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Reducing Corruption in Public Education Programs in Africa: Instruments and Capture in Madagascar

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Abstract

This paper investigates how the choice of public expenditure instrument is affecting capture in the public education sector. We analyze data on two public funding schemes in Madagascar. We find that there is much more capture of in-kind transfers than of cash transfers. Capture of both instruments declines with better local access to media information and with higher local literacy rates. However, capture of cash grants falls rapidly with a raise in the level of education of the intended beneficiaries, while this effect is significantly weaker for capture of in-kind funds. Our findings suggest that intensive monitoring and increased public access to information should be combined with the right instrument for public funding implementation in order to eradicate capture and corruption.

Keywords – Public Expenditures; Transparency; Media

JEL classification codes – H52; I22

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1. Introduction

Corruption and poverty are strongly related (e.g., Rose-Ackerman, 1975; Klitgaard, 1991; Bardhan, 1997; Tanzi, 1998; Stapenhurst and Kpundeh, 1999; Svensson, 2003, 2005; Olken, 2006). Corruption reduces growth (e.g., Shleifer and Vishny, 1993; Mauro, 1995, 1997; Tanzi and Davoodi, 1997; Wei, 1997) while corruption itself reduces with income and education (Glaeser *et al.*, 2004; Glaeser and Saks, 2004). Recently, the importance of controlling corruption has been emphasized; among other things to improve the efficiency of public service delivery programs. In a well-documented study, Reinikka and Svensson (2004) find that in the early 1990s in Uganda only 13 percent of non-wage public expenditures on primary education actually reached the schools. The bulk of the public grants was captured by local government officials and politicians who were supposed to disburse the funds to the schools. Most studies in Africa, including Tanzania, and Ghana, 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, 2004), while Francken *et al.* (2009) find much lower levels of local capture in Madagascar.

Much recent analysis has focused on reducing local capture by monitoring of the beneficiaries of the services (Reinikka and Svensson, 2005). 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. It is argued that mass media can play an important role in this process as a channel of information (Besley and Burgess, 2002; Strömberg, 2004; Francken *et al.*, 2009).

In this paper we focus on how the choice of instrument for public expenditure implementation affects local capture. In particular, we investigate the difference in capture

of cash versus in-kind transfers, because of differences in information and monitoring costs related to the nature of the funding instrument.

There is an extensive literature on the optimality of cash versus in-kind transfers. This literature focuses primarily on comparing the relative efficiency of the different transfer instruments, either with perfect information (e.g., Thurow, 1974) or when there is imperfect information about the intended beneficiaries (e.g., Blackorby and Donaldson, 1988). However, these studies ignore the issue of differences in information and monitoring costs related to the implementation of these instruments. The latter is linked to the issue of how transparency of public funding schemes may affect capture (e.g., Stiglitz, 1999, 2002; Islam, 2003; Bellver and Kaufmann, 2005).

Our analysis compares capture of public expenditures on education in Madagascar in two programs: one where public funding of local school expenditures was through cash transfers and another where public funding was under the form of in-kind transfers. The analysis uses data collected in a budget tracking survey in 2003. The survey measured the extent to which public spending on education reached the local schools. We compare capture of cash flows and in-kind contributions from 23 decentralized district facility levels to 156 public primary schools.

We first analyze the difference in average levels of capture and then whether capture itself is differently affected by the information, and/or monitoring costs of the beneficiaries of the services.

Our first finding is that local capture of in-kind programs was much higher than capture of cash transfers. Ninety percent of the total amount of intended cash transfers to the schools arrived at school level, although in one-fifth of the schools the amount received did not correspond with the amount declared as sent by the district facility. Capture of in-kind transfer programs was considerably higher: 40% of the schools reported having received less

material than allocated at the district level. Anecdotal evidence suggests that in a majority of these cases the diverted funds were used for purposes unrelated to education or for private gain of local district officials.

Our second finding is that the presence of mass media significantly decreased capture of cash as well as in-kind programs. Independent regional media inform and empower the local recipients of the public services and hence mass media can be important tools in the fight against capture and corruption.

Third, capture of cash and in-kind programs is negatively related with the level of education of the intended beneficiaries. However, we find a significantly weaker effect on capture of in-kind grants. This could be an indication that intensive bottom-up monitoring is not sufficient to eradicate capture of public funds.

Our findings taken together have implications for the debate on capture in public services (e.g., Rose-Ackerman, 1975; Klitgaard, 1991; Bardhan, 1997; Tanzi, 1998; Stapenhurst and Kpundeh, 1999; Svensson, 2003, 2005; Olken, 2006). Intensive monitoring, together with increased public access to information through the mass media do not appear to be sufficient. Our results suggest that these measures should be combined with the use of the right, i.e. easily traceable, public funding instrument (as in our case study cash grants) in order to eradicate capture.

The paper is organized as follows. We first explain the policy framework in Section 2. We then describe the data, the methodology used to measure capture, and our basic results in Section 3. Section 4 tries to explain the first findings by formulating hypotheses on the difference in information and monitoring costs related to the nature of the two public funding mechanisms. We empirically test our hypotheses in Section 5 by analyzing the capture options the local government official faces and estimating a multinomial logit to account for

all the different choices. Finally, we present our results in Section 6 and formulate our conclusions in Section 7.

2. The Policy Framework

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.

Following the Millennium agenda of “free” education, and a political crisis in 2002, the new Government of Madagascar legislated a fixed per student cash grant to every public primary school. For every registered student, schools would receive approximately 2 USD in the capital city and 1.5 USD in the rest of the country.

This program importantly changed the financing of public education in Madagascar. The public educational environment consists of two different levels of governance with decision power (World Bank, 2004). First, the central authority is the Ministry of Education. Second, 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.¹ The financing traditionally had three components (Francken, 2003). First, the government pays the teachers’ salaries. Second, the government finances school equipment by providing a credit line to the district education offices (CISCOs). The latter then buy and distribute the school equipment in-kind to the schools. The materials could vary from pens or books to chalk or blackboards. In theory, the delivery of equipment is demand-driven as the distribution of materials to the schools happens

¹ Madagascar counts 6 provinces, 111 districts and at the time of the survey 1392 communes. Hence, on average there are 18 districts per province and there were 13 communes per district.

according to the needs formulated by the beneficiaries i.e. the school council in cooperation with the parents-teachers association.² Third, all additional expenditures of the schools were covered by tuition fees paid by the parents of the students. The objective of the new government policy was to ban parental contributions to schools and replace the latter by government grants.³ The implementation started in August 2002, at the beginning of the school year 2002-2003. Cash funds were transferred from the central government to the districts (CISCOs) and district officials were to transfer the payments to the public primary schools. We will discuss the characteristics of both public funding schemes in greater detail in Section 4.

The analysis in this paper concentrates on a comparison of local capture of (a) the cash payments and (b) the in-kind contributions during the academic year 2002-2003. In particular, we will focus on the differences between cash and in-kind transfers and the differences in information and monitoring costs related to the nature of the public funding instrument. In the next section, we first describe the data, and the methodology used to measure capture. We then provide our basic results by comparing local capture of cash versus in-kind grants.

3. Measuring and Comparing Capture of Cash versus In-kind Transfers

Our analysis quantifies two types of capture in the supply chain of the education sector in Madagascar. First, we look at discrepancies between the cash funds recorded as sent by the district facility levels and as received by the public primary schools. Second, we

² The schools were not able to order equipment that was unrelated to education. In a poor country as Madagascar with limited public educational funds the fact of demand-driven delivery should also be interpreted with caution as the schools often did not receive the equipment they ordered because of a lack of funds at district level.

³ The changes in the education sector of Madagascar were similar to the educational changes in other African countries as e.g. Zambia (Das *et al.*, 2004).

try to match the in-kind contributions purchased by the district officers, on their credit line for school equipment, and received by the schools.

3.1. *Data*

To collect specific information on the public funding flows in the education sector, we organized a budget tracking survey on cash and in-kind transfers from district facility to 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. The survey also allowed us to analyze how the choice of instrument for public expenditure implementation affected local capture. To ensure compatibility, the surveys at district, and school level were held at the same time. The survey was conducted in the whole of Madagascar.⁴ 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 23 districts and 156 schools.

3.2. *Measuring capture*

We calculated the following indicator of capture, c^{ij} , for school j ;

$$c^{ij} = 1 - \frac{\text{funds received by school } j}{\text{funds from CISCO}_i \text{ intended for school } j} \quad (1)$$

where CISCO_i is the district facility level i.e. the organization higher up the chain from school j . Capture (c) is indexed by i and j as it can vary by donor and recipient. An indicator of 1 indicates full capture; 0 means no leakage. Using this indicator, we calculated capture at each school.

⁴ In each province, 4 districts and 13 communes were surveyed.

We also calculated capture indices for the in-kind contributions which are purchased and distributed by the district education offices. As mentioned before, these materials vary from a pen to a football or a blackboard. As it was impossible to value the in-kind contributions correctly and consistently in monetary terms, we constructed a qualitative capture indication as a 0-1 variable indicating 1 when there was a significant discrepancy between the CISCO and the school, i.e. if the district officer recorded to have sent more material than the public primary school noted as received; and 0 otherwise.

Small deviations (as e.g. one missing football or a missing pen) were considered as measurement error. The disappearance of more than one small item, one large item or more was considered as capture. We believe that in a country where – according to our interviews – some schools only received one pen, one football, five books and a chair during the previous school year, our measure of capture is accurate.⁵

We are aware that discrepancies between the in-kind transfers recorded as sent by the district facility levels and as received by the schools could be due to weak planning models and incompetence, as well as very poor accounting procedures at both levels instead of capture. However, clear cases of incompetence were excluded from the analyses. One district facility level did not keep any accounting on the material that it distributed as it claimed not to be able to keep the books. As we were unable to find any in-kind distribution records, it was excluded from the analysis. Twelve schools were excluded for the same reason. Moreover, our survey contained a control question (to be answered by the enumerators⁶) on the clarity of the entire district or school bookkeeping.⁷ We constructed a dummy variable that equals one if the enumerators perceived it as clear; and zero otherwise.

⁵ On the other hand, there was a small minority of schools reporting to have received more than the CISCO stated to have sent. A more detailed investigation of these cases showed that the reported supplies equaled the sum of material received during the last two or three school years. Taking this into consideration, those schools received the correct amount of material during the school year 2002-2003.

⁶ The enumerators were well trained to accurately evaluate the clarity of the bookkeeping.

⁷ The entire bookkeeping i.e. all records on the distribution or receipt of cash, school equipment, and books.

One could imagine that unclear records are caused by a general lack of competence and very poor accounting procedures. This matter will be discussed in further detail in the next paragraph.

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.⁸ 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.

3.3. *Basic results*

Our first result is that local capture of in-kind contributions was much higher than capture of cash transfers. Overall, there was little capture of the latter at district level. By April 2003, the divergence between the cash grants recorded as sent by the district facility levels and as received by the schools was very low: 90% of the funds arrived at school level. Although in 21% of the schools the amount received did not correspond with the amount declared as sent by the district facility (Figure 1 and Table 1). On the other hand, the divergence in the bookkeeping on the in-kind contributions was considerably higher as 40% of the schools reported having received less material than allocated at district level.

The correlation between cash and in-kind capture is very low and not significant. Only 8% of the schools reported to have suffered from capture of both cash and in-kind funds (Table 1).

Table 2 shows the relationship between the clarity of the entire bookkeeping as perceived by the enumerators and the discrepancies found in the delivery of cash and in-kind

⁸ The situation in Madagascar is similar to the situation in Uganda as described in Reinikka & Svensson (2004).

transfers from district to school level. Respectively 69% and 75% of the schools that reported having received less in-kind or cash transfers than allocated at district level were perceived as having clear bookkeeping. On the contrary 31% and 25% of the schools with in-kind or cash capture reports were perceived as having unclear accounting procedures. Overall, a high 73% of the schools were perceived as having clear bookkeeping compared to 56% of the districts. This result could indicate incompetence at district level. However, the accounting procedures are supervised by the school and district director respectively and a vast majority of district directors have a considerably higher education degree⁹ and are therefore expected to have a better understanding of accounting than the school directors. Hence, these results seem to suggest that the irregularities in the delivery of cash and in-kind transfers from district to school level are not driven by incompetence at the decentralized levels, but are mainly due to capture of funds. This is consistent with the findings from our field interviews that significant capture existed at district level. However, we do not underestimate the fact that there is a general lack of competence in African bureaucracies and we are aware that some cases may only reflect incompetence. Table 2 shows that 62% of the schools that reported discrepancies in the receipt of both cash and in-kind transfers were perceived as having unclear accounting procedures. As in these particular cases irregularities are probably due to incompetence rather than capture, we will test the robustness of our results when excluding the latter observations from the analyses.

In-kind capture could then either result from effective theft of materials by the district officer or from over-invoicing of materials in the district's accounts i.e. the district officer noted a higher invoice price compared to the real price of the in-kind contributions he sent to the school.¹⁰ It was not always possible to identify the exact method of in-kind capture, but evidence from our field interviews suggests common practice of over-invoicing. To assess

⁹ A vast majority of the district directors (90%) have a university degree.

¹⁰ Anecdotal evidence suggests that diverted funds were used for purposes unrelated to education or for private gain of local district officials.

the importance of over-invoicing, we organized price surveys of the most prevalent school material in some of the districts in our sample. Table 3 shows the mean invoice price reported by the CISCO and the mean retail price for some standard school supplies in the district: the differences range from 12% to 82%. While we were unable to completely control for quality differences, this evidence seems to suggest that the district education office was subject to practices of over-invoicing. Unfortunately, we could not identify the exact method of in-kind capture for all districts in our sample, so we created an in-kind capture dummy variable that equals one in case of effective theft of the materials and/or over-invoicing; and zero otherwise.

In order to compare capture of cash and in-kind transfers, we also created a cash capture dummy variable that equals one in case of local capture of cash funds; and zero otherwise. In the remainder of this paper we will continue our analyses with both dummy variables.

Our data show strong regional differences suggesting that the variations in capture are not random but reflect structural differences of the schools, the local communities, and the districts. This is consistent with anecdotal evidence based on our personal interviews.

In the following section, we will try to explain our basic results by discussing the characteristics - more specifically those related to the information and monitoring costs - of the two different instruments of public funding implementation in greater detail.

4. Hypotheses on the Difference in Capture between Funding Instruments

Our first hypothesis why there is more capture of in-kind contributions than of cash funds relates to the difference in information costs of the two different instruments of public funding implementation. The accompanying measures of the cash grants scheme appear to

have decreased the latter's information costs which may have resulted in a lower incidence of local capture of cash funds compared to in-kind contributions.

The cash grant scheme was implemented together with several accompanying measures in order to ensure that the funds would actually arrive at the school level and to prevent capture along the chain. First, the Ministry of Education 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. Second, 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 information on the abolishment of the public school tuition fee was reported widely in the written press and broadcasted on national and local radios and TV. In sum, both measures were to increase public access to information i.e. ensure transparency and hence to decrease the information costs by the beneficiaries of the cash public funding scheme.

On the contrary, the in-kind funding mechanism was characterized by a lack of public access to information. As aforementioned, one district facility level did not keep any accounting on the school equipment it distributed and was excluded from the analysis. In several other CISCOS the bookkeeping was extremely ambiguous and/or not publicly accessible. Overall, our enumerators encountered lack of clarity in the bookkeeping of almost half (44%) of the district facility levels. During our survey, schools were also asked to evaluate the in-kind distribution system of their respective CISCO and half of the public primary schools reported not to be satisfied. One of the main reasons was the lack of transparency and accountability leading to increased information costs by the intended recipients and hence providing substantial opportunity for capture by the district bureaucrats (Francken, 2003).

Second, we hypothesize that the difference in monitoring costs makes it more likely that capture of in-kind transfers occurs, compared to local capture of cash grants. Anecdotal evidence from our field interviews suggests that this is indeed often the outcome. On the one hand, transfer of the cash payments to the schools was conditional upon submission of a budget plan from the schools. A newly created institution, 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. This work plan was publicly accessible and evidence from our field interviews suggests that even for people with a minimal amount of education, cash transfers were relatively easy to monitor.

On the other hand, we describe two cases that are typical for the situation concerning the in-kind funding scheme that we encountered in the field. The first case is that of a school reporting that it asked the district facility level to buy and send glue. By the time the glue arrived at school level, it exceeded the expiration date and was unusable. For the school it was unclear whether the glue expired during storage at the district facility or whether the CISCO procured bad glue at a lower price from the supplier. Our visits of the district education office and the respective supplier confirmed the latter, hence indicating capture at CISCO level.¹¹ The second case refers to a situation where the school reported to have requested and received 100 pieces of white chalk while the CISCO noted to have sent 100 pieces of colored chalk which is considerably more expensive. Both cases illustrate practices of over-invoicing and thus capture at district level while it was difficult for the schools to detect and monitor the actions of the CISCOs. In sum, our findings suggest that higher monitoring costs for the beneficiaries of the in-kind funding scheme might make it more likely that local capture of in-kind contributions occurs, compared to capture of cash grants.

¹¹ We encountered several similar cases during our field work. While it could have been possible that the suppliers were not providing truthful information and the district directors only paid the correct price and received a false receipt, our field interviews with other district personnel confirmed collusion in a majority of the cases. Moreover, as aforementioned 90% of the district directors had a university degree and were expected to have a considerable understanding of accounting.

In the next section we will test these hypotheses on the differences in information and monitoring costs for the intended recipients by analyzing the capture options the local district official faces and estimating a multinomial logit to account for all the different choices.

5. Empirical Model

Our empirical model incorporates three different options for the district bureaucrat: 1) “no” capture i.e. neither cash, nor in-kind capture; 2) “in-kind” capture: capture of in-kind contributions but no capture of cash grants; 3) “cash” capture. We combine two scenario’s i.e. cash without in-kind and cash with in-kind capture in option 3 because we have insufficient observations to include the latter scenario separately. We believe that combining these two different scenario’s in option 3 is a reasonable approach as we are merely interested in cash versus in-kind capture. We will nevertheless test for the robustness of our results when we drop the observations from the schools that suffered from both cash and in-kind capture from our analyses.

We estimate the probability of a district bureaucrat capturing cash and/or in-kind funds relative to the reference state of no capture using a multinomial logit model (see Greene (1997) for more details). This model allows us to estimate a set of coefficients β_j corresponding to each outcome category:

$$\text{Prob}(Y_i = j) = \frac{e^{\beta_j' x_i}}{\sum_{k=0}^J e^{\beta_k' x_i}} \quad (2)$$

The estimated equations provide a set of probabilities for the $J+1$ choices for a decision maker with characteristics x_i . The model however is unidentified in the sense that there is more than one solution to β_j that leads to the same probabilities for $y = j$. A convenient normalization that solves the problem is to assume that $\beta_0 = 0$. This means that the

remaining coefficients β_j measure the change relative to the $y = 0$ group. The probabilities are now given by:

$$\text{Prob}(Y=j) = \frac{e^{\beta_j' x_i}}{1 + \sum_{k=1}^J e^{\beta_k' x_j}} \text{ for } j = 1, 2, \dots, J$$

$$\text{Prob}(Y=0) = \frac{1}{1 + \sum_{k=1}^J e^{\beta_k' x_j}} \quad (3)$$

In terms of our analysis, the normalization means that we compare each outcome with the comparison group of bureaucrats at district level that do not capture funds. Table 4 gives an overview of the different scenarios. Our dependent variable is a school-specific measure. Furthermore, the model identifies several explanatory variables of which two key variables are related to the information and monitoring costs for the beneficiaries of the services.

First, we use one key explanatory variable that relates to the difference in information costs of the two public funding instruments. In particular we use an indicator of the effect of the mass media campaign that was put in place together with the cash grants scheme in order to decrease the information costs of the beneficiaries of the latter. Several recent studies (e.g., Reinikka and Svensson, 2004, 2005) show the importance of local, independent media as a tool to decrease information costs. Our variable, *radio*, is a dummy variable with value one if the community members reported to have access to at least one (private) radio outlet at the time of the survey; and zero otherwise. Based on the results from our field research, this measure is the most important instrument to capture and quantify media access as radios play an important role in Madagascar. We expect the presence of a radio station to decrease the likelihood of capture of cash transfers as one of the accompanying measures to increase public access to information on the newly implemented cash grant program – and hence to decrease the information costs of the intended beneficiaries – was its announcement on the

radio. As there was no specific mass media campaign on the in-kind contributions scheme, we expect to find a substantially smaller impact of *radio* on the likelihood of in-kind capture.

Our second key explanatory variable is *literacy*, which is an indicator of human capital of the parents-teachers association and is measured as the average degree of literacy in the commune. The variable is likely to capture two effects: higher human capital may cause lower monitoring costs and may make it easier to absorb information through the media. To separate these effects out, we include both the level term and an interaction effect with the media variable in our analysis. First, human capital is typically positively related to entrepreneurship and skills in various activities. Higher educated beneficiaries below in the service delivery chain will have lower (bottom-up) monitoring costs as their capability to obtain information will be higher. We expect that higher literacy rates i.e. more human capital endowments of the public, will increase the effectiveness of their monitoring and therefore, decrease the likelihood of capture by public officials. However, consistent with our hypothesis that the monitoring costs of the in-kind grants scheme are higher than those of the cash grants scheme, we expect to find a bigger impact of *literacy* on the likelihood of cash - compared to in-kind - capture.

In addition and as mentioned above, we include an interaction effect of *literacy* with the media variable (*radio*literacy*). The information costs of the beneficiaries of the services do not only depend on the supply of information, e.g. through media, but also on the ability of people to process the information. It is expected that *radio* and *literacy* each reduce capture, but that they are partly offsetting as more educated people have more human capital to obtain information from other sources than mass media.

Fourth, different control variables are included in the analysis. The choice of these variables is based on the conceptual framework developed in Francken *et al.* (2009). The first control variable relates to the top-down monitoring cost and the importance of

“remoteness” or geographical isolation in development, an issue emphasized in contributions by e.g. Krugman (1991) and Gallup *et al.* (1998).¹² *District_capital* measures the distance (in kilometers) from the district facility level to Antananarivo, the nation’s capital. 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 in the service delivery chain i.e. the central education authorities 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 in the education chain will lead to less capture at district level.

The second control variable measures the quality and effectiveness of the local justice system. The dummy variable *red_district* equals 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. Consistent with earlier findings, we expect that highly unsafe districts will be characterized by higher probabilities of capture of both public funding instruments at district level.

The third control variable measures 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 in the district. According to the theory of Reinikka and Svensson (2004), the bargaining power of the school vis-à-vis the district officer will depend on her size i.e. a bigger school is expected to suffer less from local capture.

The fourth control variable is a dummy for cyclical droughts (*drought*) that equals one if the commune was hit by two or more droughts, i.e. heavy income shocks, during the last four years (1998/2002). Parents who have to deal with cyclical shocks will care more

¹² 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 & Shilpi (2003) find that geographical isolation significantly reduces subjective welfare. Fafchamps & Moser (2003) and Fafchamps & Minten (2006) show that remoteness is positively correlated with crime in Madagascar.

about their family's instant needs then about education, so we expect this variable to have a positive impact on capture.

Finally, provincial dummies are included to account for additional fixed effects.

6. Results

6.1. Descriptive statistics

Descriptive statistics are reported in Table 4. The rows represent the different options for the district bureaucrats. As explained above, more than half of the schools (53%) experienced capture. Approximately one third (32%) of the schools did receive the cash funds, but not the in-kind contributions they were entitled to. On the other hand, 13% of the schools experienced cash, but no in-kind capture. Only 8% of the schools in our sample suffered from capture of both cash and in-kind grants.

Comparing our key explanatory variables i.e. access to a radio outlet and the average literacy rate in the commune between the different categories reveals interesting results. Table 4 shows that a majority of the schools (80%) that did not suffer from capture had access to a radio. This number is the same for the schools that suffered from capture of in-kind contributions. On the contrary, less than half of the schools (40%) that suffered from capture of cash grants had access to a radio. Table 5 investigates the differences in greater detail and illustrates that a little more than half of the schools with radio access did not suffer from capture, approximately one third suffered from capture of in-kind transfers, and less than one sixth suffered from capture of cash grants (or full i.e. cash and in-kind capture). This compares to approximately one quarter of the schools without radio access that suffered from capture of in-kind grants and 39% from cash capture. These descriptive results seem to support our first hypothesis that the decreased information costs of the cash grants scheme

through its announcement via the radio has led to a lower incidence of local capture of cash transfers compared to in-kind contributions.

The average literacy rate in the communes with schools that suffered from in-kind capture was 72%, very close to the average literacy rate in communes with no capture in the primary education sector (74%). On the contrary, the mean literacy rate in the communes with schools that suffered from capture of cash funds was substantially lower as it equaled 44% (Table 4). Table 5 shows that the majority of the schools (57%) in communes where more than half of the population was literate did not suffer from capture, one third suffered from capture of in-kind contributions and only 9% suffered from cash capture. On the other hand, a high 65% of the schools in communes where less than half of the population was literate suffered from cash capture. A little more than one fifth of these schools (23%) suffered from capture of in-kind funds. These findings seem to support our second hypothesis concerning the difference in monitoring costs of the two public funding instruments.

Furthermore, our descriptive results in Table 4 indicate that schools that suffered from cash capture were on average situated in districts that were more isolated from the capital; in highly unsafe districts and/or in communes that experienced frequent income shocks.

6.2. Results on the difference in capture

The estimation results are presented in Table 6. 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. Table 6 illustrates the results of our analysis with

the two key explanatory variables, the interaction term, the provincial dummies, and the control variables.

Radio is highly significant with a negative sign in all columns suggesting that access to a radio outlet decreases the likelihood of capture within the cash as well as the in-kind funding scheme. More specifically, recalculating the impact of radio access at the mean of *literacy* illustrates that access to a radio outlet decreases the likelihood of capture of cash funds with 42 percentage points.¹³ Table 6 shows that the effect of radio access is stronger on the likelihood of “cash” capture, which is consistent with the fact that the cash grants scheme received much more attention in the mass media. Although the odds-ratio plot (Figure 2) shows that “in-kind” and “cash” capture are not significantly differentiated by radio access. Hence, we can reject our first hypothesis and conclude that it is not the difference in information costs that is responsible for the difference in capture of the two public funding instruments. On the other hand, the odds-ratio plot confirms that radio access significantly increases the odds of “no” capture relative to (cash or in-kind) capture which emphasizes the importance of independent regional media as tools in the fight against capture and corruption.

Our second key variable, *literacy*, also shows to have a significant negative impact on “cash” as well as “in-kind” capture. This finding indicates that capture of cash and in-kind programs is negatively related with the level of education of the intended beneficiaries, consistent with the hypothesis that monitoring costs, which are a function of local human capital, are an important factor. More specifically, we find that a 10% increase of the average literacy rate in the commune is associated with a decrease in the probability of cash capture of 26 percentage points in the absence of radio access (Table 6). Hence, promoting an increase in monitoring capacity and as a result intensive monitoring by the beneficiaries will decrease capture in the cash grants system. On the other hand, the effect of *literacy* is

¹³ The recalculations are not reported in the tables.

significantly weaker on the likelihood of capture of in-kind transfers. A 10% increase of the average literacy rate in the commune is associated with a decrease in the probability of in-kind capture of only 2 percentage points (in the absence of radio access). The odds-ratio plot (Figure 2) confirms our results and shows that “no”, “in-kind” and “cash” capture are all three significantly differentiated by the level of education of the recipients. The latter entails that a higher average literacy rate in the commune increases the odds of “in-kind” relative to “cash” capture. This confirms our second hypothesis that higher monitoring costs of the in-kind funding scheme make it more likely that capture of in-kind grants occurs compared to cash transfers. It could also be an indication that intensive (bottom-up) monitoring by the beneficiaries of the services is not sufficient to eradicate capture.

The interaction effect, *radio*literacy*, has a significant positive impact on the likelihood of “in-kind” capture implying that *radio* and *literacy* each reduce “in-kind” capture, but that their impacts are partly offsetting. Although our findings suggest that the impact of radio access on “in-kind” capture is significant, the impact is rather small. Our results recalculated at the mean of *literacy* suggest that access to a radio outlet decreases the likelihood of “in-kind” capture with 11 percentage points. In sum, intensive monitoring together with increased public access to information (through the mass media) do not appear to be sufficient and should be combined with the use of the right, i.e. easily traceable, public funding instrument (as in our case study cash grants) in order to eradicate capture.

In addition, we find that a higher distance between the capital and the district facility level increases the probability of “cash” and of “in-kind” capture compared to the reference state of “no” capture as *district_capital* is significant with a positive sign in all columns in Table 5. This finding is consistent with the results of Olken (2005) and Francken *et al.* (2009). 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. More specifically, we can conclude that being 100km closer to the centre is associated with a decrease in the probability of “cash” and “in-kind” capture of 15 and 2 percentage points respectively compared to the reference state of “no” capture. These results seem to indicate that, besides the aforementioned difference in bottom-up monitoring costs, there is also a difference in top-down monitoring costs (i.e. the monitoring costs of the donor of the services) between the two instruments of public funding implementation. Though, a more detailed analysis on this matter is beyond the scope of this paper and future research should be encouraged to confirm this result.

Schools situated in highly unsafe districts or in communes that suffered from cyclical droughts experience a higher likelihood of capture of “cash” and “in-kind” grants compared to the reference state of “no” capture. *Red_district* and *drought* both appear to be significant with a positive sign in all columns of Table 5. More specifically, our findings suggest that living in a highly insecure district will increase the probability of “cash” capture with 65 percentage points, at the means of all other variables and compared to the reference state of “no” capture. Schools that are situated in areas suffering from cyclical droughts will show an 80 percentage points’ higher probability of “cash” capture.

6.3. *Additional tests and discussion*

We explored several potential concerns with the analysis. First, as there might be some concern that we combine two different scenario’s in option 3 i.e. cash with in-kind and cash without in-kind capture and that the reported discrepancies in the former scenario could mainly be driven by incompetence rather than capture, we conducted our analyses without those schools that reported both “cash” and “in-kind” capture. The results are illustrated in Table 7 and are partly consistent with our earlier findings. A higher education level of the

intended recipients decreases the likelihood of “cash” as well as “in-kind” capture of funds. Yet, the impact of *literacy* is considerably smaller on “in-kind” compared to “cash” capture. Radio access also significantly reduces the likelihood of “cash” as well as “in-kind” capture. However, the marginal effect of *radio* on “cash” capture appears to be considerably smaller than the marginal effect of *radio* on “in-kind” capture which does not correspond with our previous results.

Second, as we are merely interested in cash versus in-kind capture, we decided to only take those schools into account that suffered from “cash” or “in-kind” capture. Our dummy variable *in-kind_cash* equals one if the schools reported to have suffered from “in-kind” capture (and not from “cash” capture); and zero otherwise. The results in Table 8 show that a higher average literacy rate of the beneficiaries will significantly increase the likelihood of “in-kind” capture compared to “cash” capture. This confirms our earlier findings and suggests that the difference in capture is not due to the difference in information costs but due to the difference in monitoring costs of the two public funding instruments. It could also be an indication that intensive (bottom-up) monitoring by the beneficiaries of the services is not sufficient and should be combined with the use of the right public funding instrument in order to eradicate capture.

Third, one could argue that the placement of radio towers is not an exogenous process. To correct for potential bias, we looked more closely into matching schools with similar observable characteristics, and only different in radio access. We tried to apply matching techniques from the average treatment effects literature to estimate the impact of radio access on the likelihood of both “in-kind” (versus no) capture and “in-kind” versus “cash” capture. However, our data did not allow for estimating the average treatment effects due to a lack of matched control units. More specifically, the sample size of schools with information on “in-kind” capture is already smaller than the sample size of schools with

information on “cash” capture. Matching schools considerably reduced the sample size, leading to a lack of matched control units.

Fourth, to test for the independence of irrelevant alternatives (IIA), we conducted a Hausman and a Small-Hsiao test. In results not reported in the tables, the IIA holds according to the Hausman test, but is violated in the Small-Hsiao test. However, Long and Freese (2006) state that this is very common, and it often indicates that the IIA has not been violated. McFadden (1973) suggests that models estimated with multinomial logit should only be used if outcome categories can be plausibly differentiated and weighed independently by decision-makers. We believe the latter to be the case as in our example the district bureaucrats can clearly distinguish and choose between no capture, capture within the cash transfers and/or the in-kind contributions scheme.

Fifth, there could be some potential problems with including the average literacy rate in the commune in the model as such. There could be a selection bias as active families choose to live in communes with a higher educational level i.e. higher literacy rates and these families also monitor school funding better. However, Madagascar has a particular geographical composition and rather low internal migration. Hence, we do not believe selection bias is of a major concern. Moreover, we partly control for it by comparing two different public funding schemes. Finally, if selection bias would be the case, we would also expect that the active families would be able to monitor the in-kind funding system better, but our results do not indicate the latter.

In summary, our findings seem to suggest that the difference in monitoring costs of the two public funding instruments is responsible for a higher prevalence of in-kind capture compared to cash capture. This could indicate that intensive monitoring is not sufficient and should be promoted in combination with the right instrument of public funding implementation in order to curb capture.

7. Conclusion

This paper has used data on public education expenditures in Madagascar to investigate how the choice of instrument of public funding implementation affects capture. More specifically, we measure capture of cash versus in-kind funds from district to school level. The cash funding system is newly implemented since the beginning of the school year in which the survey was conducted (2002-2003) and is accompanied by several measures to increase public access to information. On the other hand, the in-kind funding system is characterized by a general lack of transparency and accountability.

First, we find that local capture of in-kind funds was much higher than capture of cash transfers. The central estimates are that 21% of the schools did not receive the cash grants they were entitled to; compared to a high 40% that did not receive all in-kind contributions they were supposed to receive. Capture was more likely to be found in highly unsafe and more remote districts and in areas that suffer regularly from cyclical droughts.

Second, local presence of mass media significantly decreases capture of cash as well as in-kind transfers. This result is consistent with findings of Reinikka and Svensson (2005) and confirms that independent regional media can be important tools in the fight against capture and corruption.

Third, capture of cash transfers is negatively related with the level of education of the intended beneficiaries, consistent with the hypothesis that monitoring costs, which are a function of local human capital, are an important factor. On the other hand, we find a significantly weaker relationship with the in-kind transfer programs. This result could indicate that enhanced monitoring by the intended beneficiaries is not sufficient to eradicate capture.

Finally, our findings taken together have implications for the debate on capture in public services. Intensive monitoring, together with increased public access to information

through the mass media do not appear to be sufficient. Our results suggest that these measures should be combined with the use of the right, i.e. easily traceable, public funding instrument in order to eliminate capture and corruption.

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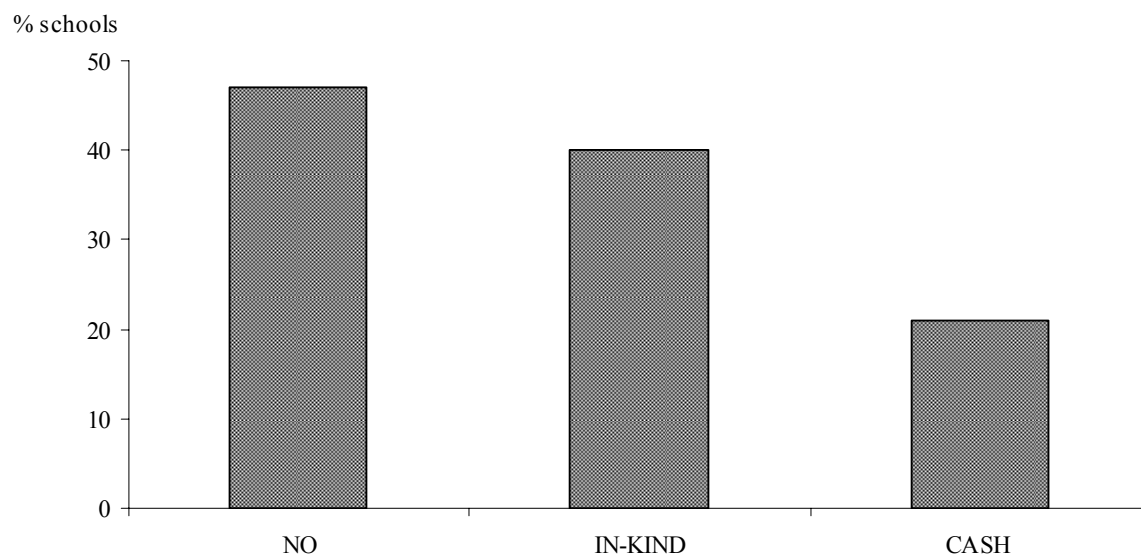


Figure 1: Capture of educational funds

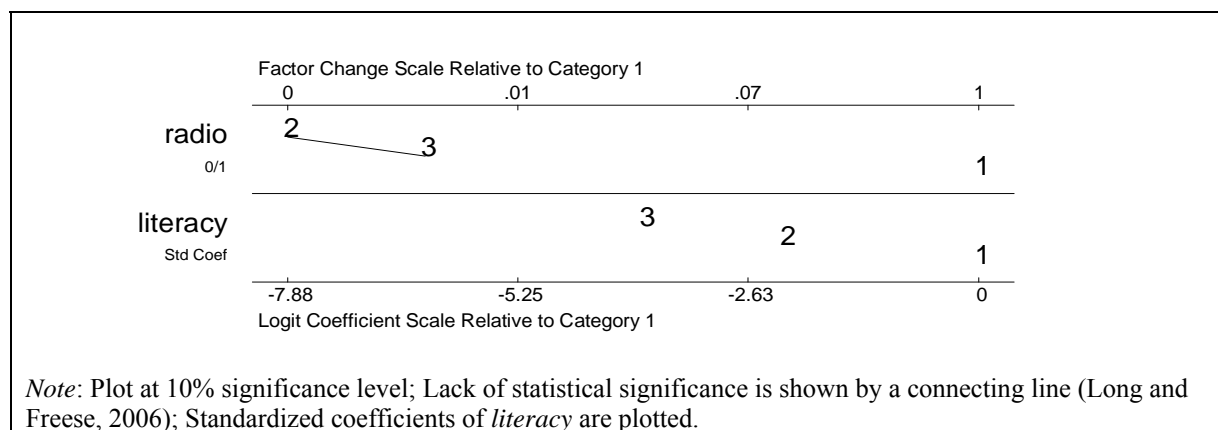


Figure 2: Odds-ratio plot

Table 1: Capture of cash and in-kind contributions

<i>In % of observations</i>		Capture of IN-KIND contributions			<i>Nr. of obs.</i>
		No	Yes	Total	
Capture of CASH funds	No	47	32	79	123
	Yes	13	8	21	33
Total		60	40	100	156
<i>Nr. of obs.</i>		94	62	156	

Table 2: Perceived clarity of bookkeeping versus discrepancies in cash/in-kind funds

<i>In % of observations</i>		PERCEIVED CLARITY	
		CLEAR	NOT CLEAR
At SCHOOL level:			
No discrepancies		83	17
Discrepancies in...			
1/ IN-KIND funds		69	31
2/ CASH funds		75	25
3/ CASH & IN-KIND funds		38	62

Source: Francken, 2003.

Table 3: Mean invoice and retail prices at district facility level (school year 2002-2003)

Material	Mean invoice price at Cisco level (in FMg)	Mean retail price at district level (in FMg)	Invoice price difference
Pen	1,414	1,177	+ 20%
Slate	3,171	2,822	+ 12%
Notebook 50 pages	2,088	1,525	+ 37%
Glue	5,816	3,203	+ 82%

Source: Francken, 2003; *Note:* In 2002, the Francs Malagasy was the legal currency in Madagascar.

Table 4: Description of the dataset

CAPTURE		NO*	IN-KIND**	CASH***
<i>Variable</i>	<i>Unit</i>	<i>Mean</i>	<i>Mean</i>	<i>Mean</i>
Information cost				
Radio	Dummy	0.8	0.8	0.4
Monitoring cost				
Literacy	Percent	73.9	72.1	43.5
Control variables				
District capital	Km	461.9	550.3	820.0
Red district	Dummy	0.2	0.3	0.5
Schoolsize	Percent	1.2	1.4	0.8
Drought	Dummy	0.1	0.4	0.5
Observations		74	49	33

Note: * Option 1 (base category); ** Option 2; *** Option 3

Table 5: Radio coverage and literacy rates

CAPTURE		NO*	IN-KIND**	CASH***
	<i>Nr. of obs.</i>	<i>% of obs.</i>	<i>% of obs.</i>	<i>% of obs.</i>
Radio coverage				
No	46	37	24	39
Yes	110	52	34	14
Literacy rate (in %)				
0-50	34	12	23	65
51-100	122	57	34	9

Note: * Option 1 (base category); ** Option 2; *** Option 3

Table 6: Multinomial regression results with no capture (option 1) as base category

	IN-KIND capture			CASH capture		
	Coeff.	z-value	Marg. Eff. ¹	Coeff.	z-value	Marg. Eff. ¹
<i>Radio</i>	-7.881	-3.83***	-0.333	-6.310	-2.10**	-0.594
<i>Literacy</i>	-0.094	-2.97***	-0.002	-0.162	-3.67***	-0.026
<i>Radio* literacy</i>	0.109	3.37***	0.003	0.062	1.21	0.010
Control variables	YES					
<i>District_capital</i>	0.008	2.40**	0.000	0.009	2.78***	0.001
<i>Red_district</i>	1.559	2.02**	0.007	3.460	2.71***	0.646
<i>Schoolsize</i>	0.100	0.40	0.002	0.177	0.58	0.029
<i>Drought</i>	2.266	2.41**	0.003	4.659	3.87***	0.796
Provincial Dummies	YES					
No. observations	156					
Pseudo R2	0.407					

Note: ¹Marginal effects, but discrete changes are reported for dummy variables; Robust standard errors adjusted for clustering on districts; significance levels of 10, 5 and 1% are represented by *, ** and ***.

Table 7: Multinomial regression results with no capture (option 1) as base category and excluding the observations with inconsistencies in reports on both cash and in-kind funds

	IN-KIND capture			CASH capture		
	Coeff.	z-value	Marg. Eff. ¹	Coeff.	z-value	Marg. Eff. ¹
<i>Radio</i>	-9.790	-2.95***	-0.869	-5.726	-1.87*	-0.100
<i>Literacy</i>	-0.107	-3.44***	-0.003	-0.181	-3.76***	-0.010
<i>Radio* literacy</i>	0.136	2.90***	0.004	0.045	0.89	0.002
Control variables	YES					
<i>District_capital</i>	0.009	2.32**	0.001	0.008	2.39**	0.001
<i>Red_district</i>	1.885	2.12**	0.066	2.251	1.59	0.198
<i>Schoolsize</i>	0.075	0.32	0.002	0.063	0.16	0.003
<i>Drought</i>	2.818	2.13**	0.041	5.227	2.94***	0.700
Provincial Dummies	YES					
No. observations	143					
Pseudo R2	0.384					

Note: ¹Marginal effects, but discrete changes are reported for dummy variables; Robust standard errors adjusted for clustering on districts; significance levels of 10, 5 and 1% are represented by *, ** and ***.

Table 8: Probit regression results with cash capture as base category

IN-KIND capture			
	Coeff.	z-value	Marg. Eff. ¹
<i>Radio</i>	-0.094	-0.06	-0.018
<i>Literacy</i>	0.073	3.64***	0.014
<i>Radio* literacy</i>	0.014	0.56	0.003
Control variables	YES		
<i>District_capital</i>	0.001	0.23	0.001
<i>Red_district</i>	-1.045	-1.15	-0.204
<i>Schoolsize</i>	0.059	0.26	0.012
<i>Drought</i>	-1.130	-1.40	-0.221
Provincial Dummies	YES		
No. observations	69		
Pseudo R2	0.424		

Note: ¹Marginal effects, but discrete changes are reported for dummy variables; Robust standard errors adjusted for clustering on districts; significance levels of 10, 5 and 1% are represented by *, ** and ***.

ANNEX

B.1. Data description

Capture of cash funds = dummy variable with value one if there was a discrepancy between HIPC cash funds recorded as sent by the district facility level and noted as received in the public primary school records; and zero otherwise (Source: Budget Tracking Survey, 2003);

Capture of in-kind contributions = dummy variable with value one if there was a discrepancy between the in-kind contributions recorded as sent by the district facility level and noted as received in the public primary school records; and zero otherwise (Source: Budget Tracking Survey, 2003);

Radio = dummy variable with value one if the people reported to have clear access to at least one (private) regional radio station people in the commune (Source: Post-crisis Survey, 2002);

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

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);

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);

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).