Corrupting Learning:

Evidence from Missing Federal Education Funds in Brazil*

Claudio Ferraz† Frederico Finan‡ Diana B. Moreira

PUC-Rio UC-Berkeley Harvard University

September 2011

Abstract

This paper examines if money matters in education by looking at whether missing resources due to corruption affect student outcomes. We use data from the auditing of Brazil's local governments to construct objective measures of corruption involving educational block grants transferred from the central government to municipalities. Using variation in the incidence of corruption across municipalities and controlling for students', schools' and municipal characteristics, we find a significant negative association between corruption and the school performance of primary school students. Students residing in municipalities where corruption in education was detected score 0.35 standard deviations less on standardized tests, and have significantly higher dropout and failure rates. Using a rich dataset of school infrastructure and teacher and principal questionnaires, we also find that school inputs such as computer labs, teaching supplies, and teacher training are reduced in the presence of corruption. Overall, our findings suggest that in environments where basic schooling resources are lacking, money does matter for education achievement.

JEL: D73, I21, H72

---

*We are grateful to the staff at the CGU for support and clarifications of the auditing process, and to Elaine Pazzelo and Roberta Biondi for help with the education data. We thank David Card, Miguel Foguel, Seema Jayanchandran, Enrico Moretti, Ted Miguel, Sergei Soares, Fernando Veloso and seminar participants at BREAD, GRADE, Ibmec-Rio, IPEA-Rio, Notre Dame, PUC-Rio, RAND, USP for comments and suggestions. We also thank Tássia Cruz, Carolina Grottera, and Marcio Nery for excellent research assistance. Financial support from CCPR and CNPq is gratefully acknowledged.

†Department of Economics, Pontifícia Universidade Católica do Rio de Janeiro (PUC-Rio), Rua Marquês de São Vicente, 225- Gávea Rio de Janeiro, RJ, 22453-900, Brasil. Email: cferraz@econ.puc-rio.br; and BREAD

‡Department of Economics, 508-1 Evans Hall, Berkeley, California 94720-3880. Email: ffinan@econ.berkeley.edu; and BREAD, IZA, NBER

1 Introduction

The focus of most education reforms around the world has been to provide more resources to public schools. But whether more resources lead to improvements in student outcomes is highly disputed, due in large part to the difficulties in evaluating these types of policies.[1] The evaluation of policies aimed at providing more resources to schools is complicated for at least two reasons. First, those involved in the educational process may respond to the policy in ways that might dampen its effects – local officials may cut back on educational funding from local taxes or other revenue sources, teachers may feel less of a need to compensate for the lack of resources and in so doing provide less effort in the classroom, or similarly parents might decide to provide less inputs at home.[2] Second, resources transferred from higher level offices can be expropriated by the local government or school-level officials. In the presence of leakages, reported transfers to schools do not translate into school inputs.[3]

Evidence from cross-country data supports the idea that leakages can reduce educational quality. As seen in Figure 1, there is a strong negative association between a country's corruption level and its performance on the international standardized exams.[4] But there are several reasons why one should be cautious about interpreting this relationship as causal. First, there are many institutional and cultural differences across countries that determine both its level of corruption and the quality of education. Moreover, as it has been well documented, subjective cross-country measures of corruption are subject to important shortcomings (Svensson 2005). Thus, despite its importance, empirical evidence on the effects of leakages from educational funds on student outcomes remains remarkably sparse.

This paper examines whether money matters in education by looking at whether missing resources due to corruption affect student outcomes. We use data from public schools in Brazil where locally-provided primary education is mostly funded by block grants from the central government. Brazil provides an ideal case to examine the effects of corruption in education. Despite significant expenditures on primary schooling per pupil, the performance

[1] See for instance Hanushek (1996), Hedges, Laine, and Greenwald (1994), Glewwe and Kremer (2006).

[2] See Todd and Wolpin (2003), Das et al. (2011), Pop-Eleches and Urquiola (2011).

[3] Although the divergence of public sector resources is more common in developing countries (Reinikka and Svensson (2004)), there is also evidence that bureaucrats in developed countries also use creative accounting to divert funds (Baicker and Staiger (2005)).

[4] Figure 1 plots the relationship between the performance on the PISA international exams in 2006, after accounting for expenditures on primary schooling per pupil, and a country's corruption index. The PISA examination is available in 2006 for 56 countries when we include only those countries for which we also have information on spending in primary education per pupil. The corruption index is from Kaufmann, Kraay, and Mastruzzi (2009), we invert the sign of the corruption control index.

of students on the international PISA examination is among the worst in the world (see panels A and B of Figure 2). Even within Brazil, the association between spending per pupil and academic performance among primary school children in public schools is weak (see panels A and B of Figure 3). Finally, based on both official government audits, as well as accounts from the media, corruption involving education grants has become an overarching concern in Brazil.

To overcome the data constraints that have limited cross-country analysis, we build a novel dataset based on audit reports to quantify local-level corruption and mismanagement associated with grants earmarked for education.[5] This data set, which represents one of the first large scale attempts to measure corruption in education at a local level, has several advantages over the existing literature.[6] First, we have corruption information for not only educational grants, but also for transfers made in other sectors such as health and urban infrastructure. Because we can distinguish between corruption in education and corruption in other sectors, we can test whether our estimates reflect leakages from educational funds or simply capture the effects of overall corruption in the municipality. Second, the effects of corruption are identified separately from the effects of mismanagement practices in education. Corrupt politicians may have low management skills or hire poor managers, both of which may negatively affect educational outcomes. Our data allow us to distinguish between these different types of irregularities.[7]

We link municipal-level corruption measures to data on the educational achievement of primary school students across 1488 public schools located in 365 municipalities throughout Brazil. We use the variation in corrupt practices across municipalities to estimate the effects of "missing resources" on dropout rates, failure rates, and student achievement in a national standardized exam. We find that the educational outcomes of students residing in municipalities where corruption was uncovered are significantly lower than those of students residing in municipalities where no corruption was detected. For instance, test scores on a standardized Language and Math exam among 4^{th} graders are 0.30 standard deviations lower in corrupt municipalities. Corruption is also associated with higher dropout and failure rates among primary school children. We use complementary data sources to show that educational inputs are indeed lower in municipalities with more corruption. Based on Brazil's

[5]The data were constructed based on the audit reports used in Ferraz and Finan (2011), but exploiting the detailed reports from the educational grants.

[6]See Reinikka and Svensson (2004) for estimates of local capture of educational grants using expenditure tracking surveys.

[7]This is related to the distinction made by Bandiera, Prat, and Valletti (2009) on active and passive waste.

school census, we find that the percentage of teachers who had received pedagogical training is 10.7 percentage points lower compared to non-corrupt municipalities. Schools in corrupt municipalities are also less likely to have a computer lab. From independent directors' and teachers' surveys, we also find that both teachers and school principals of schools in municipalities where corruption was detected are much more likely to report the lack of resources and teaching supplies as being serious problems.

We undertake a series of robustness tests to make sure our results are indeed driven by "missing resources". First, we account for a large number of factors that are correlated with both corruption and test scores. These factors include not only the standard socioeconomic characteristics that have been showed to be associated with corruption (e.g. GDP per capita, urbanization, population size, and income inequality), but also various of the local institutional characteristics that allow the population to hold school managers accountable (e.g. presence of parent-teacher associations, elections for school principals, and the degree of community participation in school maintenance, etc). Second, we show that the results are robust to controlling for measures of corruption detected in other sectors (e.g. health and infrastructure). Controlling for corruption in sectors other than education is likely to proxy for many of the unobservable characteristics that are both correlated with corruption in education and determine student achievement. It will also capture any indirect effects that corruption in other sectors might have on student achievement. Third, using the audit reports we also construct a measure of mismanagement of education resources. This allows us to disentangle the effects of corruption from the effects of mismanagement. Finally, we conduct a placebo test in which we examine whether corruption in educational funds in the municipality affects the schooling outcomes of children attending private school. We do not find any evidence that public sector corruption is associated with the dropout and failure rates of children attending private school, suggesting that children are neither sorting into private schools nor that differences in education performance are driven by municipal level unobserved characteristics.

Our findings contribute to the literature that examines whether resources matter for education. We show that a reduction in the availability of resources driven by corruption has negative effects on student outcomes. This is consistent with recent experimental and quasi-experimental evidence showing that increases in school inputs affect student outcomes (e.g. Muralidharan and Sundararaman (2011), Clark (2009), Duflo, Hanna, and Ryan (2010)). It is also consistent with Harbison and Hanushek (1992) who finds that, when schools lack even the most basic resources such as permanent physical structure, textbooks, and teachers with

completed secondary education; resources can in fact have positive effects.

This study contributes more broadly to the literature on the consequences of corruption. While there is a general agreement among academics and policy makers that corruption harms economic development, with few exceptions, the evidence is based on cross-country comparisons using subjective or self-reported measures of corruption (e.g. Mauro (1995)). Our study complements a growing literature showing that leakages from public funds create inefficiencies in the delivery of public goods and services.[8]

Our results are most closely related to Bjorkman (2007) and Reinikka and Svensson (2011) who use variation from an information campaign to measure the effects of a reduction in corruption on student outcomes. But our study differs in several aspects. First, we provide evidence on the mechanisms that link corruption to student outcomes. We use a rich dataset of school infrastructure and teacher and principal questionnaires to show how school inputs such as teachers with a higher education degree, computer labs, resources and teaching supplies, and teacher training are reduced in the presence of corruption. Second, we exploit the richness of the audit reports to build different measures of corruption and mismanagement.

The paper proceeds as follows. Section 2 provides an overview of Brazil public education system and corruption program that conducted the audit reports. Section 4 describes our conceptual framework and outlines our empirical strategy. In Section 3, we describe the data, including how our corruption measures were coded. Section 5 presents our results, and Section 6 concludes.

2 Background

2.1 Decentralization and Block Grants for Education

Brazil transfers over US$2.2 billion in educational grants to municipal governments and spends 4.1 percent of its GDP on public education per year. Unfortunately, these expenditures have not led to many improvements in academic performance. For instance, on the 2006 Programme for International Student Assessment (PISA) test among 15 year old students, Brazil ranked 54th among 57 countries in mathematics and ranked 49th out of 56 countries in reading. Brazil also placed well below Mexico and Argentina, both of which

[8]See Chaudhury et al. (2006) who provides evidence on the widespread teacher and health worker absenteeism in developing countries; Olken (2006) who examines corruption in redistributive programs; Niehaus and Sukhtankar (2011) who examine leakages from public employment programs.

spend on average similar amounts on primary education.

Brazil's local governments bare much of the blame for this poor performance. The constitution dictates that states and municipal governments share the responsibility for the provision of primary and secondary education. In practice, however, most state governments manage secondary schools, while municipal governments manage primary schools (*ensino fundamental*). By 2005, approximately 85% of all first to fourth grade primary schools were managed by municipal governments.[9] In order to guarantee adequate investments in education, Brazil's constitution mandates that at least 25 percent of all state and municipal revenues are spent for educational purposes. Local governments are thus responsible for building schools, providing adequate infrastructure, distributing school lunches and school transportation, training teachers, and paying salaries.

To cover these costs, the federal government transfers to states and municipalities large sums of resources in the form of block grants.[10] Also, a new financing scheme named FUNDEF was created in 1997 to equalize the amount of resources available for education across regions.[11] It consists of a state fund to which state and municipal governments contribute 15 percent of specific taxes and transfers. The fund, which totaled US$13.7 billion in 2005, is then redistributed to state and municipal governments on the basis of student enrollment. The federal government supplements local governments in states where per student allocations fall below an established spending floor. The FUNDEF constitutes a large share of resources available to mayors, but the use of resources is not completely free. For instance, the rule stipulates that at least 60 percent of FUNDEF revenues must be spent on teachers' salaries.

To monitor the use of these federal funds and ensure compliance with federal guidelines, local councils were established comprised of representatives of the municipal government, teachers, and parents.[12] Unfortunately, these councils have been mostly ineffective. They have either been captured by local mayors or do not meet regularly enough to effectively monitor the use of these resources (Transparência Brasil 2005). That these local councils are unable to fulfill their role as an effective watchdog is not too surprising. Throughout

[9]See Madeira (2007) for details of the school decentralization process and its impacts in the state of São Paulo.

[10]The largest block grant, called Fundo de Participação dos Municípios, was created in the 1960s and distribute resources to municipalities based on their population and the state's income per capita.

[11]FUNDEF stands for Fundo de Manutenção e Desenvolvimento do Ensino Fundamental e de Valorização do Magistério. See Gordon and Vegas (2005) and Menezes-Filho and Pazello (2007) for a detailed description of FUNDEF.

[12]These councils are called *Conselhos de Acompanhamento e Controle Social*.

Brazil, local governments are under the control of elites and powerful mayors who often divert resources for their own benefits.[13]

2.2 Embezzlement and Misuse of Educational Block Grants

With the large influx of intergovernmental transfers to municipalities, the potential for local capture has increased considerably over the past two decades in Brazil. Resources for education have become particularly attractive targets for rent-seeking politicians, with much of the embezzlement involving funds from FUNDEF, which despite being the largest block grant, is effectively unmonitored.[14]

The principal reason for the lack of oversight has to do with the fact that no government agency was ever assigned to monitor the resources. According to the laws that govern FUNDEF, each municipality is required to transfer 15 percent of its revenue to a state fund that is redistributed to municipalities based on the share primary school students enrolled relative to total state enrollment. Since redistribution takes place within states, similar municipalities across different states receive different amounts of FUNDEF funds. The federal government then complements the amount municipalities receive if a minimum spending per pupil is not met. Because all three spheres of government (municipal, state and federal levels) contribute to this fund, the laws do not specify which tier of government should be responsible for monitoring. As a result, prior to the introduction of the audit program in 2003, the spending of these funds went largely unmonitored.[15] Because of the lack of oversight associated with FUNDEF funds, we would expect corruption in education to be higher in places that receive a higher share of their educational resources from FUNDEF. We test this prediction in the next section.

Cases of mayors diverting resources from these educational block grants are numerous. During 2005 alone, there were 26 news stories about the misuse of FUNDEF resources in the Brazilian press.[16] Some examples are helpful to illustrate how prevalent the problem has become. In the municipality of Placas, in the North of Brazil, the ex-mayor could not

[13]Corruption at the local level is not unique to Brazil. Elite capture of public resources at local levels is a serious concern for several countries throughout the world (Rose-Ackerman 1999).

[14]In a report by Transparência Brasil, based on audits executed by the Controladoria Geral da Unio (CGU), the federal government controller's office, estimated that approximately 13% to 55% of FUNDEF's total budget between 2001 and 2003 was lost to fraud. Transparência Brasil (2005).

[15]In 2010, the Federal Auditors' Court (TCU) ruled that the legislation creating FUNDEF did not in fact assign any entity to monitor the use of its resources and that it was not the responsibility of the National Fund for Educational Development (FNDE), the branch responsible for making all educational transfers of federal resources to municipalities.

[16]See www.deunojornal.org.br/busca.php?assunto=463

account for US$1.25 million of FUNDEF funds between 2003 and 2004. Moreover, when auditors asked the new mayor that took office in 2005 for documents and receipts, he said that all documents disappeared from the archives during the government transition.[17] The new mayor of Camaragibe, state of Pernambuco, also had a surprise when he took office in January 2005. He discovered that US$400,000 from the FUNDEF account was transferred by the ex-mayor to a private bank account.[18]

Examples of teachers not receiving their full salaries are also widespread. In May 2009, approximately 90 percent of municipal school teachers in Itabuna, Bahia received less than half of their monthly salary, after approximately US$100,000 "disapeared" from the FUNDEF account.[19] In the municipality of Senador Alexandre Costa, Maranhão, teachers did not receive their 13th monthly salary and bonus because the mayor had diverted all of the funds from FUNDEF. By April 2007, despite the school year having started in early February, all municipal schools were still closed and without energy due to the lack of payments.[20] In Gonçalves Dias, state of Maranhão, 129 municipal teachers did not received their salaries during 9 months in 2004. They went on strike and it was only in December that the municipal government paid part of their earnings. The new mayor, who inherited the debt, negotiated to pay only 40 percent of the back pay in exchange for having the new salaries paid on time.[21]

Mayors have engaged in other forms of coercion as well. For instance, in the municipality of Traipu, a geography teacher and local representative of the teachers' union, was transferred from an urban school where she taught geography to high school students to a rural school to teach small children after she denounced the mayor's misuse of educational grants. In the municipality of Viçosa, Alagoas students that participated in protests were forbidden to use the municipal bus that transports students to the only secondary school, which was located in the neighboring municipality.[22] The small city of Satuba in Alagoas provides a particularly extreme case. In June 2003, Paulo Bandeira, a teacher started a campaign to

[17] "Dinheiro do FUNDEF é o maior alvo de desvios", O Globo 06/25/2006.

[18] "Desvio do FUNDEF atrasa salários de professores", O Globo 03/27/2005.

[19] See "Professores de Itabuna recebem só metade do salario", in the Blog *Pimenta na Muqueca*, assessed in 05/04/2009.

[20] Taken from a public complaint made by a citizen from Senador Alexandre Costa on a public email sent to Arlindo Chinaglia, the President of the National Congress, in April 2007.

[21] According to Francisco Carlos Custódio, the municipal Secretary of Education for Gonçalves Dias: "Many teachers were angry with the situation, but accepted the offer because they were afraid of not receiving their future salaries." (*Desvio do FUNDEF atrasa salários de professores*, O Globo 03/27/2005).

[22] See the report "Irregularidades na utilização de recursos públicos - Alagoas", written by the NGO *Ação Educativa*, available at http://www.acaoeducativa.org.br.

denounce the mayor for embezzling funds. Soon after, he was found tortured and killed.

While mayors have found ways of coercing teachers, this does not suggest that all cases of corruption go unpunished. In 2005 the Federal Police arrested 8 mayors and 4 ex-mayors in the state of Alagoas with charges of diverting US$1 million from the FUNDEF.[23] The ex-mayor of Cocal, in the state of Piaui, was also arrested accused of diverting US$1.2 million from the FUNDEF. He had already been impeached from public office in 2008 for corruption allegations.[24] In December 2008, after a long investigation, the Federal Police arrested 9 mayors, 7 municipal secretaries and 64 public servants for diverting resources from education and health funds in 16 municipalities in the state of Bahia. The police estimated that approximately US$11.5 million was embezzled.[25] In April 2009, the Federal Police arrested four ex-mayors and 17 other persons in the municipalities of Montes Altos, São Pedro da Água Branca and Governador Edison Lobão, in the south of Maranhão. They were accused of diverting R$6.5 million from educational grants during 2008.[26]

Given its prevalence in the education sector, corruption can severely impact a student's ability to learn through a variety of ways. First, when teacher salaries are delayed or not paid in full due to corruption, this can affect teachers' motivation or the functioning of the school. In some cases, teachers go on strike or the school shuts down. Second, school quality is also comprised when funds intended for new classrooms or school supplies are diverted. Insufficient school inputs may not only have a direct effect on a student's ability to learn but also affect a teacher's ability to teach. Third, corruption also occurs in the provision of school lunches. For children of poor households, these meals can represent an important source of daily calories. If corruption reduces these calories, then enrollment or regular attendance may suffer.

In sum, Brazil's local governments receive large sums of resources through educational block grants.A significant share of these resources is misused and diverted, thus affecting educational quality. Brazil's local governments provide an ideal setting to examine how local corruption affects educational outcomes. Next, we describe Brazil's anti-corruption program and how we used the audit reports from this program to build measures of misuse and diversion of resources from educational block grants.

[23]See O Globo, "Dinheiro do FUNDEF é o maior alvo de desvios". 25/06/2006)

[24]"PI: ex-prefeito é preso por desvios de fundo do Fundeb e do FUNDEF", Correio Braziliense, 01/30/2009

[25]See A Tarde, "Prefeitos envolvidos na Operação Vassoura-de-Bruxa devem ser ouvidos até sexta".

[26]See "PF prende quatro ex-prefeitos e mais 17 pessoas no MA", Estado de S.Paulo 04/28/2009.

3 Data

Our empirical analysis combines three different data sources. First, we use information contained in the audit reports of Brazil's anti-corruption program to construct our measures of corruption and mismanagement in the education sector. Second, we collect information on various schooling outcomes and student characteristics, which we aggregate to the school level. The third data source contains information about the socio-economic characteristics of the municipality. Because the identifying variation is at the level of the municipality, accounting for differences across municipalities will be important for our analysis.

3.1 Building Measures of Corruption and Mismanagement of Educational Funds

Widespread corruption scandals in municipalities have led to a growing concern over the misuse of federal funds. In May 2003, the federal government started an unprecedented anti-corruption program based on the random auditing of municipal government's expenditures. The program, which is implemented through the *Controladoria Geral da União* (CGU), aims at discouraging misuse of public funds among public administrators and fostering civil society participation in the control of public expenditures. The program started with the audit of 26 randomly selected municipalities, one in each state of Brazil. It has since expanded to auditing 50 and later 60 municipalities per lottery, from a sample of all Brazilian municipalities with less than 450,000 inhabitants. The lotteries, which are held on a monthly basis at the Caixa Econômica Federal in Brasilia, are drawn in conjunction with the national lotteries. To assure a fair and transparent process, representatives of the press, political parties, and members of the civil society are all invited witness the lottery.[27]

Once a municipality is chosen, the CGU gathers information on all federal funds transferred to the municipal government from 2001 onwards. Approximately 10 to 15 CGU auditors are then sent to the municipality to examine accounts and documents, to inspect for the existence and quality of public work construction, and delivery of public services. Auditors also meet members of the local community, as well as municipal councils in order to get direct complaints about any malfeasance.[28] After approximately one week of inspections, the auditors submit a report containing, for each inspected area (i.e education, health, ur-

[27] See Ferraz and Finan (2008) for a more detailed description of these audits.

[28] These auditors are hired based on a public examination, and prior to visiting the municipality receive extensive training on the specificities of the sampled municipality. Also, there is a supervisor for each team of auditors.

ban infrastructure), a list of government programs audited, the total amount of federal funds transferred, and a detailed list describing each irregularity found.[29] At the time of this study, audit reports were available for approximately 790 municipalities randomly selected across the first 16 lotteries of the anti-corruption program. From these 16 lotteries, we randomly selected the municipalities from 10 lotteries to measure corruption and mismanagement in education, health, and urban infrastructure, the three largest sources of federal transfers for municipalities.[30] Thus, in total, we construct indicators of corruption and mismanagement for 366 municipalities.

In order to build our measures of corruption and mismanagement, we read the report for each municipality and classify the irregularities listed by the auditors into several pre-established categories. We define three types of irregularities as acts of corruption: *diversion of public funds*, *over-invoicing*, and *irregular public procurements*. We classify *diversion of resources* as any irregularity involving the embezzlement of public funds. This typically occurs in two situations: 1) federally-transferred resources simply "disappear" from municipal bank accounts; and 2) the municipality claimed to have purchased goods and services that were never provided, which is determined when there is no proof of purchase and community members confirm that the goods were in fact not delivered. We classify *over-invoicing* as any irregularity in which auditors determined that the goods and services were purchased at a value above market price. We classify the irregularity as an *irregular public procurement* when there is an illegal call-for-bids and the contract is awarded to a "friendly firm". These firms are usually connected directly to the mayor and/or his family or some cases do not physically exist. Most cases of corruption involving illegal public procurements include any combination of: i) use of non-existing firms in the bidding process; ii) use of fake receipts to pay for goods and services; iii) over-invoicing of prices to increase the amount paid for the goods and services.

In addition to cases of corruption, we also construct measures of mismanagement. These are irregularities that are uncovered by the auditors, but do not involve any incidence of fraud. Administrative irregularities, however, may still affect the quality of education if they create inefficiencies in the allocation of school inputs. Some examples are useful to illustrate this measure. Municipalities that receive funds from the FUNDEF program are required to establish an active and independent community council to monitor the use of these funds. Auditors uncovered several cases where the council simply did not function. It either never

[29]For some irregularities, the amount of resources diverted are estimated by the auditors.

[30]As a result, we do not have data from lotteries 8, 11-13, and 15.

met or was led by a mayor's family member. Although this irregularity is not an act of corruption, the lack of a well functioning council prevents the effective use and monitoring of resources by civil society. Another common form of mismanagement is the use of resources that are mandated for other purposes. For instance, mayors have to spend at least 60 percent of resources from FUNDEF on teacher salaries. In some municipalities, auditors discovered that these resources were used to pay the salaries of other public servants or the purchase of gasoline for municipal cars. Again, even though this does not constitute the diversion of resources for private gains, it may affect the allocation of resources intended for education. Finally, public procurements require at least three firms to participate in the call-for-bids. Even in the case where the public good or service was provided (and is thus not considered corruption) the lack of competition in the bidding process might have led the government to overspend, thus creating distortions in the allocation of resources.

Using the classifications described above, we define three measures of corruption. First, an indicator for whether auditors detected any corruption in education. Second, we count the number of irregularities associated with corruption and divide by the number of service items audited. Third, we estimate the value of resources diverted (when information is available) and divide it by the amount of resources in education that were audited.[31] While the second and third measures capture the extent of corruption, corruption in education was only detected in 35 percent of municipalities, suggesting that the extensive margin may capture most of the relevant variation in the data. So while we present results using all three measure of corruption, most of our analysis will focus on the corruption indicator. For mismanagement, most irregularities are not associated with values (e.g. lack of a council to monitor the use of funds) and virtually every municipality has some incident of mismanagement. Thus, we can only build measures counting the total number of irregularities.

Table 1 presents summary statistics of the corruption measures. Corruption in the area of education was discovered in 35 percent of municipalities. Among these municipalities, 35 percent of services items in education were found to be corruption and 8 percent of resources were diverted. Corruption in other sectors were also discovered in 50 percent of the municipalities, and on average 2 irregularities per service item were found to be associated with some type of mismanagement.

[31] Because some of the irregularities associated with corruption have missing values, the share of corruption is underestimated.

3.2 Data on Schooling Outcomes and Municipal Characteristics

We have two main sources of schooling data, both of which are aggregated at the school level. The data on test scores and student characteristics come from a national standardized examination of 4th and 8th graders called *Prova Brasil*. In 2005, the program conducted a standardized exam in the subjects of Mathematics and Portuguese given to all 4th graders enrolled in a public school with at least 20 students. In addition to the exam, the program conducted a survey designed to measure the child's socio-economic conditions. The survey includes not only information about the child: such as, gender, age, and race, but also information about the parents and home environment: such as, the education of the parents, whether the child lives with both parents, size of the family, whether the household owns a computer, and other assets. The wealth of information contained in the survey allows us to control for a host of characteristics that are likely to affect student achievement.

Our second principal data source comes from the 2005 and 2006 school census, referring to information from the 2004 and 2005 school year respectively. The census measures the basic conditions of schools in Brazil. Contained in the census is information about approval rates, dropout rates, and failure rates by school. There is also information regarding school conditions: such as whether the school has sanitation, or computer and science labs, as well as information about teachers: such as, years of experience and what proportion have a degree or are credentialed.

Table 2 provides summary statistics based on information from these surveys, as well as, basic socio-economic information about the municipality. In panel A, we see that the proportion of children with parents with at least high school degree is on average 16 percent. And on average 15 percent of children have a computer at home. The average dropout rate for schools in our sample is 4 percent, while failure rates are at 10 percent. Only 19 percent of schools have a computer lab and 4 percent of schools have a science lab.

From the 2007 *Prova Brasil*, we also have responses from a principal's survey and a teacher's survey. These surveys, which were conducted separately, asked whether the following four items were a serious concern at school: 1) lack of financial resources 2) lack of school supplies 3) lack of teachers to teach the courses 4) disciplinary problems among the student body. In both the teacher's and principal's survey, 55 percent of the schools cite a lack resources and school supplies as serious concerns. Only 23 percent cited a lack of teachers as an important concern.

Combining the test score data with the information from the audit reports, Figure 4 plots the distribution of test scores by whether or not corruption in education was detected in the

municipality. Consistent with the cross-country evidence, we find that the distributions of scores for both math and language in corrupt municipalities is to the left of the distributions of scores in municipalities where corruption was not found. On average, test scores are 15 points lower in municipalities where some corruption in education was detected. In the next sections, we investigate the robustness of this relationship.

4 Empirical Strategy

To estimate the effects of corruption on student achievement, let us assume that the academic achievement $A_{i,s,m,t}$ of an individual i attending school s in municipality m in grade g is determined by the following reduced-form equation:

$$A_{i,s,m,g} = \delta A_{i,s,m,g-1} + \gamma_t(Y_{m,g} - C_{m,g})$$

where $Y_{m,g}$ is the amount of the education funds per school, and $C_{m,t}$ is the amount per school that is diverted.[32] The parameter γ_g measures the effect of schooling resources on student performance, which may vary by grade level, and δ captures how much learning decays from one grade to the next. Under this value-added specification, a student's achievement at the end of the fourth grade is given by the following expression:

$$A_{i,s,m,4} = \sum_{g=1}^{4} \delta^{4-g}\gamma_g(Y_{m,g} - C_{m,g}) + \delta^4 A_{i,s,m,0}.$$

Given that our measure of corruption captures the average amount of diversion in education over a three year period, if we assume that corruption does not vary much across grades, we can rewrite the equation above as:

$$A_{i,s,m,4} = \beta C_m + \delta^4 A_{i,s,m,0} + \sum_{g=1}^{4} \delta^{4-g}\gamma_g Y_{m,g}$$

[32] We are assuming that the municipality's education budget is distributed evenly across schools, which is why we drop the schooling subscript, s. Thus, we do not consider the possibility that corruption affects one school disproportionately more than another.

where $\beta = -\sum_{g=1}^{4} \delta^{4-g}\gamma_g$. After averaging across students within a school, we arrive at the our estimation equation:

$$A_{s,m,4} = \alpha + \beta C_m + Z'_m\theta_1 + X'_{s,m}\theta_2 + \epsilon_{s,m} \tag{1}$$

where $A_{s,m,4}$ is the average student achievement of fourth graders in school s in municipality m, C_m is the level of corruption in education that was detected in the municipality, and $X_{s,m}$ is a vector of predetermined student characteristics (e.g. gender, age, race, etc) and family characteristics (e.g. parent's education, assets, etc) that will account for differences in the initial student achievement, $A_{s,m,0}$, of the student body. To proxy for $\sum_{g=1}^{4} \delta^{4-g}\gamma_g Y_{m,g}$, we control for total expenditure in primary school which is included in the vector Z_m along with a set of other municipal characteristics. The variable $\epsilon_{s,m}$ denotes a random error term that is clustered at the school-level. Given the value-added specification and under the assumption that $E[C_m\epsilon_{s,m}|X_m Z_{s,m}] = 0$, the coefficient β captures the discounted cumulative effects of corruption on student performance since the first grade.

Given our identification assumption, there are three broad classes of factors that are likely to affect our ability to interpret the causal effects of corruption on student achievement. First, as we know from the cross-country literature, corruption is not only negatively correlated with economic development, but test scores are also on average lower among countries that are less economically developed. In wealthier places, households will invest more in their children's education both because they have more financial resources to do so, but also because the returns to education might be higher due to different types of economic activities. In our regressions, we account for a municipality's level of economic development using municipal GDP per capita. We also control for other socio-economic characteristics that have been showed to be associated with corruption such as, urbanization, population size, and income inequality.[33] Second, local institutions that hold school managers accountable to the population are likely to improve school performance and reduce corrupt practices in education. We use detailed institutional data to control for the presence of parent-teacher associations, elections for school principals, and the degree of community participation in school maintenance. Third, the education policies of a municipality also reflect the preferences of the mayor. Mayors, who care more about education, will presumably be less willing to divert money away from education. To account for the mayor's preferences towards education, we control for several characteristics of the municipality and the mayor: the amount

[33]See for instance Ades and Di Tella (1999), Glaeser and Saks (2006), Glaeser, Scheinkman, and Shleifer (2003), La Porta et al. (1999), Reinikka and Svensson (2004), and Treisman (2000).

of spending per pupil, whether the municipality has an intergovernmental consortium in education, whether a school council exists, as well as the mayor's gender and schooling level.

In Table 3, we examine how these various characteristics correlate with our measures of corruption in education. Each column uses a different measure of corruption and for each one we estimate both a basic OLS model and a non-linear model accounting for corner solutions. Overall, the results suggest that municipalities with a larger urban population and greater inequality are associated with more corrupt practices while municipalities that hold elections for school principals, that have an educational council, and where the mayor holds a college degree are associated with less corruption.[34]

Given that our most robust specification controls for all these potential determinants of corruption, a natural question becomes: what is the variation that allow us to identify the effects of corrupt practices on schooling outcomes. The identifying variation comes from how the Federal Government monitored and audited intergovernmental transfers in education prior to the introduction of the audits program. As we discussed in the Section 2, municipalities fund their expenditures in education from a variety of sources. These funding sources, however, are subjected to different degrees of monitoring under Federal law. Consequently, municipalities receiving the same amount of educational resources can experience, for arguably exogenous reasons, quite different amounts of monitoring.

To see how variation in the degree of monitoring might affect corruption, consider the cause of FUNDEF. As we mentioned previously, despite the fact that FUNDEF represents almost 80 percent of the intergovernmental transfers used for education, these funds are essentially unmonitored. Thus, we would expect more corruption in education in places that receive a higher share of their educational funding from FUNDEF. In the first row of table 3 we find that municipalities with a larger share of revenues from FUNDEF have, on average, more corrupt practices: a one standard deviation increase in the share of educational funds from FUNDEF increases the probability of corruption in education by 8 percentage points, or 23 percent. This result is consistent with the idea that the decentralization of responsibilities financed by intergovernmental transfers, rather than local revenue collection, allow local officials to ignore the consequences of mismanagement because they are less accountable to local taxpayers.[35]

Even controlling for the observable characteristics described above, we might still be worried that municipalities with less corruption may offer more public goods and other

[34]The results for the share of audited resources with corruption in education are less precisely estimated.
[35]See Fan, Lin, and Treisman (2009); Fisman and Gatti (2002)

amenities that might affect student achievement. For instance, mayors who care about education may also care about improvements in health, and may also refrain from corruption in the health sector. Because the health of a child is also likely to affect his academic achievement, our estimates may also be capturing the effects of less corruption in the health sector. It may also be the case that families that value education may choose to live in municipalities with less corruption. In these situations, we will over-estimate the negative effects of corruption on education.[36]

To address these concerns, we present several robustness checks. First, we re-estimate Equation (1) controlling for corruption detected in other sectors (e.g. health and infrastructure). Controlling for corruption in sectors other than education is likely to proxy for many of the unobservable characteristics that are both correlated with corruption in education and determine student achievement. It will also capture any indirect effects that corruption in other sectors might have on student achievement. Second, using the audit reports we also construct a measure of mismanagement of education resources. This allows us to disentangle the effects of corruption from the effects of mismanagement.

Our third main robustness check uses private schools as a placebo test. Here, we re-estimate Equation (1) using educational outcomes of children who attend private school as the dependent variable. Under this specification, we would expect $\hat{\beta} = 0$, since corruption in public expenditures should not affect private school outcomes. Similarly, we also test whether the effects of corruption on educational outcomes differ in municipalities with private schools by estimating the following equation:

$$A_{sm} = \alpha + \beta C_m + \eta_1 P_m + \theta(P_m \times C_m) + Z'_m\delta + X'_{s,m}\gamma + \epsilon_{sm}$$

where P_m is an indicator for whether a private school exists in the municipality. If in corrupt municipalities more able students are sorting into private schools, then we would expect the interaction effect between corruption and the existence of a private school to be negative, i.e. $\theta < 0$.

5 Results

In this section we present the main empirical results of the paper. We begin by presenting estimates of the relationship between schooling outcomes and corruption in education. We

[36] If parents in corrupt municipalities compensate for the lack of schooling inputs then we would underestimate the negative effects of corruption.

then show that our estimates are robust across various specifications, including ones that control for the effects of mismanagement and corruption in other sectors. In the final part of the section, we explore the mechanisms that link corruption to poor schooling achievement.

5.1 The effects of corruption practices on educational outcomes

Table 4 reports estimates of the association between corruption and various schooling outcomes measured in 2005. The results are OLS estimates of a series of regression models based on Equation (1). Our base specification, which is reported in the odd columns, adjusts for several key school characteristics (e.g. gender, race, age, parent's education, household wealth, student-teacher ratio, etc) which are likely to affect the education production function. In the even columns, we augment this base specification to also include various characteristics of the municipalities (e.g. GDP per capita, population, Gini, etc).

Panel A presents estimates using as our measure of corruption the proportion of education items audited found to involve corruption. Across the various schooling measures, the negative effects of corruption are substantive. For instance, a 30 percentage point (or approximately one standard deviation) increase in corruption is associated with a 0.10 standard deviation decrease in test scores (columns 2 and 4), and a 0.6 percentage point increase in both dropout and failure rates (columns 6 and 8). These point estimates, while economically meaningful, are also highly robust to the inclusion of important controls that control for differences in labor market opportunities, such as GDP per capita and urbanization rates.

In Panel B, we present estimates using the share of resources in education found to be corrupt as an alternative measure of corruption. In reading the audit reports, it is difficult to calculate a dollar amount for every irregularity. Yet despite the imprecision associated with this measure, the results in Panel B tell a similar story. In columns 2 and 4 of Panel B, the estimates imply that a 5 percentage point increase in corruption is associated with a 0.04 standard deviation decrease in test scores. The share of audited resources found to be corrupt is also positively associated with both dropout and failure rates, but imprecisely estimated.

In Panel C, we present a third alternative measure of corruption: an indicator for whether or not corruption in education was detected. The results suggests that children residing in municipalities where corruption was detected fare much worse on the standardized exams than those with similar observable characteristics but residing in municipalities where no corruption was revealed. Based on the estimates presented in column 1, corruption in education is associated with a significant decrease of 0.35 standard deviations in test scores

(robust standard error = 0.076).

While columns 1-4 suggest that corruption may have affected learning, the results in columns 5-8 indicate that corruption may also affect a child's education attainment. Dropout rates are 2.9 percentage points higher in municipalities where corruption was detected, which represents almost a 65 percent increase from the average. Failure rates are also higher in corrupt municipalities (see column 7 and 8), which is consistent with the effects on test scores.

While all three alternative measures of corruption produce similar results, the measures presented in panels A and B have the potential advantage of capturing the effects of corruption along the intensive margin. However, given that only 35 percent of municipalities committed some act of corruption in education, the relevant variation in the data may simply be reflected in the extensive margin. In Figure 5, we plot the relationship between test scores and the proportion of items audited associated with corruption. As we see from this figure, the effects of corruption, while decreasing, are statistically similar once the proportion of items is larger than 0.1. While this relationship might appear puzzling, it is likely to reflect the fact that this measure does not capture the amount of resources diverted. Thus, committing one big act of corruption versus many small acts of corruption may affect education similarly. This explanation is consistent with what we see in Panel B when we plot the relationship between test scores and the share of resources involving corruption. Here, we find a much more consistently negative relationship between corruption and test scores, although as we mentioned previously, this variable is measured with much more noise.[37] For these reasons, in the remainder of the analysis, we use the indicator for whether or not corruption in education was detected as our main measure of corruption.

Overall, the results presented in Table 4 suggest that the effects of corruption on education outcomes are quite severe. Our findings are however comparable to those presented by Reinikka and Svensson (2011), who find that a 30 percentage point increase (or approximately one standard deviation) in corruption is associated with a 0.10 standard deviation decrease in test scores. Because their measure of leakage is continuous, we can compare this effect with our point estimates in Panel B of Table 4. When based on the share of resources associated with corruption, our estimates imply that an increase in corruption of 20 percentage points (or approximately one standard deviation) is associated with a reduction in test scores of 0.14 (for Math) and 0.18 (for Portuguese) standard deviations. Although our estimates appear

[37]Given these figures, it is perhaps not surprising that correlation between the proportion of items found to be corrupt and share of resources found to be corrupt is only 0.29.

slightly larger, recall that our measure of leakage represents an average over a 3 year period. Thus our effects are in fact slightly smaller than those reported by Reinikka and Svensson (2011) whose measure of leakage is based on a single year.

5.2 Robustness Checks

Controlling for Institutional Quality

The results presented in Table 4 suggest that corruption in education may have adverse effects on the educational outcomes of primary school children. An obvious concern with this interpretation is that our estimates may be capturing the effects of the overall quality of institutions in the municipality, rather than the effects of corruption in education per se. If municipalities with less corruption have better institutions and provide better public goods, which may also attract families who value education more, then our estimates will be biased upwards.

To address this set of concerns, in Table 5 we re-estimate our main specification controlling for corruption in other sectors, as well as, other measures of institutional quality at the local level (e.g. whether members of the community participates in the budgetary process (participatory budgeting) or has a judiciary district). This specification is useful for two reasons. First, it identifies the effects of corruption specifically in education, rather than potentially estimating a proxy for more general corruption. Second, by controlling for corruption in other sectors and other measures of institutional quality, we are accounting for many of the unobserved differences between municipalities that do and do not engage in corruption more generally. For instance, returns to education are often lower in places that are more prone to corruption, since these areas tend to be economically depressed and more reliant on local patronage practices. With this specification, we are, for example, able to capture any potential differences in the returns to education that were not necessarily accounted for by controlling for just differences in income across municipalities.

Corruption in other sectors also has a strong negative correlation with educational outcomes. For instance, in column 1 of Table 5, corruption in other sectors is associated with a 0.2 standard deviation decline in test scores, which is comparable to our main effects. This estimate reflects the fact that corruption in other sectors may not only be serving as an important proxy for other institutional characteristics of the municipality that adversely affect test scores, but is also capturing the negative indirect effects that corruption in sectors, such as health and sanitation, can have on test scores. We also see that even after controlling for

whether corruption in other sectors was detected, our estimates remain both economically and statistically meaningful. Overall these results suggest that our estimates are robust to unobservable factors that affect both schooling outcomes and a municipality's propensity to engage in corruption more generally.

Controlling for school institutions and preferences

Even after controlling for institutional differences across municipalities, our results still suggest that test scores and other educational outcomes are substantially lower in municipalities with more corruption in education. While encouraging, our specifications do not rule out the possibility that differences in educational institutions and policies across municipalities are confounding the results. For instance, it could be the case that parent-teacher associations, and other school/parent organizations, operate more effectively in municipalities where corruption was not detected. If these organizations also hold government officials more accountable then we would be overestimating the effects of corruption on student achievement. Also, it could be the case that mayors, who care more about education, both refrain for extracting rents in that sector, and also invests in complementary activities to promote education.

In the even columns of Table 5, we re-estimate the main regression model controlling for a series of variables intended to capture these differences in either preferences or local institutions specific to education. These variables either directly capture the efficacy of local schools and parent organizations (e.g. active PTA, existence of school council) or serve as proxies for the general level of civic engagement in the municipality (e.g. principal is elected, municipality uses participatory budgeting).[38] We find that test scores are higher in municipalities that either elect the principal or participate in intergovernmental consortiums. Yet controlling for these characteristics, as well as the other proxies, does not affect any of our original estimates. Even accounting for participatory budgeting and principal elections, both of which are negatively correlated with corruption in education, (e.g. point estimate on participatory budgeting= -0.212 with robust standard errors=0.105) has no effect on our estimates.

[38]Intergovernmental consortiums are entities managed by the civil society. They group municipalities to implement a certain action that individual municipalities are not capable of doing alone. They have autonomous management and financing and are usually used to provide public services, e.g. management of a public hospital, irrigation project, public transportation, etc. Participatory budgeting is a type of participatory democracy, in which citizens are formally given the opportunity to discuss and prioritize public spending projects, and in some cases even decide how to allocate parts of the municipal budget.

Does the misuse of public funds affect educational performance of children in private?

In Table 6, we present alternative tests for whether unobserved differences between corrupt and non-corrupt municipalities are affecting our results. In columns 1 and 2, we estimate the effects of corruption in education on the dropout and failure rates of children attending private schools.[39] Because our measure of corruption is based on the misuse of funds intended for public schools, we should not expect the measure to predict educational outcomes of private-school children. The results in columns 1 and 2 do in fact show that the effects of corruption on private schooling outcomes are small and statistically insignificant.

Although we do not find that corruption affects the dropout and failure rates of private school children, an alternative explanation for our results is that corruption influenced the selection of students into public and private schools. We test this hypothesis in columns 3-7. In column 3, we estimate whether children are more likely to enroll in private schools in municipalities with corruption. In columns 4-7, we estimate whether the effects of corruption on educational outcomes are more pronounced in municipalities where a private school exists. If in municipalities with corruption, high ability students are more likely to attend private schools, then we should expect the effects of corruption to be more pronounced among municipalities with a private school. But as we see in columns 3-7, corruption neither predict enrollment rates among private schools nor are its effects more pronounced among municipalities with a private school, suggesting that differential sorting does not explain our findings.

Corruption or mismanagement?

Another possible concern is that our estimates capture the effects of not only the diversion but also the mismanagement of educational resources. If corruption and mismanagement of educational funds are positively correlated, then our estimates are overstated. Table 7 shows this is not the case. In columns 1-4, we re-estimate the full specifications presented in Table 3, controlling for the share of audited items in education associated with mismanagement practices. Our findings in columns 1 and 2 suggest that test scores are in fact negatively correlated with the incidence of mismanagement. A one standard deviation increase in the incidence of mismanagement is associated with a 0.14 standard deviation decrease in math scores. Yet despite this negative correlation, the magnitude of the effect is small relative

[39] Unfortunately, standardized Mathematics and Portuguese exams are only conducted on students attending public schools.

to the size of the effects of corruption. The incidence of mismanagement in a municipality would have to increase from the 1st percentile to the 99th percentile of the distribution in order to achieve the same effects as those of corruption. Overall, the estimated coefficients across the various educational outcomes suggest substantive effects of corruption, even after accounting for the negative effects of mismanagement.

Functional form

Table A1 presents additional specification checks that relax our functional form assumptions. In Panel A, we estimate the effects of corruption in education on our various educational outcomes using propensity score, and in Panel B we estimate the effects by propensity score matching. To compute the propensity score, we estimate the probability that corruption in education was detected in the municipality using a logit regression on the entire set of school and municipal controls. For the regression, we use a highly flexible specification that included a full set of second-order polynomials and interactions.[40] The propensity score is the predicted values from this regression. In Figure A1 in the appendix, we plot the distribution of the propensity score for municipalities with corruption versus municipalities without corruption. Overall, municipalities where corruption was detected have a much higher propensity, and although there does appear to be substantial common support, 20 percent of the corrupt municipalities have a propensity score above the maximum propensity score for non-corrupt municipalities. In the estimates presented in both panels A and B, we drop these municipalities that are off the common support. Table A2 of the appendix demonstrates how accounting for the propensity score eliminates almost all of the differences in covariates between corrupt and non-corrupt municipalities. Only the number of household members above the age of 6 is statistically different between the two groups, at less than the 10 percent level.

Panel A of Table A1 reports the estimated effects of corruption on education outcomes using a propensity score approach (Rosenbaum and Rubin 1983). Specifically, we regress the outcomes indicated in each column on an indicator for whether or not corruption in education was detected in the municipality, the propensity score, the corruption indicator interacted with the propensity score demeaned. While specifications presented in Panel A are regression based, the estimates presented in Panel B are computed using a bias-adjusted matching estimator (Abadie and Imbens 2006) on the propensity score.

[40]Using a higher order structure does not change the estimates of the effects of corruption on schooling outcomes.

Overall, the findings presented in Table A1 support the conclusion that corruption has a negative effect on education outcomes of children in 4th grade of primary school. In both set of specifications, the point estimates are similar to those presented in Table 3. Although compared to the previous regression analysis the identification assumptions are similar, the estimators presented here have the advantage that they neither assume an additive linear functional form nor extrapolate over areas of uncommon support in the observable characteristics.

5.3 Mechanisms linking corruption to educational outcomes

Thus far, we have presented estimates of a reduced-form relationship between corruption in education and student achievement. As discussed in Section 4, corruption can affect student performance through various channels. The direct channel we examine here is the reduction of schooling inputs or infrastructure. In Table 8, we explore whether schooling inputs are lower in municipalities where corruption was detected using data from the 2005 school census.

Column 1 examines whether corrupt municipalities are less likely to have received pedagogical training. One common form of corruption uncovered in the audits was the diversion of funds intended for teacher training. The results in column 1 confirm this. In municipalities where corruption was detected, the percentage of teachers who are trained is 11.3 percentage points (standard error 0.061) lower compared to non-corrupt municipalities. Given that 44 percent of teachers receive training, this estimate represents a 25 percent decline. Schools in corrupt municipalities are also less likely to have a computer lab (coefficient=-0.060; standard error =0.026), but we find no effects on the likelihood of having a science lab (coefficient=-0.008; standard error =0.013). We do not find any evidence that schools in corrupt municipalities have less access to sanitation, but this might be a margin where corruption is harder to hide. Also, from the results presented in the even columns, our estimates are robust to controlling for schooling inputs in 2001.

Table 9 provides further evidence that schools have fewer resources in municipalities where corruption in education was detected. Table 9 presents estimates based on a series of linear probability models, where the dependent variable is specified at the top of each column. Each dependent variable is constructed based on a series of questions asking teachers and principals whether the school faced the following non-mutually exclusive problems: 1) insufficient resources; 2) insufficient teaching supplies; 3) lack of teachers; 4) disciplinary problems among the students. In columns 1-4, we present estimates based on information

from a teacher's survey, whereas the estimates presented in columns 5-8 are based on responses for the same question, but asked separately to the school principal.

Despite the fact that the two surveys were conducted separately, both teachers and principals of schools in municipalities where corruption was detected are much more likely to report a lack of resources is a serious problem. For instance, in corrupt municipalities, teachers are 7.2 percentage points (standard error=0.034) more likely to indicate a lack of teaching supplies (see column 2); whereas, school directors are 10.6 percentage points (standard error=0.035) more likely to complain about a lack of teaching supplies (see column 6). While corruption would expectedly lead to fewer resources, one would not necessarily expect corruption to affect disciplinary problems among students or even a lack of teachers (at least in the short run). The data do in fact bear this out. In columns 3-4 and 7-8, we do not find any association between corruption in education and whether the school faces disciplinary problems amongst its students or a lack of teachers. Using information from the principal's survey, we investigate whether schools in corrupt municipalities are less likely to offer pedagogical training. As reported in column 9, we find that schools in corrupt municipalities are 10.6 percentage points less likely to have gone through teacher training. This result is consistent with the finding presented in Table 8.

6 Conclusions

Improving school quality remains a challenge facing most developing countries. But how to improve quality remains a highly debated question. In this paper we present evidence that leakages from educational resources can be an important constrain on school quality. Using a novel dataset of corruption in education and schooling outcomes across public schools in Brazil, we find that student test scores on a national standardized exam and pass rates are significantly lower, and dropout rates from school are significantly higher, in municipalities where corruption is prevalent.

Consistent with the idea that corruption reduces schooling inputs, we find that schools in municipalities found to be corrupt are much less likely to have school infrastructure (i.e. computer lab) and teachers that have received training. Moreover, both teachers and principals report the lack of resources as a principal concern in corrupt municipalities. Thus, our results contradict a large literature suggesting that additional resources do not affect schooling outcomes. We conclude that, in environments where basic schooling resources are lacking, money does matter for education achievement. To the extent that the quality of

education affects long-run economic growth, our results suggest a direct channel through which corruption affects long-run economic development (Hanushek and Woessmann 2009).

Our findings have important policy implications. First, they suggest that efforts to increase school quality in developing countries need to incorporate policies that aim at reducing leakages. Introducing a system to monitor the use of educational funds, including block grants, should be a central concern to governments. Moreover, it can be a cost-effective way to improve schooling outcomes. Second, in addition to corruption, we find that the mismanagement of resources have detrimental effects on students' performance. These findings complement the work of Bandiera, Prat, and Valletti (2009) who show that passive waste in public service might be as important as active waste in generating public sectors inefficiencies. Thus, reforms aimed improving the capabilities of local bureaucracies may help reduce inefficiencies in the use of public funds.

Although our results focus on the direct effects of corruption-induced leakages, the negative effects of corruption on schooling may not simply represent a shift in the school budget constraint. If for instance, corruption also affects the allocation of schooling inputs – perhaps to avoid detection – then corruption can lead to important distortionary effects as well (Shleifer and Vishny 1993). Future research should address these additional costs of corruption.

References

Abadie, Alberto, and Guido Imbens. 2006. "Large Sample Properties of Matching Estimators for Average Treatment Effects." *Econometrica* 74 (1): 235–267.

Ades, Alberto, and Rafael Di Tella. 1999. "Rents, Competition, and Corruption." *American Economic Review* 89 (4): 982–993 (September).

Baicker, Katherine, and Douglas Staiger. 2005. "Fiscal Shenanigans, Targeted Federal Health Care Funds, and Patient Mortality." *Quarterly Journal of Economics* 120 (1): 345–386.

Bandiera, Oriana, Andrea Prat, and Tommaso Valletti. 2009. "Active and Passive Waste in Government Spending: Evidence from a Policy Experiment." *American Economic Review* 99 (4): 1278–1308.

Bjorkman, Martina. 2007. "Does Money Matter for Student Performance? Evidence from a Grant Program in Uganda." *IGIER Working Paper n. 326*, August.

Chaudhury, Nazmul, Jeffrey Hammer, Michael Kremer, Karthik Muralidharan, and F. Halsey Rogers. 2006. "Missing in Action: Teacher and Health Worker Absence in Developing Countries." *Journal of Economic Perspectives* 20 (1): 91–116 (Winter).

Clark, Damon. 2009. "The Performance and Competitive Effects of School Autonomy." *Journal of Political Economy* 117 (4): 745–783.

Das, Jishnu, Stefan Dercon, James Habyarimana, Pramila Krishnan, Karthik Muralidharan, and Venkatesh Sundararaman. 2011. "School Inputs, Household Substitution, and Test Scores." *Mimeo, UCSD.*

Duflo, Esther, Rema Hanna, and Stephen P. Ryan. 2010. "Incentives Work: Getting Teachers to Come to School." *American Economic Review*, vol. Forthcoming.

Fan, C. Simon, Chen Lin, and Daniel Treisman. 2009. "Political decentralization and corruption: Evidence from around the world." *Journal of Public Economics* 93 (1-2): 14–34 (February).

Ferraz, Claudio, and Frederico Finan. 2008. "Exposing Corrupt Policiticans: The Effects of Brazil's Publicily Released Audits on Electoral Outcomes." *Quarterly Journal of Economics* 123 (2): 703745.

———. 2011. "Electoral Accountability and Corruption: Evidence from the Audits of Local Governments." *American Economic Review* 101 (June): 1274–1311.

Fisman, Raymond, and Roberta Gatti. 2002. "Decentralization and corruption: evidence across countries." *Journal of Public Economics*, no. 83:325345.

Glaeser, Edward, Jose Scheinkman, and Andrei Shleifer. 2003. "The injustice of inequality." *Journal of Monetary Economics* 50 (1): 199–222 (January).

Glaeser, Edward L., and Raven E. Saks. 2006. "Corruption in America." *Journal of Public Economics* 90:1053–1072.

Glewwe, Paul, and Michael Kremer. 2006. "Schools, Teachers, and Education Outcomes in developing Countries." In *Handbook on the Economics of Education*, edited by Erik Hanushek and Finis Welchh. Oxford: Elsievier.

Gordon, Nora, and Emiliana Vegas. 2005. "Educational Finance, Equalization, Spending, Teacher Quality, and Student Outcomes: the Case of Brazil's FUNDEF." In *Incentives to Improve Teaching: Lessons from Latin America*, edited by Emiliana Vegas. Washington D.C.: The World Bank.

Hanushek, Eric A. 1996. "School Resources and Student Performance." In *Does Money Matter? The Effect of School Resource on Student Achievement and Adult Success*, edited by Gary Burtless. Washington, D.C.: Brookings Institution.

Hanushek, Eric A., and Ludger Woessmann. 2009. "Do Better Schools Lead to More Growth? Cognitive Skills, Economic Outcomes, and Causation." NBER working papers 14633, National Bureau of Economic Research.

Harbison, Ralph, and Eric Hanushek. 1992. *Educational performance of the poor: Lessons from rural northeast Brazil*. Oxford: Oxford University Press.

Hedges, Lany V., Richard Laine, and Rob Greenwald. 1994. "Does Money Matter? A Meta-Analysis of Studies of the Effects of Differential School Inputs on Student Outcomes." *Education Researcher* 23 (3): 5–14 (April).

Kaufmann, D., A. Kraay, and M. Mastruzzi. 2009. "Governance Matters VIII: Aggregate and Individual Governance Indicators, 1996-2008." World bank policy research working paper 4978, World Bank.

La Porta, Rafael, Florencio Lopez-de-Silanes, Andrei Shleifer, and Robert Vishny. 1999. "The Quality of Government." *Journal of Law, Economics and Organization* 15 (1): 222–79 (April).

Madeira, Ricardo. 2007. "The Effects of Decentralization on Schooling: Evidence From the Sao Paulo State Education Reform." *Mimeo*.

Mauro, Paolo. 1995. "Corruption and Growth." *Quarterly Journal of Economics*, no. 110:681–712.

Menezes-Filho, Naercio A., and Elaine Pazello. 2007. "Do Teachers Wages Matter for Proficiency? Evidence from a Funding Reform in Brazil." *Economics and Education Review* 26 (6): 660–672.

Muralidharan, Karthik, and Venkatesh Sundararaman. 2011. "Teacher Performance Pay: Experimental Evidence from India." *Journal of Political Economy* 119 (1): 39–77.

Niehaus, Paul, and Sandip Sukhtankar. 2011. "The Marginal Rate of Corruption in Public Programs." *UCSD, Mimeo.*

Olken, Benjamin A. 2006. "Corruption and the costs of redistribution: Micro evidence from Indonesia." *Journal of Public Economics* 90 (4-5): 853–870 (May).

Pop-Eleches, Cristian, and Miguel Urquiola. 2011. "Going to a Better School: Effects and Behavioral Responses." *Mimeo, Columbia University.*

Reinikka, Ritva, and Jakob Svensson. 2004. "Local Capture: Evidence from a Central Government Transfer Program in Uganda." *Quaterly Journal of Economics* 119 (2): 679–705 (May).

———. 2011. "The power of information in public services: Evidence from education in Uganda." *Journal of Public Economics* 95 (7-8): 956–966 (August).

Rose-Ackerman, Susan. 1999. *Corruption and Government: Causes, Consequences, and Reform.* New York: Cambridge University Press.

Rosenbaum, Paul, and Donald Rubin. 1983. "The Central Role of the Propensity Score in Observational Studies for Causal Effects." *Biometrika* 70:41–50.

Shleifer, Andrei, and Robert W. Vishny. 1993. "Corruption." *Quarterly Journal of Economics* 108 (3): 599–617 (August).

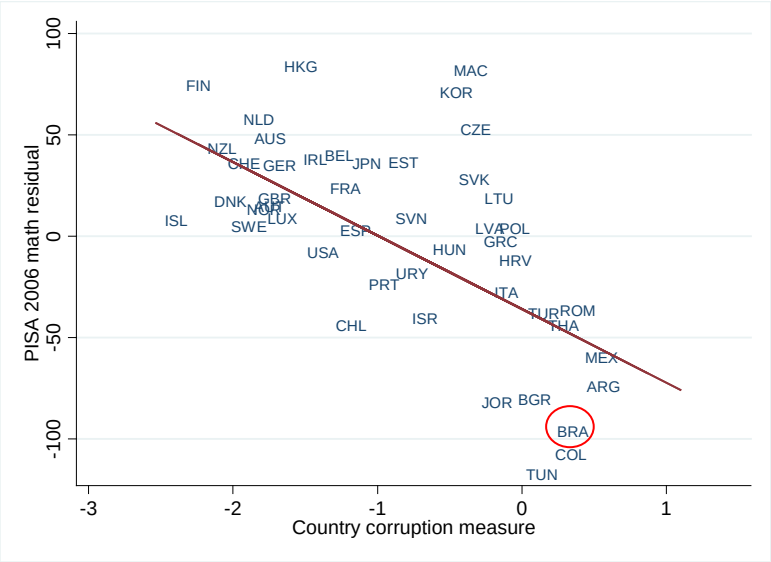
Svensson, Jakob. 2005. "Eight Questions about Corruption." *Journal of Economic Perspectives* 19 (3): 1942 (Summer).

Todd, Petra E., and Kenneth I. Wolpin. 2003. "On The Specification and Estimation of The Production Function for Cognitive Achievement." *Economic Journal* 113 (485): F3–F33 (February).

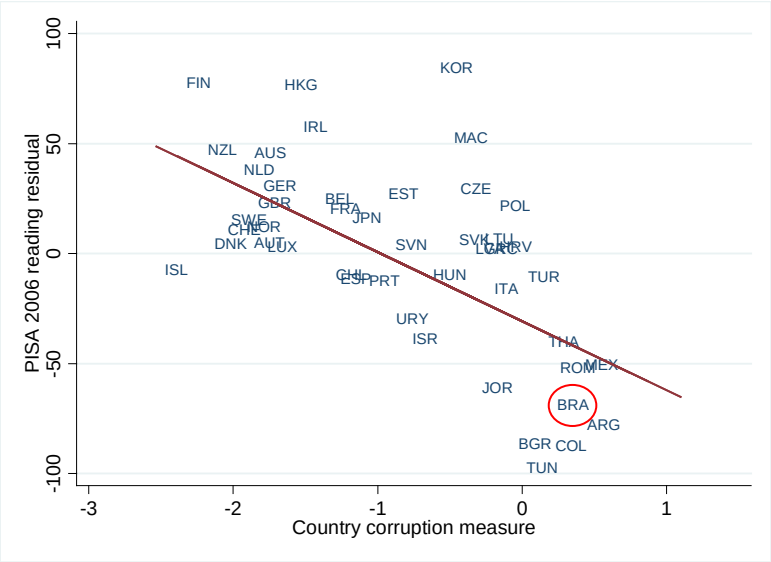
Transparência Brasil. 2005. "Brazil: The Hidden Cost of Decentralized Education." In

Stealing the Future: Corruption in Classroom, edited by Bettina Meier and Michael Griffin. Berlin: Transparency International.

Treisman, Daniel. 2000. "The causes of corruption." *Journal of Public Economics*, vol. 76.



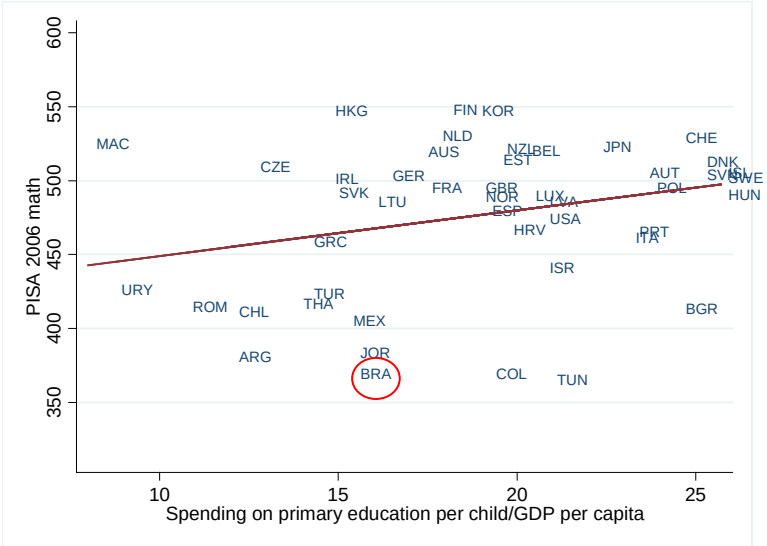
PANEL A: MATH



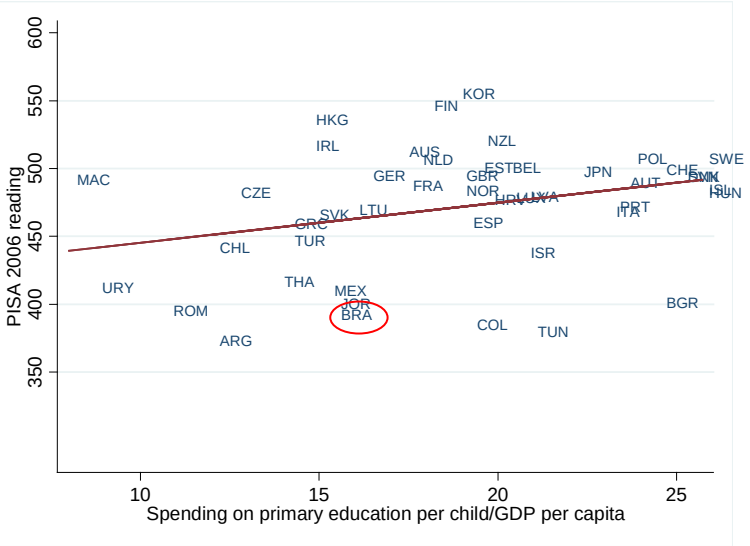
PANEL B: READING

FIGURE 1: TEST SCORES AND CORRUPTION

Notes: The scatter plots in panels A and B depict the relationship between the residuals from a regression of performance on the PISA exams in 2006 on expenditure on primary education per capita as a share of 2005 GDP per capita, and the World Bank corruption index (Kaufmann, Kraay, and Mastruzzi (2005)). The data used for these graphs can be found: http://www.pisa.oecd.org.



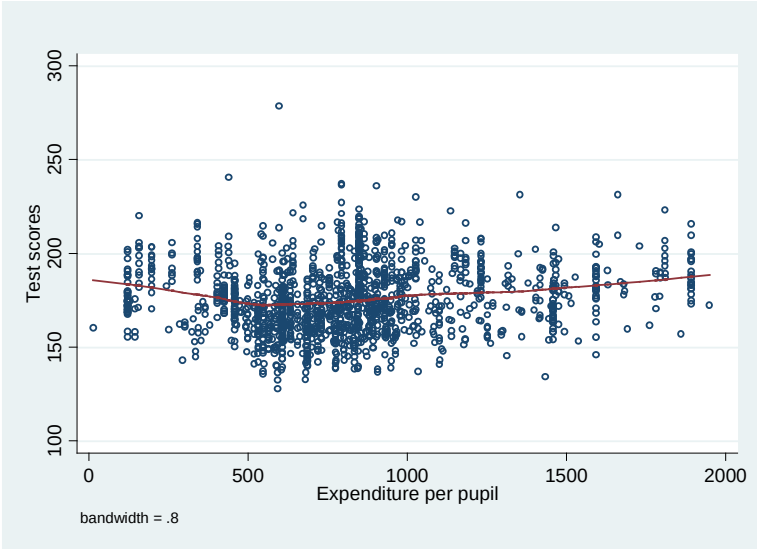
PANEL A: MATH



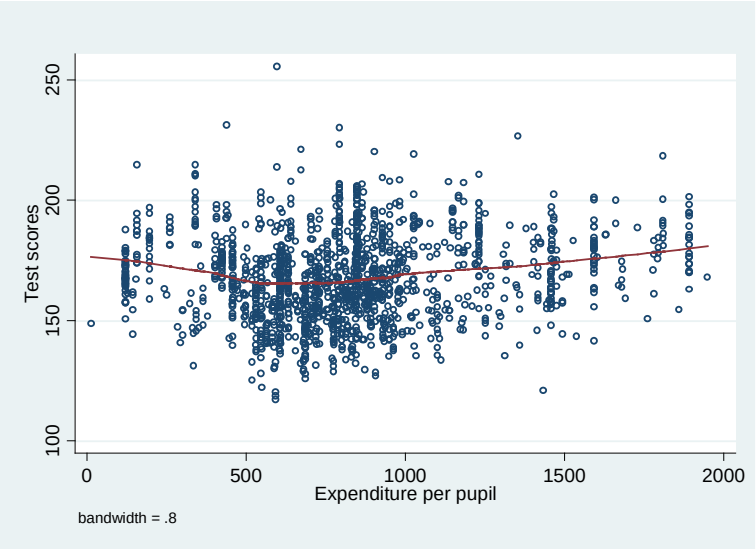
PANEL B

FIGURE 2: TEST SCORES AND SPENDING IN PRIMARY SCHOOL PER PUPIL IN 2005

Notes: The scatter plots in panels A and B depict the relationship between a country's performance on the PISA exams in 2006 and its expenditure on primary education per child as a share of GDP per capita in 2005. The data used for these graphs can be found: http://www.pisa.oecd.org.



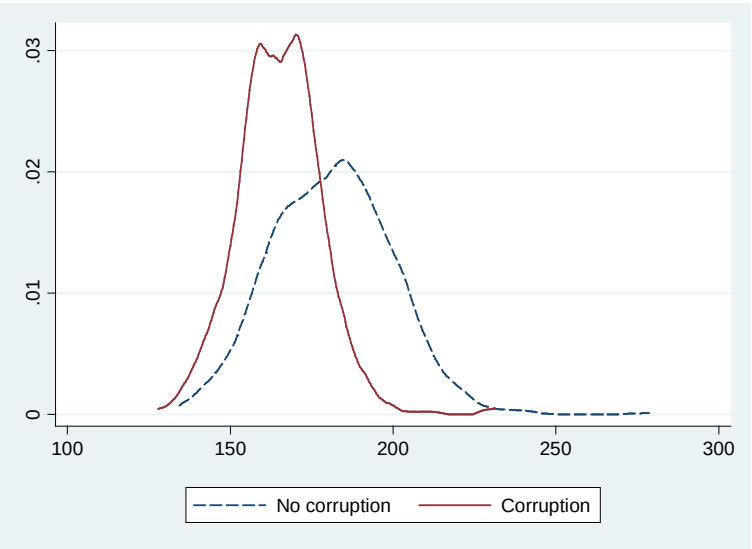
Panel A: Mathematics



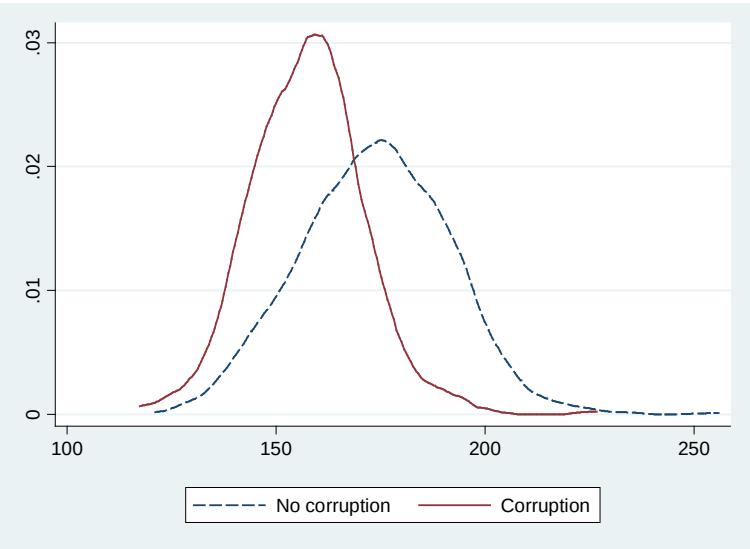
Panel B: Portuguese

FIGURE 3: TEST SCORES AND SPENDING IN PRIMARY SCHOOL PER PUPIL WITHIN BRAZIL

Notes: : The scatter plots in panels A and B depict the relationship between 2005 test scores on a national standardized exam for 4th graders in Brazil and municipal expenditure on primary education per pupil in 2005. The line represents a nonparametric estimate of the relationship, with a bandwidth of 0.8. The data on test scores come from Prova Brasil and the data on expenditures come from Brazil's national treasury. See the data appendix for more details.



Panel A: Mathematics



Panel B: Portuguese

FIGURE 4: DISTRIBUTION OF TEST SCORES FOR MATHEMATICS AND PORTUGUESE BY CORRUPTION

Notes: Panels A and B display kernel densities of 2005 test scores aggregated at the school-level by subject matter. The densities were estimated separately depending on whether the school resided in municipality where corruption was detected in education. The densities were estimated using the Epanechnikov kernel, with an optimally computed bandwidth.

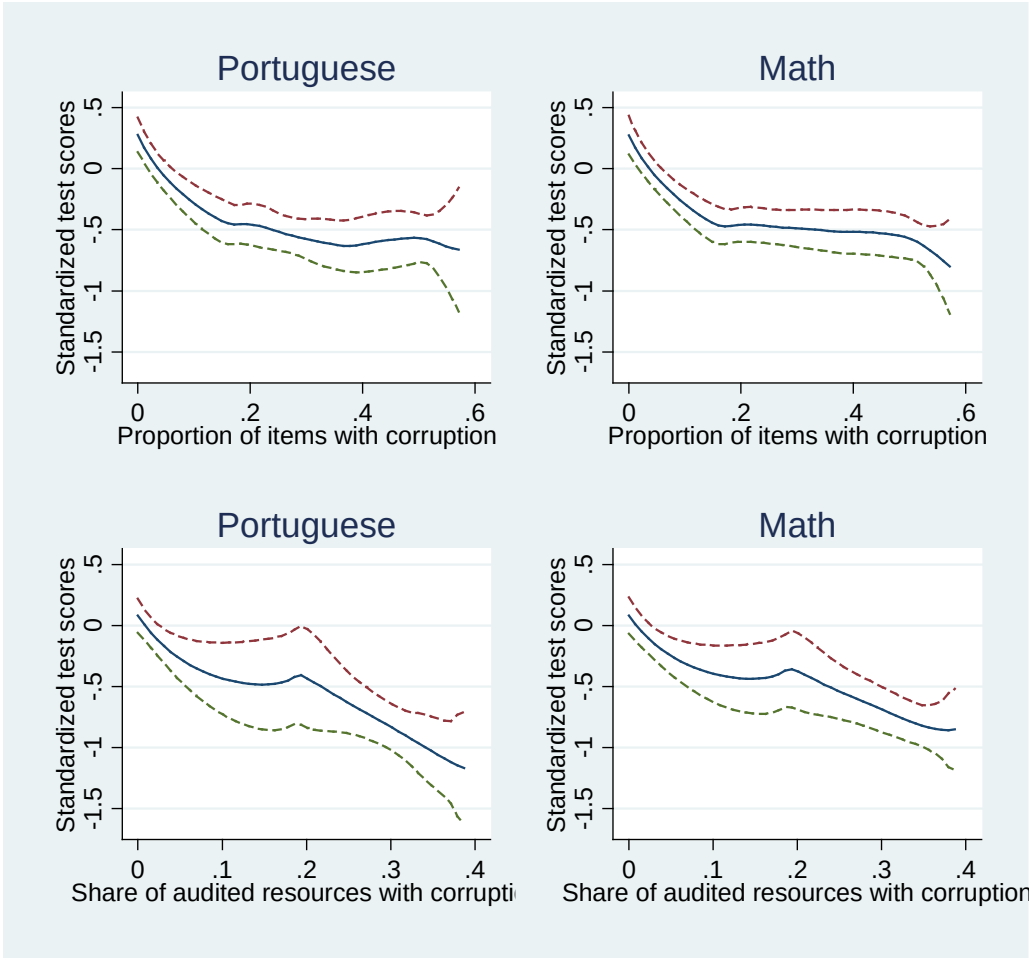


FIGURE 5: ASSOCIATION BETWEEN TEST SCORES FOR MATHEMATICS AND PORTUGUESE AND CORRUPTION IN EDUCATION

Notes: Each graph shows the results of a locally weighted regression with a quartic Kernel (Fan, 1992). The dependent variable is the 4th grade standardized test score for either Portuguese or Math and the independent variable is the respective measure of corruption (proportion of items found with corruption or share of audited resources found with corruption). The bandwidth is equal to one-third of the range of the independent variable. The lines in dashes show the 95 percent confidence intervals calculated with 100 bootstrapped replications where the standard error is clustered by municipality. The estimation dropped 5 outliers with extremely high corruption.

TABLE 1: CORRUPTION IN THE EDUCATION SECTOR

	N	mean	sd	p25	p50	p75
Proportion of municipalities with corruption in education	365	0.35	0.48	0.00	0.00	1.00
Proportion of items in education found to be corrupt	365	0.12	0.25	0.00	0.00	0.15
Proportion of items in education found to be corrupt conditional on some corruption	128	0.35	0.32	0.13	0.25	0.50
Share of resources audited in education that were found to be corrupt	365	0.03	0.12	0.00	0.00	0.01
Share of resources audited in education found to be corrupt conditional on some corruption	128	0.08	0.19	0.00	0.03	0.07
Proportion of municipalities with corruption in some area other than education	365	0.50	0.50	0.00	1.00	1.00
Proportion of items audited found to be associated with mismanagement	365	2.00	1.83	0.75	1.46	2.71
Proportion of municipalities with corruption involving a school feeding program	343	0.15	0.36	0.00	0.00	0.00
Proportion of municipalities with corruption involving teachers and school supplies	305	0.28	0.45	0.00	0.00	1.00
Proportion of municipalities with corruption involving other aspects of education	364	0.03	0.18	0.00	0.00	0.00

Notes: This table reports descriptive statistics on the various measures of corruption. Column 1 reports the sample size. Column 2 reports the mean and column 3 reports the standard deviation. Columns 4-6 report the 25^{th}, 50^{th}, and 75^{th} percentiles of the distribution. The data used to compute these statistics come from the audit reports.

TABLE 2: SUMMARY STATISTICS

	N	mean	sd	p25	p50	p75
Panel A: Student characteristics						
Standardized exam in Mathematics - 4th grade	1488	175.80	18.25	162.23	174.01	188.22
Standardized exam in Portuguese - 4th grade	1488	168.09	18.07	155.41	167.10	180.15
% males	1488	0.50	0.09	0.45	0.50	0.56
% white	1488	0.31	0.15	0.21	0.29	0.39
% of mothers with a high school degree	1488	0.17	0.09	0.10	0.15	0.21
% of fathers with a high school degree	1488	0.15	0.08	0.09	0.14	0.19
% children that live with both parents	1488	0.61	0.12	0.54	0.62	0.70
% familes with 6 or more inhabitants	1488	0.26	0.13	0.17	0.24	0.34
% families with a home computer	1488	0.15	0.10	0.08	0.13	0.20
% families with electricity at home	1488	0.92	0.09	0.89	0.94	0.97
% families with running water at home	1488	0.84	0.14	0.79	0.88	0.93
% of children who are 8 years old or younger	1488	0.01	0.02	0.00	0.00	0.02
% of children who are 9 years old	1488	0.05	0.05	0.01	0.04	0.07
% of children who are 10 years old	1488	0.36	0.18	0.22	0.35	0.49
% of children who are 11 years old	1488	0.25	0.10	0.18	0.24	0.31
% of children who are 12 years old	1488	0.12	0.07	0.07	0.11	0.16
Panel B: School Characteristics						
Dropout rates	1488	0.04	0.07	0.00	0.02	0.06
Failure rates	1488	0.10	0.09	0.03	0.09	0.16
% of teachers with a teaching credentials	1488	0.43	0.36	0.05	0.42	0.75
School has a computer lab	1488	0.19	0.39	0.00	0.00	0.00
School has a science lab	1488	0.04	0.19	0.00	0.00	0.00
School has sanitation	1488	0.03	0.17	0.00	0.00	0.00
Director's survey						
Lack of financial resources is a serious concern	1488	0.55	0.50	0.00	1.00	1.00
Lack of schooling supplies is a serious concern	1488	0.40	0.49	0.00	0.00	1.00
Lack of teachers is a serious concern	1488	0.23	0.42	0.00	0.00	0.00
Disciplinary problems is a serious concern	1488	0.63	0.48	0.00	1.00	1.00
Training courses are provided to teachers	1488	0.49	0.50	0.00	0.00	1.00
Teacher's survey						
Lack of financial resources is a serious concern	1488	0.56	0.50	0.00	1.00	1.00
Lack of schooling supplies is a serious concern	1488	0.51	0.50	0.00	1.00	1.00
Lack of teachers is a serious concern	1488	0.26	0.44	0.00	0.00	1.00
Disciplinary problems is a serious concern	1488	0.63	0.48	0.00	1.00	1.00

Notes: This table reports descriptive statistics for the variables used in the analysis. Column 1 reports the sample size. Column 2 reports the mean and column 3 reports the standard deviation. Columns 4-6 report the 25^{th}, 50^{th}, and 75^{th} percentiles of the distribution. The variables presented in Panels A and B are computed for the 1488 schools that reside in the 365 municipalities for which information on corruption exists.

TABLE 2: SUMMARY STATISTICS (CONTINUED…)

	N	mean	sd	p25	p50	p75
Panel C: Municipal Characteristics						
% population urban	365	0.61	0.23	0.44	0.62	0.80
Gini	365	0.57	0.06	0.54	0.57	0.61
GDP per capita	365	8707.74	22821.08	2545.43	4678.03	8544.47
Expenditure in primary school per child	365	942.20	487.67	656.48	856.68	1106.40
Dropout rates among private schools	188	0.01	0.03	0.00	0.00	0.00
Failure rates among private schools	188	0.02	0.04	0.00	0.00	0.02
Election is held for principal	365	0.10	0.30	0.00	0.00	0.00
Average number of state schools that elect its principal	365	0.43	1.25	0.00	0.00	0.00
Average number of state schools in the municipality	365	1.68	3.31	0.00	1.00	2.00
PTA is active in the municipality	365	0.48	0.50	0.00	0.00	1.00
Municipality has a intergovernmental consortium	365	0.26	0.44	0.00	0.00	1.00
Municipality has an education council	365	0.69	0.46	0.00	1.00	1.00
Schools receive support from private sector	365	0.07	0.25	0.00	0.00	0.00
Municipality uses participatory budgeting	365	0.71	0.45	0.00	1.00	1.00
The community helps in the maintenance of the school	365	0.15	0.36	0.00	0.00	0.00
The school participated in an awareness campaign for the community	365	0.41	0.49	0.00	0.00	1.00

Notes: This table reports descriptive statistics for the variables used in the analysis. Column 1 reports the sample size. Column 2 reports the mean and column 3 reports the standard deviation. Columns 4-6 report the 25^{th}, 50^{th}, and 75^{th} percentiles of the distribution. The variables presented in Panels A and B are computed for the 1488 schools that reside in the 365 municipalities for which information on corruption exists.

TABLE 3: DETERMINANTS OF CORRUPTION IN EDUCATION

Dependent variable:	Corruption in education		Proportion of items with corruption in education		Share of audited resources with corruption in education	
	OLS	Probit	OLS	Tobit	OLS	Tobit
	(1)	(2)	(3)	(4)	(5)	(6)
School finance:						
% education revenue from FUNDEF transfers	0.501	0.574	0.195	0.209	0.036	0.044
	[0.200]**	[0.277]**	[0.096]**	[0.103]**	[0.024]	[0.022]**
Socio-economic characteristics						
Share of urban population	-0.413	-0.417	-0.224	-0.178	-0.006	-0.017
	[0.135]***	[0.145]***	[0.075]***	[0.055]***	[0.010]	[0.011]
Gini coefficient	0.745	0.883	0.286	0.326	0.055	0.061
	[0.417]*	[0.456]*	[0.255]	[0.178]*	[0.044]	[0.037]
Log GDP per capita	-0.041	-0.034	0.026	0.003	-0.011	-0.006
	[0.037]	[0.040]	[0.033]	[0.013]	[0.004]**	[0.003]**
Log population	0.043	0.050	0.015	0.016	0.001	0.002
	[0.033]	[0.039]	[0.020]	[0.015]	[0.003]	[0.003]
School institutions						
Share of schools with elections	-0.017	-0.089	-0.006	-0.033	-0.001	-0.007
	[0.010]*	[0.037]**	[0.005]	[0.015]**	[0.001]	[0.003]**
Share of schools with a PTA	0.000	0.009	0.002	0.006	-0.001	0.000
	[0.011]	[0.014]	[0.006]	[0.006]	[0.002]	[0.001]
% schools community helps in maintenance	-0.011	-0.033	-0.021	-0.025	-0.001	-0.002
	[0.021]	[0.030]	[0.016]	[0.012]**	[0.003]	[0.002]
% schools participate in an awareness community	0.014	0.014	0.018	0.012	0.003	0.002
	[0.019]	[0.023]	[0.017]	[0.010]	[0.003]	[0.002]
Preferences towards education						
Log spending primary education per kid (×100)	-7.632	-9.502	-0.318	-2.125	0.004	-0.331
	[5.004]	[5.291]*	[2.680]	[1.961]	[0.561]	[0.401]
Intergovernmental consortium in education	0.052	0.065	0.014	0.018	0.007	0.006
	[0.057]	[0.063]	[0.032]	[0.024]	[0.007]	[0.005]
Education council exists	-0.093	-0.103	-0.073	-0.055	-0.004	-0.009
	[0.056]*	[0.058]*	[0.031]**	[0.024]**	[0.007]	[0.005]*
Mayor is a male	-0.142	-0.161	-0.122	-0.094	-0.002	-0.008
	[0.095]	[0.107]	[0.080]	[0.056]*	[0.010]	[0.009]
Mayor has a college degree	-0.136	-0.148	-0.036	-0.050	-0.004	-0.007
	[0.051]***	[0.053]***	[0.030]	[0.021]**	[0.006]	[0.004]*
Number of observations	366	366	366	366	361	361
R-squared	0.18		0.11		0.06	
Pseudo R-squared		0.17		0.15		0.69

Notes: This table reports the association between municipal characteristics and different measures of corruption in education. Column (1), (3) and (5) present OLS results while columns (2), (4) and (6) present the marginal effects of non-linear models that account for the discrete or censured dependent variable. The dependent variable used in each regression is listed at the top of each column. All regressions exclude municipalities that report zero revenues from the FUNDEF program. The regressions shown in columns (5) and (6) exclude municipalities where the estimated share of corruption is above 1. Robust standard errors are displayed in brackets. Significantly different than zero at 99 (***), 95 (**), 90 (*) percent confidence.

TABLE 4: THE EFFECTS OF CORRUPTION ON SCHOOLING OUTCOMES

Dependent variable:	Mathematics		Portuguese		Dropout rates		Failure rates	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Panel A:								
Proportion of items with corruption in education	-0.323	-0.315	-0.356	-0.34	0.021	0.019	0.019	0.018
	[0.069]***	[0.078]***	[0.068]***	[0.069]***	[0.010]**	[0.008]**	[0.006]***	[0.006]***
R-squared	0.49	0.52	0.55	0.59	0.26	0.29	0.15	0.16
Panel B:								
Share of audited resources with corruption in education	-0.722	-0.447	-0.9	-0.583	0.048	0.028	0.029	0.022
	[0.372]*	[0.320]	[0.413]**	[0.365]	[0.016]***	[0.019]	[0.023]	[0.023]
R-squared	0.49	0.52	0.54	0.58	0.26	0.28	0.15	0.15
Panel C:								
Corruption in education	-0.356	-0.29	-0.357	-0.277	0.029	0.024	0.019	0.018
	[0.076]***	[0.076]***	[0.070]***	[0.073]***	[0.005]***	[0.005]***	[0.008]**	[0.008]**
R-squared	0.51	0.53	0.56	0.59	0.29	0.31	0.16	0.16
Student characteristics	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Municipal characteristics	No	Yes	No	Yes	No	Yes	No	Yes

Notes: This table reports the effects of corruption on various education outcomes. Each column presents the results of an OLS regression where the dependent variable is listed at the top of each column. For the results reported in Panels A, C, and D, the number of observations is 1488 schools. Whereas, for Panel B, the number of observations is 1479, due to missing values in the amount of resources audited. Student characteristics included proportion of male children, proportion of white children, the schooling of the mother, schooling of the father, the proportion of kids with both parents living at home, family size, proportion of households with a computer, proportion of families with running water, proportion of families with electricity, age dummies. Municipal characteristics included share of population that resides in urban areas, Gini coefficient, Log GDP per capita in 2004, and log population. Robust standard errors clustered at the municipality are displayed in brackets. Significantly different than zero at 99 (***), 95 (**), 90 (*) percent confidence.

TABLE 5: THE EFFECTS OF CORRUPTION ON SCHOOLING OUTCOMES - ROBUSTNESS

Dependent variable:	Mathematics		Portuguese		Dropout rates		Failure rates	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Corruption in education	-0.286	-0.283	-0.264	-0.277	0.027	0.027	0.018	0.022
	[0.076]***	[0.080]***	[0.071]***	[0.070]***	[0.005]***	[0.005]***	[0.009]**	[0.009]**
Local institutional quality								
Corruption in other sectors	-0.199	-0.185	-0.162	-0.141	0.007	0.006	0.001	0.001
	[0.068]***	[0.068]***	[0.064]**	[0.063]**	[0.004]*	[0.004]	[0.007]	[0.007]
Judiciary district	0.133	0.146	0.179	0.202	-0.004	-0.007	-0.006	-0.003
	[0.093]	[0.092]	[0.083]**	[0.084]**	[0.005]	[0.005]	[0.007]	[0.008]
Share of council that supports the mayor	-0.178	-0.145	-0.133	-0.107	-0.015	-0.014	-0.022	-0.028
	[0.190]	[0.187]	[0.168]	[0.162]	[0.012]	[0.012]	[0.020]	[0.019]
Practices participatory budgeting	0.024	-0.005	0.074	0.044	0.009	0.009	-0.001	0.001
	[0.079]	[0.076]	[0.071]	[0.067]	[0.005]*	[0.005]*	[0.010]	[0.010]
School institutions								
School elects the principal		0.136		0.081		0.004		0.005
		[0.079]*		[0.062]		[0.004]		[0.008]
School has active PTA		0.014		0.057		-0.003		-0.001
		[0.045]		[0.036]		[0.003]		[0.005]
School receives help from community		0.056		0.035		-0.003		-0.002
		[0.050]		[0.041]		[0.003]		[0.006]
School participates in community awareness campaigns		0.012		0.005		-0.001		0.006
		[0.035]		[0.035]		[0.003]		[0.004]
Preferences towards education								
Municipality has an intergovernment consortium in education		0.136		0.161		-0.004		0.001
		[0.078]*		[0.067]**		[0.005]		[0.008]
Education council exists		-0.031		-0.002		0.003		0.002
		[0.077]		[0.064]		[0.005]		[0.007]
Mayor is a male		0.082		0.02		0.011		-0.01
		[0.124]		[0.125]		[0.008]		[0.014]
Mayor has a college degree		0.07		0.062		-0.008		0.015
		[0.072]		[0.066]		[0.005]		[0.008]*
Student and municipal characteristics	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Number of schools	1488	1468	1488	1468	1488	1468	1488	1468
R-squared	0.54	0.55	0.6	0.61	0.31	0.32	0.16	0.17

Notes: This table reports the effects of corruption on various education outcomes. Each column presents the results of an OLS regression where the dependent variable is listed at the top of each column. Our measure of corruption is an indicator for whether corruption was detected in education. Our measure of other corruption is an indicator for whether corruption was detected in sectors other than education. Student characteristics included proportion of male children, proportion of white children, the schooling of the mother, schooling of the father, the proportion of kids with both parents living at home, family size, proportion of households with a computer, proportion of families with running water, proportion of families with electricity, age dummies. Municipal characteristics included share of population that resides in urban areas, Gini coefficient, GDP per capita in 2004, expenditure per child in primary school. Robust standard errors clustered at the municipality are displayed in brackets. Significantly different than zero at 99 (***), 95 (**), 90 (*) percent confidence.

TABLE 6: PRIVATE SCHOOLS

Dependent variable:	Dropout rates for private schools	Failure rates for private schools	Share of students enrolled in a private school	Mathematics	Portuguese	Dropout rates	Failure rates
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Corruption in education	-0.005	-0.008	0.004	-0.28	-0.249	0.023	0.019
	[0.003]	[0.006]	[0.009]	[0.101]***	[0.098]**	[0.006]***	[0.013]
Corruption in education × Municipality has a private school				0.003	-0.017	0.002	-0.003
				[0.100]	[0.097]	[0.008]	[0.012]
Student characteristics	Yes	Yes	No	Yes	Yes	Yes	Yes
Municipal characteristics	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Number of schools	1185	1185	331	1488	1488	1488	1488
R-squared	0.07	0.14	0.04	0.53	0.59	0.31	0.19

Notes: This table reports whether there is a differential effects of corruption in municipalities with a private school. Each column presents the results of an OLS regression where the dependent variable is listed at the top of each column. In columns 1 and 2, the dependent variables are dropout and failure rates of children in private schools. In columns 3-6, the dependent variables are the education outcomes for children attending municipal schools (as in the previous tables). Our measure of corruption is an indicator for whether corruption was detected in education. Student characteristics included proportion of male children, proportion of white children, the schooling of the mother, schooling of the father, the proportion of kids with both parents living at home, family size, proportion of households with a computer, proportion of families with running water, proportion of families with electricity, age dummies. Municipal characteristics included share of population that resides in urban areas, Gini coefficient, GDP per capita in 2004, expenditure per child in primary school. Robust standard errors clustered at the municipality are displayed in brackets. Significantly different than zero at 99 (***), 95 (**), 90 (*) percent confidence.

TABLE 7: EFFECTS OF CORRUPTION ON SCHOOLING OUTCOMES ACCOUNTING FOR MISMANAGEMENT

Dependent variable:	Mathematics (1)	Portuguese (2)	Dropout rates (3)	Failure rates (4)
Corruption in education	-0.265	-0.251	0.024	0.02
	[0.081]***	[0.077]***	[0.005]***	[0.009]**
Mismanagement	-0.041	-0.046	0.001	-0.004
	[0.018]**	[0.017]***	[0.001]	[0.004]
Student characteristics	Yes	Yes	Yes	Yes
Municipal characteristics	Yes	Yes	Yes	Yes
Number of schools	1486	1486	1486	1486
R-squared	0.53	0.59	0.31	0.17

Notes: This table reports the effects of corruption on various education outcomes, controlling for mismanagement and corruption in other sectors. Each column presents the results of an OLS regression where the dependent variable is listed at the top of each column. Our measure of corruption is an indicator for whether corruption was detected in education. Our measure of mismanagement is the share of audited service items that found to be associated with poor management practices. Student characteristics included proportion of male children, proportion of white children, the schooling of the mother, schooling of the father, the proportion of kids with both parents living at home, family size, proportion of households with a computer, proportion of families with running water, proportion of families with electricity, age dummies. Municipal characteristics included share of population that resides in urban areas, Gini coefficient, GDP per capita in 2004, expenditure per child in primary school. Robust standard errors clustered at the municipality are displayed in brackets. Significantly different than zero at 99 (***), 95 (**), 90 (*) percent confidence.

TABLE 8: THE EFFECTS OF CORRUPTION ON SCHOOLING INPUTS

Dependent variable:	Percentage of teachers with a higher education degree		Proportion of schools with a computer lab		Proportion of schools with a science lab		Proportion of schools with sanitation
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Corruption in education	-0.113	-0.114	-0.06	-0.059	-0.008	-0.005	-0.008
	[0.053]**	[0.053]**	[0.026]**	[0.029]**	[0.013]	[0.014]	[0.016]
Initial input in 2001	N	Y	N	Y	N	Y	N
Student characteristics	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Municipal characteristics	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Number of schools	1488	1488	1488	1150	1488	1150	1488
R-squared	0.26	0.26	0.13	0.13	0.08	0.08	0.02

Notes: This table reports the effects of corruption on various schooling inputs. Each column presents the results of an OLS regression where the dependent variable is listed at the top of each column. Our measure of corruption is an indicator for whether corruption was detected in education. Student characteristics included proportion of male children, proportion of white children, the schooling of the mother, schooling of the father, the proportion of kids with both parents living at home, family size, proportion of households with a computer, proportion of families with running water, proportion of families with electricity, age dummies. Municipal characteristics included share of population that resides in urban areas, Gini coefficient, GDP per capita in 2004, expenditure per child in primary school. Robust standard errors clustered at the municipality are displayed in brackets. Significantly different than zero at 99 (***), 95 (**), 90 (*) percent confidence.

TABLE 9: PROBLEMS THAT SCHOOLS FACE BASED ON TEACHER AND PRINCIPAL SURVEYS

Survey repondent:	Teacher				Principal				
Dependent variable:	Insufficient resources	Insufficient teaching supplies	Lack of teachers	Disciplinary problems among students	Insufficient resources	Insufficient teaching supplies	Lack of teachers	Disciplinary problems among students	Provided teacher training
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Corruption in education	0.072	0.066	-0.004	0.007	0.045	0.106	-0.014	-0.032	-0.106
	[0.034]**	[0.032]**	[0.031]	[0.029]	[0.034]	[0.035]***	[0.030]	[0.031]	[0.047]**
Student characteristics	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Municipal characteristics	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Number of schools	1488	1488	1488	1488	1488	1488	1488	1488	1488
R-squared	0.02	0.05	0.04	0.01	0.05	0.08	0.02	0.02	0.04

Notes: Each column presents the results of an OLS regression where the dependent variable is listed at the top of each column. Our measure of corruption is an indicator for whether corruption was detected in education. In columns 1-4, the data come from a survey conducted with a teacher. In columns 5-9, the data come from a survey conducted with the principal. Student characteristics included proportion of male children, proportion of white children, the schooling of the mother, schooling of the father, the proportion of kids with both parents living at home, family size, proportion of households with a computer, proportion of families with running water, proportion of families with electricity, age dummies. Municipal characteristics included share of population that resides in urban areas, Gini coefficient, GDP per capita in 2004, expenditure per child in primary school. Robust standard errors clustered at the municipality are displayed in brackets. Significantly different than zero at 99 (***), 95 (**), 90 (*) percent confidence.

TABLE A1: THE EFFECTS OF CORRUPTION ON SCHOOLING OUTCOMES USING PROPENSITY SCORE MATCHING

Dependent variable:	Mathematics (1)	Portuguese (2)	Dropout rates (3)	Failure rates (4)
Panel A: Propensity score	-0.332	-0.331	0.019	0.017
Corruption in education	[0.101]***	[0.095]***	[0.007]**	[0.010]*
Panel B: Propensity score matching	-0.592	-0.588	0.019	0.018
Corruption in education	[0.103]***	[0.112]***	[0.006]***	[0.012]
Number of schools	1449	1449	1449	1449

Notes: This table reports the effects of corruption on various educational outcomes. Each column in Panel A presents the results of an OLS regression where the dependent variable is listed at the top of each column, whereas Panel B presents estimates from the Abadie and Imbens (2004) matching estimator. Our measure of corruption is an indicator for whether corruption was detected in education. The propensity score is estimated from a logit regression based on a 3rd order polynomial approximation of the student and municipal characteristics. Robust standard errors clustered at the municipality are displayed in brackets. Significantly different than zero at 99 (***), 95 (**), 90 (*) percent confidence. The sample has been restricted to areas of common support based on the estimated propensity score.

TABLE A2: DIFFERENCE IN MEANS BEFORE AND AFTER ADJUSTING FOR THE PROPENSITY SCORE

Dependent variable:	Unadjusted difference	Propensity-score adjusted difference
	(1)	(2)
Share of male students	-0.001	0.004
	[0.005]	[0.007]
Share of white students	-0.072	-0.01
	[0.015]***	[0.020]
Share of mothers with a high school degree	-0.026	0
	[0.008]***	[0.009]
Share of fathers with a high school degree	-0.028	-0.003
	[0.009]***	[0.009]
Both parents reside in the household	-0.024	0.011
	[0.013]*	[0.012]
Household size	0.094	0.026
	[0.014]***	[0.013]*
Proportion of households with electricity	-0.021	0.004
	[0.008]***	[0.009]
Proportion of households with running water	-0.052	-0.005
	[0.013]***	[0.015]
Age 3	-0.079	0
	[0.023]***	[0.022]
Age 4	0.002	-0.007
	[0.012]	[0.015]
Age 5	0.031	0.01
	[0.006]***	[0.009]
Gini coefficient	0.023	-0.001
	[0.006]***	[0.009]
Per capita income	-3,510.11	-1,385.72
	[785.241]***	[993.955]
Share of expenditures in education per child	-0.153	-0.116
	[0.062]**	[0.107]

Notes: This table reports differences in student and municipal characteristics between municipalities where corruption in education was detect and those where corruption in education was not detected. Column 1 reports the unadjusted differences, whereas column 2 reports the differences conditional on the propensity score. The propensity score is estimated from a logit regression based on a 3rd order polynomial approximation of the student and municipal characteristics. Robust standard errors clustered at the municipality are displayed in brackets. Significantly different than zero at 99 (***), 95 (**), 90 (*) percent confidence. The sample has been restricted to areas of common support based on the estimated propensity score.

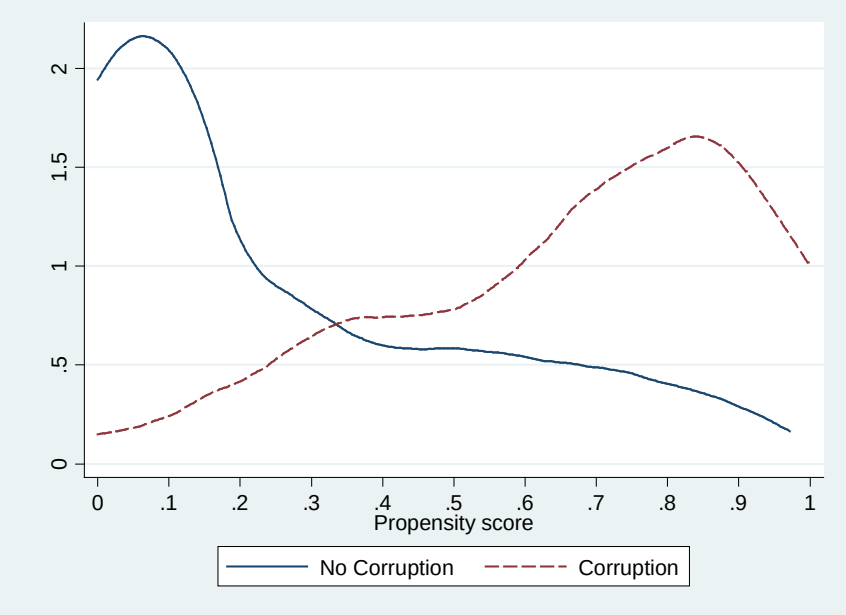


FIGURE A1: OVERLAP IN THE DISTRIBUTION OF THE ESTIMATED PROPENSITY OF BEING CORRUPT

Notes: Figure A1 displays the distribution of the propensity score for detecting corruption in education. The propensity score is estimated from a logit regression based on a 3rd order polynomial approximation of the student and municipal characteristics. The densities were estimated using the Epanechnikov kernel, with an optimally computed bandwidth.