December 2001, which threw Madagascar into a political and economic crisis. General strikes and roadblocks hit the economy and halted social service delivery in the country. The crisis was resolved in June 2002, but the impact was severe. Regarding education, a significant number of parents were unable to pay for schooling and health costs after the political crisis (Cornell University, 2003).

in public primary schools. For every registered student, schools would receive 15,000 Francs Malagasy (FMg) in the capital city, Antananarivo, and 10,000 FMg in the rest of the country.[8]

This program importantly changed the financing of public education in Madagascar. The financing traditionally had three components. First, the government pays the salaries of most teachers, which makes up a large share of the total expenditures. Second, the government finances school equipment by providing a credit line to the district education offices (CISCOs). The latter then distribute the school equipment in-kind to the schools. The CISCOs in principle do not pay salaries, but they are able to hire some teachers on their credit line for school equipment if they want to allocate extra teachers to some schools. Third, all additional expenditures of the schools were covered by tuition fees paid by the parents of the students. The tuition fees were set and collected by parents-teachers associations (FRAM[9]), which therefore paid almost all the non-salary school expenses. In addition, the FRAM also hired extra teachers if necessary. During the school year 2001-2002, 11% of the total number of teachers was hired by the FRAM as contractual workers with no social schemes (Francken, 2003).

The objective of the new government policy was to replace most of the tuition fees by government grants. The HIPC payments were introduced as a per student grant and were allocated only to public schools. Later, an additional budget ("CRESED", financed by a World Bank education project) was introduced, which was organized similarly but which provided funding to both public and private schools.[10] Officially, the implementation of the HIPC program started in August 2002, at the beginning of the school year 2002-2003. Cash

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[8] In 2002, 15,000 FMg amounted to approximately 2 USD and 10,000 FMg to 1,5 USD.
[9] FRAM = 'Fikambanan'ny Ray-Amandrenin'ny Mpianatra'
[10] After the implementation of both programs, parent contributions fell on average to around 20% of non-salary expenditures, while the HIPC government payments make up around 30% and CRESED payments around 40%. The remaining part of the budget mainly comes from community-based initiatives, often supported by non-governmental donor organizations (World Bank, 2004).

funds were transferred from the central government to the districts (CISCOs) and district officials were to transfer the payments to the public primary schools.[11]

The analysis here concentrates on local capture of the HIPC payments during the academic year 2002-2003. The HIPC payments were an entirely new policy and the surveys used in this paper were implemented to measure to what extent funds arrived at the intended beneficiaries. The CRESED payments were implemented later -- too late to be captured by the survey.

3. Monitoring and the Media

In order to ensure that the HIPC funds would actually arrive at the school level and to prevent capture of the funds along the chain, the central government, with strong pressure from the donors, put several accompanying measures in place.

First, it sent letters to the district facilities and the schools explaining the new policy and required the CISCOs and the schools to post in a public place the amount of money received. However, although posting of the amount of grants received was a necessary condition to receive funds, our survey showed that only 29% of the schools actually did so.[12]

Second, monitoring from the central level was reinforced, reflecting a new emphasis by donors and the new government on good governance. One part of the monitoring was audits and controls at the district level. Based on our interviews and anecdotal evidence it appears that the monitoring and inspections, and their effect, varied strongly across districts. In general, inspections and monitoring were imperfect and even in case of problems sanctions were rare. This left the opportunity for capture at the district level without being detected and sentenced.

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[11] In theory, the education administration at district level is supported by local agents of the 'Zones Administratives Pédagogiques' (ZAP), who cover almost all primary schools within one Commune. The agents should distribute the cash funds to the schools of their Commune. Although, in practice, their function is mainly administrative and the schools acquire the grants directly from the CISCOs.

[12] Data on posting at CISCO level are not available.

Third, transfer of the payments to the schools was conditional upon submission of a budget plan from the schools. A newly created institution, the *Fiarahana ombon'antoka ho Fampandrosoana ny Sekolo* (FAF), which was made up of parents of current and former students, of the director of the school, and of other people of the region, needed to present a work plan in which it explained the use of the funds. Further, before getting the grants, the schools had to provide the number of children at their schools as the payments were to be allocated as per student grants. When the student numbers were aggregated at the central level, the program turned out to be under-funded, and the amount of funds was adjusted, albeit limited. This, however, created some uncertainty on how much schools were to receive.

Fourth, since the mail distribution system is slow in Madagascar, the policy was also announced and explained via the mass media. The mass media campaign was to stimulate monitoring from the intended recipients of the education funds, i.e. the local schools and parents. The media campaign included newspapers, radios, and TV. The information on the abolishment of the public school tuition fee was reported widely in the media and broadcasted on national and local radios and TV.

Finally, after the elections, the new government replaced many district officials as part of the transformation of the bureaucracy. While the objective of the replacement of officials was not specifically linked to the education programs, these changes could have had an impact (see further).

4.   Measuring Capture and Its Determinants

Our analysis quantifies capture of the HIPC cash contributions in the supply chain of the education sector of Madagascar. First, we look at discrepancies between the HIPC funds recorded as sent by the central government and as received by the district facility levels.

Second, we investigate differences between HIPC grants at the district levels and the schools. Finally, we calculate indicators for a series of explanatory variables.

4.1. Data

We use three different sets of data sources. First, during the last semester of 2001, the Ilo program of Cornell University in collaboration with the National Agricultural Research Centre of Madagascar (FOFIFA), conducted a countrywide commune survey, which included 1385 communes, i.e. 99% of all communes in Madagascar. The goal of the survey was to collect detailed information at the communal level on various demographic, social and economic issues, including access to public goods and services.

Second, to evaluate the socio-economic situation after the 2002 crisis, the National Statistical Institute (INSTAT) in cooperation with FOFIFA and the Cornell Ilo program, organized a survey in 150 communes[13] at the end of 2002. The major purpose of the survey was to evaluate the impact of the crisis on economic activities and social service delivery. The stratified sampling frame was designed to be representative at the national and provincial level. Districts were divided in six strata depending on the distance to the capital of the province (close, medium, far) and on the availability of a tarred road. In each stratum, one district was selected for every province. In each district (36 out of 111 in total), four communes were selected randomly.

In each commune, two public primary schools were surveyed: one in the centre of the commune and one remote school that was at least 3 km away from the centre. Given the size of the population in cities, these were treated differently. In Antananarivo, the nation's capital, 12 public primary schools were surveyed. In each provincial capital, six public

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[13] Out of 1392 Communes in total, i.e. more than 10% of the Communes.

primary schools were visited. The survey covered 326 schools in total, of which 85% were in rural areas; 15% were in urban areas.

Third, to collect specific information on the money flows of the public education programs, we organized a budget tracking survey at government, district facility, and school level in April/May 2003. The purpose of the survey was to provide nationally representative data on budget allocations and leakages in the education sector of Madagascar, more specifically in the context of the new educational policy. To ensure compatibility, the surveys on government, district and school level were held at the same time. In this new survey, more than half of the schools included in the post-crisis survey were revisited. The survey was conducted in the whole of Madagascar. In each province, four districts and 13 communes were surveyed - see Annex I for a map with details. In total, 24 districts (more than 20% of the total) and 185 public primary schools were surveyed, of which 73% were located in rural areas. After data checking and testing, we ended up with reliable data on 176 schools.

4.2. Measuring capture

Following Reinikka and Svensson (2004a), we calculated the following indicator of capture, c^i;

$$c^i = 1 - \frac{\text{funds received by agent}_i}{\text{funds from agent}_{i-1} \text{ intended for agent}_i} \qquad (1)$$

where agent_{i-1} is the organization higher up the chain (e.g. district level) from agent_i (e.g. school level). An indicator of 1 indicates full capture; 0 means no leakage. Using this indicator, we calculated capture at each district and at each school.

As it was difficult to verify the exact amount of funds that left and arrived at district and at school level, we tried to collect as much physical evidence as possible (bank statements, signed receipts etc.) to quantify the gaps between district facility levels and

schools. In the case where this was not possible, our enumerators based themselves on the amounts reported as sent and received at both levels.

Theoretically, the intended cash funds from the centre/district facility level should be the product of the number of students in the public primary school and the HIPC contribution per student. However, in reality this was often not the case, as the records of the number of students at the central level were not updated. Before the crisis, children did have to possess a birth certificate to be accepted in public schools. This condition was annulated in a significant number of schools post-crisis or alternatively, communes made sure that enough copies were available to ascertain that more children could go to school. Consequently, the real growth in enrolment at the school level was considerably different from the central government statistics. Therefore, we measured the amount of intended funds for school$_i$ by the amount recorded as sent to school$_i$ in the district's accounts.

The accounting at school level is generally accurate, as the schools have no clear incentives to misreport their resources. The schools are subject to the supervision of the parents-teachers association and the accounting is not the basis for any type of funding and it is not submitted to any district or central authority.[14] Our interviews and anecdotal evidence indicate that there is very little incentive and possibility for potentially corrupt school directors to embezzle part of the school funds. In contrast, our interviews confirmed that significant capture existed at the district level.

4.3. Results

Our empirical analysis shows that there was almost no capture at the central level. By April 2003, the divergence between the HIPC cash grants recorded as sent by the central authorities and as received by the district facility levels was very low: 98% of the funds

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[14] The situation in Madagascar is similar to the situation in Uganda as described in Reinikka & Svensson (2004a).

arrived at district level. Based on our interviews, it appears that (a) the small gap mainly reflects minor accounting errors at the government or district level, rather than capture, and (b) that monitoring played an important role. Capture of funds at the central level was very difficult as the Ministry of Education was subject to relatively detailed inspections and pre-audit procedures.

This intensive level of monitoring reflected the new emphasis on good governance by both donors and the new government. First, the new president made the fight against corruption one of his policy priorities.[15] Second, an important part of the Poverty Reduction Strategy Paper (PRSP) of Madagascar deals with issues related to good governance. This was also implemented in practice: during the school year 2002-2003, the World Bank – together with the rest of the donor community – organized four audits at the Ministry of Education. The results are described in the 'Aide-Mémoires' (World Bank, 2003).

However, despite this new governance strategy and intensive monitoring, there was still significant local capture at the district level and strong variation in capture between districts.[16] The degree of capture of HIPC cash funds at the district level is summarized in Table 1. Overall, 20% of the public primary schools visited (i.e. 36 schools) recorded to have received less than the district officer noted as sent.[17]

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[15] The official presidential elections took place in December 2001. The presidential candidate, Marc Ravalomanana, won a majority of votes, but as the incumbent did not want to step down, the country was ruled by two presidents during a period of six months. The low popularity of the former president, Didier Ratsiraka, who was the single largest figure in Malagasy politics from 1975 to 1992 and under whose rule there were some obvious cases of presidential nepotism (Marcus, 2004), and the strong desire for a new leader put Ravalomanana in office in June 2002.

[16] Furthermore, in most places it took considerable time for the funds to arrive. The Cornell Ilo survey at the end of 2002, three months after the start of the new policy, found that only 40% of the public schools had received the funds; 60% had not yet received anything.

[17] In those cases where the stated discrepancy was smaller than 1 US Dollar, we considered the deviations as reporting errors rather than theft. In a country where 71% of the population lives below the poverty line and where the average daily wage of a teacher (paid by the parents-teachers association) in the poorest areas equals half a dollar a day, we believe this amount is a reasonable lower limit of corruption. Moreover, we believe that this absolute lower limit is more accurate than considering a relative divergence smaller or equal to 1% of the total funds as measurement error as in this case we would ignore substantial capture in five schools (where the relative percentage missing was approximately 1%). The discrepancy was only smaller than 1 US Dollar in one percentage of the total sample of schools. There were no reports of schools getting more funding than allocated.

For the schools with capture, the average difference amounts to 35% of the intended HIPC contribution. The data show strong provincial differences. Toliara, in contrast to Antananarivo, seems to be the worst performer as on average 15% of the cash grants meant for the public primary schools disappeared.

Table 1 also shows leakage of HIPC cash funds measured as a dummy variable. The variable equals one if there is an inconsistency between the district and school records concerning the distribution of HIPC grants; and zero otherwise. Although the province of Fianarantsoa does not show a high degree of capture, still 37% of the schools received less than they should have received.

In the following sections we first develop a series of hypotheses on the determinants of capture and afterwards a formal econometric analysis.

5.   Theory and Hypotheses

Consider a service delivery chain made up of consecutive agents, with agent 0 at the central level (starting point), and agent I at the local school (end point). Take agent i at some point in the service delivery chain (and $0 \leq i \leq I$). Agent i is monitored from above by agent i-1, and from below by agent i+1. We assume that agent i is an expected rent (π^i) maximizer. S/he will try to extract as much of the public funds as possible for private gains, taking into account possible penalties if s/he gets caught. Formally, agent i maximizes:

$$\text{Max}_{c^i} \pi^i(c^i) = c^i (1 - \alpha^i) - \alpha^i q^i \tag{2}$$

where c^i represents capture, measured as a share ($0 \leq c^i \leq 1$) of the total funds s/he handles[18], α^i is the probability of getting caught, and q^i is the effective penalty agent i has to pay if s/he

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[18] To start, we ignore variations in the funds handled by agents. This assumption is not crucial for our results and can be easily changed. We started with this assumption since our main focus is on the monitoring and information issue. Besides, in the empirical analysis we focus on cross-district variations in funds and capture –

gets caught. We assume that the risk of getting caught is a positive and convex function of the degree of capture, so:

$$\alpha^i = \alpha^i(c^i) \qquad \text{with} \quad \partial\alpha^i/\partial c^i > 0 \quad \text{and} \quad \partial^2\alpha^i/\partial c^{i2} > 0 \qquad (3)$$

Maximizing (2) and taking into account (3) yields the following Kuhn-Tucker conditions:

$$\partial\pi^i(c^{i*})/\partial c^i = (1-\alpha^i) - \alpha_c^i.(c^{i*}+q^i) \quad < 0 \qquad \text{and} \quad c^i = 0$$

$$\partial\pi^i(c^{i*})/\partial c^i = (1-\alpha^i) - \alpha_c^i.(c^{i*}+q^i) \quad = 0 \qquad \text{and} \quad 0 < c^i < 1 \qquad (4)$$

$$\partial\pi^i(c^{i*})/\partial c^i = (1-\alpha^i) - \alpha_c^i.(c^{i*}+q^i) \quad > 0 \qquad \text{and} \quad c^i = 1$$

With $0 < c^{i*} < 1$ (i.e. with an interior solution), at the optimal level of capture, the marginal benefits of increasing capture $(1-\alpha^i)$, equal the marginal costs for agent i, $\alpha_c^i.(c^{i*}+q^i)$.

However, the risk of getting caught is not only dependent on the degree of capture, but also on a set of exogenous variables which influence the cost of information, monitoring, etc., and hence the likelihood for agent i of getting caught. We define z^i as a vector of these exogenous variables (and we will discuss the variables in more detail later). Consequently, we can write that:

$$\alpha^i = \alpha^i(c^i, z^i) \qquad (5)$$

With an interior solution, we can then derive the impact of z^i on the optimal level of capture c^{i*}:

$$\frac{\partial c^{i*}}{\partial z^i} = -\frac{\alpha_z^i \alpha_c^i + (1-\alpha^i)\alpha_{cz}^i}{2\alpha_c^{i2} + (1-\alpha^i)\alpha_{cc}^i} \qquad (6)$$

where subscripts represent first derivatives and double subscripts represent second derivatives. We assume that the exogenous variables, affecting the cost of information, monitoring, etc. affect α^i directly (hence $\alpha_z^i \neq 0$), but do not affect the marginal effect of

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which eliminate the main source of fund size variations between stages in the chain. Furthermore, we control for variations in school (and thus funding) size through control variables in the empirical analysis.

capture on the probability of getting caught ($\partial\alpha_c^i / \partial z^i = \alpha_{cz}^i = 0$).[19] Under these assumptions, it follows that the sign of $\partial c^{i*}/\partial z^i$ is determined by the sign of α_z^i: with $\alpha_z^i > 0$, $\partial c^{i*}/\partial z^i < 0$, and vice versa. We will now discuss the effect of the z-variables more specifically.

First, define m_j^i as the <u>direct monitoring cost</u> of agent i by agent j. This cost includes the cost for agent j to inspect agent i (e.g. travel cost, opportunity cost of time etc.). With higher monitoring costs for agent j, the likelihood for agent i of getting caught decreases. Hence $\partial\alpha^i/\partial m_{i-1}^i < 0$ and $\partial\alpha^i/\partial m_{i+1}^i < 0$, and consequently, as we derived earlier, the signs of these terms determine the sign of $\partial c^{i*}/\partial m_j^i$. Hence our first set of hypotheses is that the optimal level of capture increases with the monitoring costs of the agents above and below in the service delivery chain: $\partial c^{i*}/\partial m_{i-1}^i > 0$ and $\partial c^{i*}/\partial m_{i+1}^i > 0$.

Second, define k_{i+1}^i as the <u>cost</u> for agent i+1 <u>to obtain information</u> on the services and funds which should be delivered by agent i. With higher information costs for agent i+1, the likelihood for agent i of getting caught decreases. Hence $\partial\alpha^i/\partial k_{i+1}^i < 0$, and our second hypothesis is that the optimal level of capture increases with the information costs of the agent below in the service delivery chain, so $\partial c^{i*}/\partial k_{i+1}^i > 0$.

Notice that these "information costs" can be caused/affected by structural characteristics of both the supply of information and of the consumption of information. We will return to this issue in the next section when we discuss indicator variables.

Third, define v^i as the <u>quality and effectiveness of the local justice system</u> in which agent i operates. As we will document later, this varies considerably between different

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[19] There is no evidence strongly suggesting otherwise; and even a less constraining assumption (e.g. like α_{cz}^i being small compared to α_z^i) would be sufficient.

regions in Madagascar. With a more effective local justice system the likelihood for agent i of getting caught if s/he captures public funds, will increase and thus $\partial \alpha^i/\partial v^i > 0$. Consequently, our third hypothesis is that the optimal level of capture will decrease with the quality of the local justice system ($\partial c^{i*}/\partial v^i < 0$).

Fourth, our other hypotheses have to do with the impact of <u>human and social capital</u>. The impact of these capital variables will differ along the service delivery chain. Define h^i as the human capital and s^i as the social capital of agent i. Human capital is typically positively related to entrepreneurship and skills in various activities. Therefore we can expect that an agent i with more human capital will be more able to avoid detection in capturing funds, e.g. by using more sophisticated methods. This would imply that $\partial \alpha^i/\partial h^i < 0$, and hence that $\partial c^{i*}/\partial h^i > 0$: the level of capture will increase with the human capital of agent i.

For similar reasons, the effect of more human capital of agents at different levels in the chain will be the opposite. More human capital endowments of agents above and below in the service delivery chain will increase the effectiveness of their monitoring and the likelihood for agent i to be caught. This implies that $\partial \alpha^i/\partial h^{i-1} > 0$ and $\partial \alpha^i/\partial h^{i+1} > 0$ and hence that $\partial c^{i*}/\partial h^{i-1} < 0$ and $\partial c^{i*}/\partial h^{i+1} < 0$: the level of capture will decrease with higher human capital of the agents above and below in the service delivery chain.

Social capital will allow agents to use their social networks either to avoid being caught or to help monitoring and prevent capture. For example, if agent i belongs to a local elite s/he may receive protection and assistance from this network when attempting to divert funds. Consequently, the chances of getting caught will be lower ($\partial \alpha^i/\partial s^i < 0$) and the optimal level of capture of agent i will increase with his social capital ($\partial c^{i*}/\partial s^i > 0$). This hypothesis is consistent with findings that local elites divert services to themselves, at the

expense of non-elites (e.g., Rubio, 1997; Bardhan and Mookherjee, 1999, 2000, 2006; Warren, 2004). On the other hand, the probability for agent i to be caught with capture will increase if agents above and below in the service delivery chain can rely on social networks to assist them in monitoring agent i. This implies that $\partial\alpha^i/\partial s^{i-1} > 0$ and $\partial\alpha^i/\partial s^{i+1} > 0$ and consequently that $\partial c^{i*}/\partial s^{i-1} < 0$ and $\partial c^{i*}/\partial s^{i+1} < 0$: the level of capture will decrease with the social capital of agent i-1 and agent i+1.

6. Empirical Model

To complement our insights and to econometrically quantify the determinants of leakage of cash funds, we estimate a model with the following structure,

$$c^i = f(m^i_j, \ k^i_{i+1}, \ v^i, h^{ij}, s^{ij}, \lambda, \eta) + \varepsilon_{ij} \tag{7}$$

where c^i represents capture as the dependant variable, and ε_{ij} is an error term. Our dependent variable is a school-specific measure. Furthermore, the model identifies seven explanatory variables m^i_j, k^i_{i+1}, v^i, h^{ij}, s^{ij}, λ and η.

The first explanatory variable is m^i_j, the monitoring cost. We use two specific measures to proxy for this variable. First, *district_capital* measures the distance (in kilometers) from the district facility level to Antananarivo, the nation's capital. Second, *district_school* measures the distance (in kilometers) from the district facility level to the public primary school. Given the general lack of infrastructure and means of transport in Madagascar, this variable is a valid measure of the geographical isolation of the district facilities. Less remote districts, i.e. compared to the agents above − the central education authorities − or below − the schools − in the service delivery chain, will be more easily accessible by the respective agents and thus imply lower inspection costs. Consequently, it is

expected that smaller distances to the districts from inspecting agents above or below in the education chain will lower capture at district level.

The second explanatory variable measures the information cost k_{i+1}^{i}. Several recent studies (e.g., Reinikka and Svensson, 2004a,b) show the importance of local, independent media as a tool to decrease information costs. We consider the three main sources of mass media communication in Madagascar: radio, television and newspapers. First, we use the number of local (private) radio stations (*radio*) – i.e. the number of private radio stations that the community members report they can receive clearly – as our key proxy for media. Based on the results from our field research (see further), this measure is the most important instrument to capture and quantify media access as radios play an important role in Madagascar. They are the main source of mass media communication, especially in rural areas. The National Household Survey of 1997 (INSTAT, 1997) showed that a high 45% of all households are in the possession of a radio and according to the Commune Census of 2001 (Cornell University, 2001) approximately half of all communes (48%) have access to a local radio. We only take into account the private radio stations because while in theory the government's Radio National Malagasy (RNM) broadcasts nationwide, in reality this is not the case. During our field interviews, we discovered that many rural communes do not receive any public radio signal at all or in case they do, the broadcasting is unclear.[20]

Second, we will measure the impact of the number of regional (private) television stations (*television*) – i.e. the number of private television stations that the community members report they can receive clearly – on capture. According to the Commune Census of 2001 (Cornell University, 2001) 18% of all communes have access to regional television.

Third, the number of newspapers (*newspapers*) – i.e. the number of newspapers that the community members report they can obtain in the commune – is used as our last proxy for

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[20] Unfortunately, there are no reliable data on effective access to the public radio broadcasting.

media. According to a recent study of Andriantsoa *et al.* (2005) only 6% of the Malagasy population reads a newspaper. Newspaper circulation is concentrated mostly in urban areas, and few newspapers are available in remote and rural areas. Moreover, many people are illiterate in these areas.

Fourth, by using the number of media outlets – and not just access to media – as our benchmark, we take other important factors into account, as for example, schools may be informed about the new educational policy through other people with media access and the access of schools to mass media can fluctuate.[21]

The costs of information not only depend on the supply of information, e.g. through media, but also on the ability of people to process the information. In particular, local radio and television stations are more important tools to reduce capture in less educated areas as the population has less human capital to obtain information from other sources. To measure whether the impact of local media on capture is conditional upon the characteristics of the population, in particular upon the literacy rate in the commune, we include interaction terms of the media variables with the degree of literacy in the commune (*radio*literacy* and *television*literacy*).

The quality and effectiveness of the local justice system (v^i) is measured by a dummy variable (*red_district*) with value one if the district is officially a red or highly unsafe district (i.e. a district where more than 50% of the communes suffer from an extremely high insecurity level); and zero otherwise. These red districts are insecure due to the presence of organized crime organizations (as the Dahalo[22]), which is a good indication of the lack of a well functioning judicial system.

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[21] Partly because of the variation in how often the head teacher has access to a newspaper, Reinikka and Svensson (2004b) use the proximity to a newspaper outlet as an instrument for the exposure to the media campaign.
[22] The 'Dahalo' is a well-known crime organization in Madagascar that is specialized in large-scale zebu theft.

Human capital (h^{ij}) of the different agents in the service delivery chain will affect capture. We expect higher educated district leaders to capture funds in a more sophisticated manner and hence experience a lower risk of detection. We define human capital at district level (h^i) as a categorical variable measuring the education level of the district director (*educ_district*). On the other hand, higher educated agents (above and) below in the service delivery chain will experience a lower monitoring cost as their capability to obtain information will be higher. Our measure of human capital at school level (h^j) is the quality of the parents-teachers associations' leadership, defined as the degree of literacy in the commune (*literacy*).

The impact of social capital (s^{ij}) on capture will also vary by agent. A district officer who is born in the district where he operates, has more informal connections than a newcomer. While his social capital could be an incentive to him to perform well (e.g., Putnam, 1993; Esping-Andersen, 1994), our approach accommodates the opposite concern that local elites seek to divert services to themselves, at the expense of non-elites (e.g., Rubio, 1997; Bardhan and Mookherjee, 1999, 2000, 2006; Warren, 2004). Our proxy for social capital at district level (s^j) is the origin of the district leader (*origin_district*), defined as a dummy variable that is equal to one if the district head is born in the district where he operates; and zero otherwise.

Finally, different control variables (λ) are included in the regression. According to the theory of Reinikka and Svensson (2004a), the bargaining power of the school vis-à-vis the district officer will depend on her size. First, we use the relative school size (*schoolsize*), quantified by the size of the public primary school as a percentage of the total size of all primary schools, public as well as private, in the district, as our measure.[23] Second, the dummy variable of cyclical droughts (*drought*) equals one if the commune was hit by two or

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[23] Because the district officer is responsible for the distribution of the HIPC as well as the CRESED funds and the latter are also donated to private primary schools, we believe this variable will give us the most accurate measure of the school's bargaining power.

more droughts, i.e. heavy income chocks, during the last four years (1998/2002).[24] Parents who have to deal with cyclical shocks will care more about their family's instant needs then about education, so we expect this variable to have a positive impact on capture. Third, after the elections, the new government replaced many district officials as part of the reorganization of the bureaucracy. While the objective of the replacement of officials was not specifically linked to the education programs, it might be that these changes had an impact on capture. We measure the impact of the new representation on capture using a dummy variable (*new_district*) with value one if the district director is new in his position from the beginning or during the school year 2002/2003, i.e. after the appointment of the new president; and zero otherwise. Fourth, five regional dummies – corresponding with the provinces Antananarivo, Toamasina, Mahajanga, Toliara and Antsiranana – are included to capture additional fixed effects (η). The reference region is Fianarantsoa.

In short, our complete empirical model looks as follows (8),

$$c^i = \beta_0 + \beta_1\,district\_capital + \beta_2\,district\_school + \beta_3\,radio + \beta_4\,television + \beta_5\,newspapers$$
$$+ \beta_6\,radio*literacy + \beta_7\,television*literacy + \beta_8\,red\_district + \beta_9\,educ\_district + \beta_{10}\,literacy$$
$$+ \beta_{11}\,origin\_district + \lambda + \eta + \varepsilon_{ij}$$

where c^i is censored from below[25], i.e. $c^i \geq 0$. The model suggests β_1, β_2, β_6, β_7, β_8, β_9, β_{11} > 0; β_3, β_4, β_5, β_{10} < 0.

7.   Results

7.1.   *Descriptive statistics*

Descriptive statistics are reported in Table 2. In our sample, the average distance from a district facility level to the capital, Antananarivo, is 561 km. However, there are large variations, with a maximum distance of 1235 km. The average distance from district facility

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[24] Our data on cyclical droughts are consistent with the data of the Organisation for the Coordination of Humanitarian Affairs (OCHA; *http://ochaonline.un.org*).
[25] The majority of schools visited were not subject to capture, i.e. c^i equals zero.

level to public primary school is 26 km. The maximum distance is 107 km. The average literacy rate is 67% with large variation between communes. The lowest literacy rate is 7% and the highest 97%. Looking at the district characteristics, 28% of our sample of public primary schools is situated in highly insecure districts. Approximately half of the schools have a district director who is born in the district and the majority of district officers obtained a university degree. The remaining group of directors completed at least the first cycle of high school. Finally, the average relative school size is 1.3% of the total school size in the commune, thus on average 1.3% of all children who go to primary school in the commune will go to the schools in our sample. Twenty-seven percent of our sample of schools is situated in a commune that experienced cyclical droughts during the 1998-2002 period. After the elections, the new government replaced 89% of the district officials.

Around three quarters of the communes (74%) has access to local radios. The number of local (private) radio stations fluctuates from 0 to 15, with 26% of the sample without access to any local radio. Overall, the average number of local radio outlets is 4 and the median is 3. Access to television and newspapers is much less. Only a little over one quarter of the communes (28%) has access to local television. There is only one commune with television, but no radio access. Newspapers are available in 24% of the communes. The number of regional, private television stations ranges from 0 to 6 and the number of newspapers from 0 to 4.

Table 3 illustrates the degree of variation of local (private) radio stations between and within the six provinces of Madagascar. Antananarivo shows the highest coverage of regional radio stations, while Toliara shows the lowest coverage. Historically, media activity concentrated in Antananarivo as foreign missionaries needed to remain close to the Queen and her royal court. Although slightly diminished over the years, this geographic

concentration remains a central feature of the Malagasy media even today (Andriantsoa *et al.*, 2005).

Access to regional radio outlets varies considerably within provinces. Toliara shows the lowest variation in regional radio stations. Fianarantsoa is on average covered by 2.7 regional radio stations with a range from 0 to 7 private radio outlets. Despite the general geographical concentration of the media, external influences as support from international non-governmental organizations made regional radio stations available, even in extremely remote and poor areas with low population density.[26]

7.2. *Determinants of leakage*

The first model was estimated using a probit regression. Given that 80% of the observations show no evidence of corruption, we decided to treat capture as a 0-1 variable. The dependent variable takes the value of one if there is capture of cash funds; and zero otherwise. To address the problem of any kind of intra-district correlation and arbitrary heteroskedasticity, we use robust standard errors that are adjusted for clustering on the districts. The results are shown in Table 4. As there is some concern on correlation between our key variables and some of the provincial dummies, we test for the significance of the variables with and without the provincial dummies. We also present the regression results with all key variables entered separately.

District_capital comes out highly significant and with the predicted sign, both separate (Columns 1 and 2) and together with our other explanatory variables (Columns 7 and 8), meaning that a higher distance between the capital and the district facility level increases the probability of capture. On the other hand, the distance between the district facility level and the school (*district_school*) does not affect the incidence of capture (Column 3). We thus find

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[26] Unfortunately, our data can not provide first-stage evidence that the number of radio or television stations affected the information community members have about school funding.

that monitoring "from above" – which is measured by distance from the centre – has a strong impact on capture. The inspection cost of the central monitoring agencies will increase with the geographical isolation of the district and therefore more remote districts will experience less control from the centre and thus suffer more from local capture. Considering that the government – with support of the donors – increasingly relies on decentralized interventions and entities to improve educational services, this indicates important constraints on decentralization of public service delivery, in particular in the most remote areas.

The key variable to capture the media effect is *radio* in the first model. However, there are some potential problems with including *radio* in the model as such. Areas suffering from substantial local capture of public funds could be areas that, in general, are lagging behind in their development. For this reason these areas could have less media outlets compared to other, more developed, regions. If this is the case, our *radio* variable could suffer from unobserved heterogeneity. One of the solutions to this problem is to measure the exposure to the media campaign by taking into account the average number of regional radio stations in the district, taking out the number of radio stations in the respective commune. Therefore, we use the variable *radio_mean* in order to reduce endogeneity problems.

Radio_mean has a significant coefficient estimate with the right sign, both individually (Columns 4 and 5) and jointly (Columns 7 and 8). Consistent with our expectations, we find that information on the disbursement of public funds to the intended beneficiaries – which is measured by the number of local radio outlets – is a powerful monitoring tool "from below" that empowers citizens at the bottom of the service delivery chain in their interactions with local officials and politicians and, thereby, decreases capture of public expenditures. These findings are consistent with the results of Reinikka and Svensson (2004b).

The interaction term (*radio_mean*literacy)* enters significantly at the 1%-level with a positive sign, meaning that the impact of local radio access on reducing capture is more

important when illiteracy is more widespread. This is as we expected. A higher literacy rate increases the ability to get informed, so the need for mass media as information tools is lower. Regional mass media might therefore be important in alleviating capture and corruption, especially in less educated areas.

Moreover, *red_district* appears to be highly significant with a positive sign, suggesting that the probability of leakage increases with the level of insecurity in the district. This finding is consistent with our expectations.

A higher educated district leader (*educ_district*) appears to capture significantly less. This is not as we expected. On the other hand, according to our model, schools that are situated in less educated areas experience a higher likelihood of capture as their ability to achieve information will be lower (and thus their monitoring cost will be higher compared to schools in better educated areas). This expectation can be confirmed as the variable *literacy* enters highly significantly with a negative sign.

The variable *origin_district* could be claimed to be endogenous, as district officers from districts with more leakage could already have been replaced in the past, implying that these districts show lower current leakage levels because of this. Although this is a valuable argument, results of a recent World Bank study (Francken, 2003) show that historically there were few inspections in the education sector in Madagascar and in case of problems, sanctions were rare. Therefore, we believe endogeneity not to be a serious concern. *Origin_district, schoolsize* and *drought* appear to be highly significant with a positive sign, suggesting that the incidence of cash leakage increases with the social capital of the district director, the relative school size and the occurrence of cyclical droughts in the district. Besides the result on school size, the remaining results correspond with our expectations.

Finally, we do not find any significant effect of the new representation at district level (*new_district*; Column 8). While there could be a problem of selectivity bias as maybe only

the bad district directors were replaced, the Ministry of Education indicated that all districts directors were to be replaced in the medium term.[27]

7.3. Robustness checks

We conducted some additional tests to verify the robustness of our results. First, we dropped, one at the time, all observations from each province in Madagascar to see whether any province-specific effects drive the results. The results remained intact. Moreover, we examined the conditioning of the matrix of independent variables according to Besley, Kuh, and Welsch (1980). If this number is large, there may be collinearity problems. Our conditioning value equals 23, below the threshold value of 30 suggested by Besley *et al.* implying that there are no important collinearity problems.

Second, we alternated the lower limit of corruption. Table 5 illustrates the results when considering relative capture smaller then or equal to 1% (Column 1), 5% (Column 2) or 15% (Column 3) as zero capture. As expected, the results are similar to the results in Table 4. All key independent variables remain significant with their expected sign. Although the impact of a change in the average number of regional radio stations (*radio_mean*), in the literacy rate (*literacy*) and in the interaction effect (*radio_mean*literacy*) on the capture of cash funds appears to be smaller in Columns 2 and 3, the impact remains significant. Only the two variables that did not have the expected sign in our previous model, more specifically the education level of the district director (*educ_district*) and the relative school size (*schoolsize*), show to be insignificant in Table 5.[28]

Third, to test the interpretation that the regression coefficients capture a causal effect of media rather than unobserved variation in other local characteristics, we included two

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[27] Furthermore, anecdotal evidence showed that one of the remaining district directors only started distributing the cash contributions after our visit, implying that he was not one of the best performing bureaucrats who deserved to stay in place.

[28] More precisely, the education level of the district director (*educ_district*) is insignificant in Column 1,2, and 3 of Table 5 and the relative school size (*schoolsize*) is insignificant in Columns 2, and 3 of Table 5.

additional controls for local demographics: the population density in the commune (*pop_density* in Column 1 of Table 6) and the average household expenditures per month per commune (*mean_exp* in Column 2 of Table 6). Both regressions show that our results are not driven by omitted variable bias. Although the impact of an increase in the average number of regional radio stations in the district on capture of cash funds will be considerably smaller (approximately 3% in both columns of Table 6; compared to 13% in Column 7 of Table 4), the impact remains significant. On the other hand, population density and the average household expenditures per month per commune do not have an impact on the probability of corruption.

Finally, column 3 depicts the role of television and newspapers. Besides regional radio, local television also has a negative, significant coefficient, suggesting that the likelihood of leakage will decrease with the number of local television stations. The impact is also conditional on the literacy rate and is higher in less educated areas. We do not find any significant effect of newspapers. This result confirms our hypothesis that in a country with high illiteracy rates, radio and television are more important media instruments for information dissemination to the (poor) population.

In summary, our results show that monitoring "from above" as well as "from below" plays an important role in the probability of capture of cash funds by local bureaucrats.[29] Remoteness and insecurity of the district facility level increase the likelihood of local corruption while higher educated parents of students and a more extensive access of the schools to radio and television decrease the probability of capture of cash funds. Moreover, our data reveal that the impact of radio and television is conditional upon characteristics of the population and will be higher in less educated areas. Finally, communes that are more

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[29] Our findings are consistent with the results of several qualitative studies of the education sector in Madagascar (e.g., Brinkerhoff and Keener, 2003; World Bank, 2004).

frequently victim of climatic shocks and communes which are situated in districts run by a director who is born in the district suffer more from local corruption.

8.   Conclusion

This paper examines the determinants of corruption by officials in a new public program with decentralized implementation in the education sector in Madagascar. The analysis shows that local capture can be successfully constrained as our data reveal relatively low levels of capture, especially in comparison with other Sub-Saharan African countries.

Our findings indicate the importance of monitoring "from above", i.e. by the central agencies which are implementing the public policy. This type of monitoring has a strong impact on the probability of capture as remoteness or geographical isolation increases capture of public funds.

The presence of media reduces the probability of local capture, but the impact is conditional upon characteristics of the population. When many poor are illiterate, the impact of newspaper and poster campaigns is limited, and radio and television are more important media tools. Moreover, we find that the impact of local radio and television access is more important when illiteracy is more widespread. It seems that the use of specific local mass media – especially in less educated areas – could therefore serve as a tool to increase the information level and thus help in the monitoring role of the beneficiaries.

Finally, our findings taken together have implications for the debate on decentralization of public service delivery in developing countries as they indicate important constraints on decentralization, in particular in the most remote areas. In order to increase the efficiency of public spending on services for the poor, decentralization is for this reason best implemented in conjunction with regular monitoring and evaluation audits at the decentralized levels.

ANNEX

A.1.   Map of Madagascar with interviewed districts (Budget tracking survey, 2003)
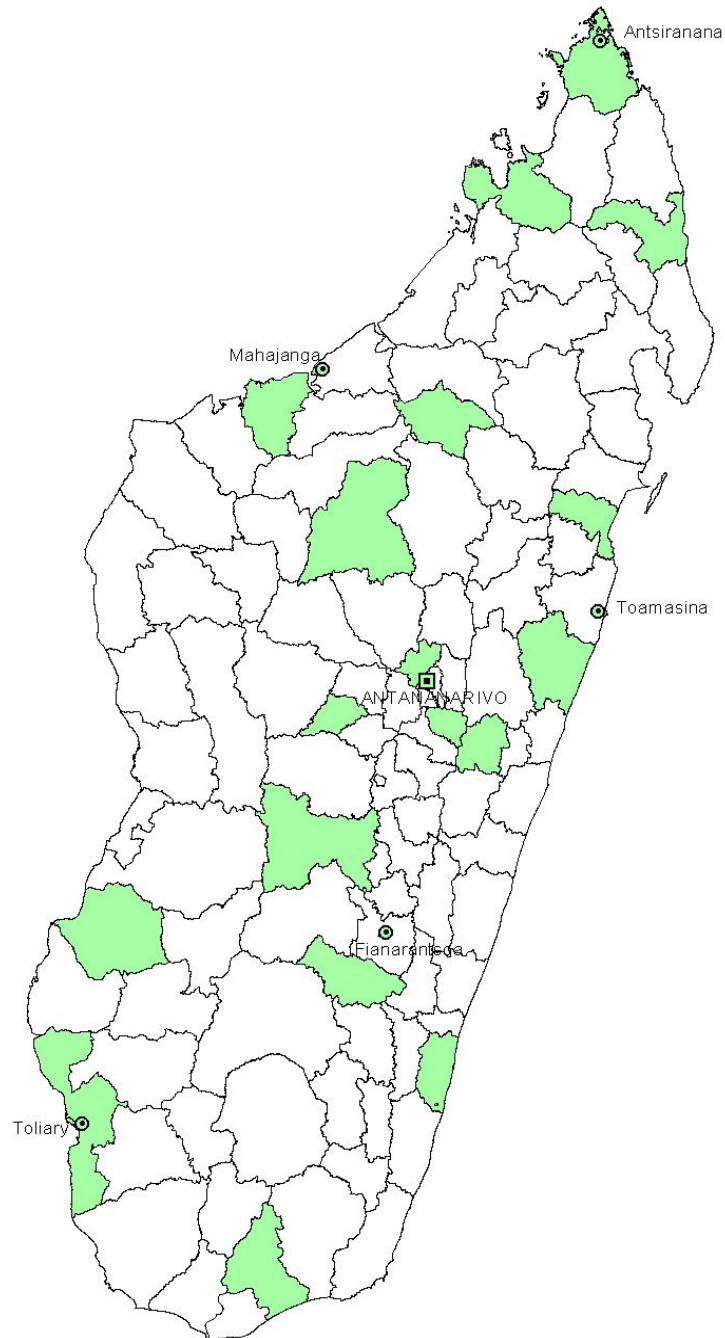
A.2. Data description

Cash funds received = HIPC cash funds noted as received in the public primary school records (Source: Budget Tracking Survey, 2003)

Intended cash funds from the district facility level = HIPC cash funds recorded as sent to the public primary schools in the accounting of the district facility (Source: Budget Tracking Survey, 2003)

District_capital = the distance in kilometers from the district facility level to Antananarivo, the capital of Madagascar (Sources: Post-crisis Survey, 2002; Commune Census, 2001)

District_school = the distance in kilometers from the district facility level to the public primary school (Sources: Post-crisis Survey, 2002; Commune Census, 2001)

Radio = the number of local (private) radio stations people report they can receive clearly in the commune (Source: Post-crisis Survey, 2002)

Radio_mean = the average number of regional (private) radio stations in the district, taking out the number of radio stations in the respective commune (Source: Post-crisis Survey, 2002)

Television = the number of local (private) television stations people report they can receive clearly in the commune (Source: Post-crisis Survey, 2002)

Newspapers = the number of newspapers that the people can obtain in the commune (Source: Post-crisis Survey, 2002)

Red_district = dummy variable with value one if the district is officially declared as a red or highly unsafe district, which means a district where more than 50% of the communes suffer from an extremely high insecurity level (Source: Commune Census, 2001)

Educ_district = the education level of the district facility director. It is a categorical variable (from 1 to 7) according to the years of study. Category 7 represents the group of district facility directors with a university degree (Source: Budget Tracking Survey, 2003)

Literacy = the literacy rate in the commune (Source: National Population Census, 1993)

Origin_district = dummy variable which equals one if the district facility director is born in the district where he is operating; and zero otherwise (Source: Budget Tracking Survey, 2003)

Schoolsize = the size of the public primary school as a percentage of the total size of all primary schools, public as well as private, in the district (Source: Cornell University Education Survey, 2003; Budget Tracking Survey, 2003)

Drought = dummy variable of cyclical droughts equals one if the commune suffered from two or more droughts during the last four years (1998-2002); and zero otherwise (Source: Commune Census, 2001)

New_district = dummy variable with value one if the district facility director is new in his position from the beginning of (or during) the school year 2002-2003, i.e. after the establishment of the new government (Source: Budget Tracking Survey, 2003)

Pop_density = population density in the commune (Source: Commune Census, 2001)

Mean_exp = average household expenditures per commune per month (Source: National Population Census, 1993)

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Table 1: Capture of HIPC cash contributions (according to formula (1) and as a dummy variable)

A. Capture according to formula (1) – in relative terms

	Mean	Median	St. dev.	Maximum	Minimum	Observations
All schools						
Capture of funds	0.07	0.00	0.20	1.00	0.00	176
Per province						
Antananarivo	0.01	0.00	0.03	0.15	0.00	35
Fianarantsoa	0.08	0.00	0.13	0.40	0.00	30
Toamasina	0.08	0.00	0.23	0.86	0.00	30
Mahajanga	0.08	0.00	0.27	1.00	0.00	29
Toliara	0.15	0.00	0.26	0.75	0.00	25
Antsiranana	0.06	0.00	0.20	0.91	0.00	27
Schools with capture of funds (uncensored values)						
Capture of funds	0.35	0.29	0.32	1.00	0.01	36

B. Capture as a dummy variable with capture = 1

	Mean	Median	St. dev.	Maximum	Minimum	Observations
All schools						
Capture of funds	0.20	0	0.4	1	0	176
Per province						
Antananarivo	0.09	0	0.28	1	0	35
Fianarantsoa	0.37	0	0.49	1	0	30
Toamasina	0.17	0	0.38	1	0	30
Mahajanga	0.17	0	0.38	1	0	29
Toliara	0.40	0	0.50	1	0	25
Antsiranana	0.07	0	0.27	1	0	27

Table 2: Descriptive statistics

Variable	Unit	Mean	Med.	St. dev.	Max.	Min.	Obs.
Determinants of capture							
District_capital	Km	560.7	473.0	410.7	1235.0	0.0	176
District_school	Km	26.0	21.5	24.4	107.0	0.0	176
Radio	Number	4.0	3.0	4.2	15.0	0.0	176
Radio_mean	Number	4.0	2.9	4.1	15.0	0.0	176
Television	Number	0.8	0.0	1.5	6.0	0.0	153
Newspapers	Number	0.7	0.0	1.4	4.0	0.0	153
Red_district	Dummy	0.3	0.0	0.4	1.0	0.0	176
Educ_district	Category	6.8	7.0	0.7	7.0	4.0	176
Literacy	Percent	66.9	71.2	23.7	96.6	6.9	176
Origin_district	Dummy	0.5	1.0	0.5	1.0	0.0	176
Control Variables							
Schoolsize	Percent	1.3	0.7	1.3	7.2	0.1	176
Drought	Dummy	0.3	0.0	0.4	1.0	0.0	176
New_district	Dummy	0.9	1.0	0.3	1.0	0.0	176
Pop_density	Hab/km^2	948.3	41.9	1899.6	7826.2	0.8	176
Mean_exp	FMg	400467.9	363401.0	162985.7	788184.0	163672.0	174

Table 3: Geographical distribution of regional (private) radio outlets (*Radio*)

	Mean	Median	St. dev.	Max.	Min.	Obs.
Madagascar	**4.0**	**3.0**	**4.2**	**15.0**	**0.0**	**176**
Per province						
Antananarivo	9.9	10.0	4.3	15	3	35
Fianarantsoa	2.7	2.0	2.4	7	0	30
Toamasina	2.4	1.0	3.5	9	0	30
Mahajanga	2.9	3.0	2.2	5	0	29
Toliara	1.5	0.0	1.9	4	0	25
Antsiranana	3.1	3.0	2.1	6	0	27

Table 4: Capture of HIPC cash contributions from district to school level: Probit analyses

	(1) dF/dx	(2) dF/dx	(3) dF/dx	(4) dF/dx	(5) dF/dx	(7) dF/dx	(8) dF/dx
District_capital	0.0009*** (4.83)	0.0003** (2.14)				0.0003*** (2.74)	0.0003*** (3.13)
District_school			0.0013 (0.89)			0.0002 (0.19)	0.0004 (0.45)
Radio_mean				-0.0334** (-2.34)	-0.0338** (-2.39)	-0.1304*** (-2.96)	-0.1469*** (-3.29)
*Radio_mean * literacy*						0.0019*** (3.56)	0.0021*** (3.73)
Red_district						0.3842*** (3.38)	0.3838*** (3.59)
Educ_district						-0.1291* (-1.73)	-0.1336* (-1.78)
Literacy						-0.0075*** (-4.31)	-0.0071*** (-4.35)
Origin_district						0.2251*** (3.70)	0.2431*** (4.22)
Control Variables	No	No	No	No	No	Yes	Yes
Schoolsize						0.0385** (1.97)	0.0442** (2.30)
Drought						0.2831*** (3.32)	0.2433*** (3.10)
New_district							0.0554 (1.52)
Provincial Dummies	Yes	No	Yes	Yes	No	Yes	Yes
No. observations	176	176	176	176	176	176	176
Pseudo R2	0.263	0.080	0.100	0.144	0.085	0.446	0.451

Note: Dependent variable equals one if the district officer noted to have sent more cash funds than the schools claimed to have received; dF/dx reports the change in the probability for an infinitesimal change in each independent, continuous variable and, by default, the discrete change in the probability for dummy variables; results with robust standard errors adjusted for clustering on districts; z-statistics are reported in parentheses; significance levels of 10, 5 and 1 percent are represented by *, ** and ***.

Table 5: Capture of HIPC funds from district to school level: Results of probit regressions – robustness tests

	(1) cut-off 1% dF/dx	(2) cut-off 5% dF/dx	(3) cut-off 15% dF/dx
District_capital	0.0002***	0.0002***	0.0001***
	(4.60)	(3.28)	(2.90)
District_school	0.0001	- 0.0003	- 0.0001
	(0.19)	(-0.93)	(-0.53)
Radio_mean	-0.0494***	-0.0318*	-0.0217**
	(-4.31)	(-1.90)	(-1.97)
*Radio_mean*Literacy*	0.0007***	0.0005*	0.0003*
	(4.45)	(1.88)	(1.87)
Red_district	0.4995***	0.3839***	0.3375***
	(5.21)	(4.33)	(4.40)
Educ_district	-0.0229	-0.0447	-0.0356
	(-1.48)	(-1.34)	(-1.33)
Literacy	-0.0026***	-0.0022*	-0.0012*
	(-3.05)	(-1.94)	(-1.80)
Origin_district	0.2142***	0.1034***	0.0459**
	(3.83)	(2.66)	(2.15)
Control Variables	Yes	Yes	Yes
Schoolsize	0.0172*	0.0137	0.0062
	(1.80)	(1.39)	(1.07)
Drought	0.2430***	0.1283***	0.1250***
	(4.96)	(2.70)	(3.09)
Provincial Dummies	Yes	Yes	Yes
No. observations	176	176	176
Pseudo R2	0.521	0.444	0.441

Note: Dependent variable equals one if the district officer noted to have sent more cash funds than the schools claimed to have received; dF/dx reports the change in the probability for an infinitesimal change in each independent, continuous variable and, by default, the discrete change in the probability for dummy variables; results with robust standard errors adjusted for clustering on districts; z-statistics are reported in parentheses; significance levels of 10, 5 and 1 percent are represented by *, ** and ***.

Table 6: Capture of HIPC funds from district to school level: Results of probit regressions – robustness tests

	(1) dF/dx	(2) dF/dx	(3) dF/dx
District_capital			0.0002**
			(2.25)
District_school			-0.0004
			(-0.74)
Radio_mean	-0.0310*	-0.0323*	-0.0475***
	(-1.93)	(-1.72)	(-3.42)
Television			-0.1743**
			(-2.27)
Newspapers			-0.0127
			(-0.48)
*Radio_mean*Literacy*			0.0010***
			(3.53)
*Television*Literacy*			0.0020**
			(2.14)
Red_district			0.3378***
			(6.11)
Educ_district			-0.0932**
			(-2.48)
Literacy			-0.0049***
			(-5.57)
Origin_district			0.1760***
			(2.65)
Control Variables	Yes	Yes	Yes
Pop_density	-6.10e-06		
	(-0.26)		
Mean_exp		-7.23e-08	
		(-0.15)	
Schoolsize			0.0155
			(1.63)
Drought			0.2390***
			(5.57)
Provincial Dummies	Yes	Yes	Yes
No. observations	176	174	153
Pseudo R2	0.144	0.155	0.491

Note: Dependent variable equals one if the district officer noted to have sent more cash funds than the schools claimed to have received; dF/dx reports the change in the probability for an infinitesimal change in each independent, continuous variable and, by default, the discrete change in the probability for dummy variables; results with robust standard errors adjusted for clustering on districts; results with robust standard errors adjusted for clustering on districts; z-statistics are reported in parentheses; significance levels of 10, 5 and 1 percent are represented by *, ** and ***.