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Educational assistance and education quality in Indonesia

The role of decentralization

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Abstract: We examine the evolution of educational assistance in Indonesia, following two decades of government decentralization, and its effect on education quality. Using Indonesia Family Life Survey data, we exploit as exogenous rule the variation in the implementation of government decentralization to compute difference-in-difference estimators. Indicative evidence suggests decentralization has facilitated collusion between village authorities and marginalized private schools, with substantial increases in educational assistance and financial resources, especially to religious schools. Despite dominant rent-seeking behaviour and self-interest motives, increased public resource allocation to private schools impacted positively on student achievement. Our results also emphasize the role of social norms in undermining efficient public goods allocation after decentralization.

Keywords: decentralization, education transfer, education quality, difference-in-difference, semi-parametric estimation, Indonesia

JEL classification: H52, H53, I28, I38

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1 Introduction

This study aims to unpack the role of the mechanism of a decentralized education system in facilitating progress in education quality, through the provision of educational assistance. The need to improve access to and quality of education, in order to achieve development progress and inclusive growth and to avoid the middle-income trap, has continued to be a pressing agenda for governments in the developing world. Human capital facilitates the creation of knowledge, fosters innovation, and enhances productivity, and its importance for growth has long been acknowledged, since early scholarly work such as Becker (1962) and Romer (1990). More recently, education has been proved to be central in explaining trends in earnings and labour market inequality (Autor 2014). Furthermore, it remains at the heart of global development objectives, from providing universal primary education through the Millennium Development Goals (MDGs) to achieving inclusion and equality in quality education by 2030 as depicted in the fourth goal of the Sustainable Development Goals (SDGs).

Nevertheless, the challenge prevails and has shifted from simply increasing the quantity to improving the quality of education. While primary education enrolment in developing countries has reached approximately 90 per cent, inequality in learning outcomes persists—the 75th percentile of children in developing countries perform less well than the 25th percentile of children in OECD countries, and more than 60 per cent of the former graduate from primary education without achieving basic competencies (World Bank 2018: 6–8).

To address this challenge, various education initiatives and policies are in place, yet educational assistance plays a key role in improving education outcomes. The direct targeting system directly benefits the key actors—students, schools, parents—and addresses education challenges from both the demand and the supply side. Programmes such as scholarships for the poor, school vouchers, and subsidies for obtaining school resources help to improve participation in schooling by reducing the associated cost (Sparrow 2007; Afridi 2011; Filmer and Schady 2014). More importantly, some programmes focus on preparing students from early childhood through improving nutrition. Education has also become the main element of human development conditional cash transfer (CCT) programmes which aim to improve health and education outcomes, such as Brazil's Bolsa Familia, Indonesia's Program Keluarga Harapan, and Mexico's Oportunidades. Nevertheless, the results are often mixed and heterogeneous depending on programme design (García and Saavedra 2017). There are also weak links between educational assistance and learning outcomes (World Bank 2013).

Indeed, what is most important is to understand the mechanism behind this weak link. Institutional capacity in the context of programme implementation is one important aspect to look at. Recent studies have examined abundant evidence in order to identify best practices in education initiatives that work to improve learning outcomes in developing countries (Ganimian and Murnane 2016; Masino and Niño-Zarazúa 2016; García and Saavedra 2017). Education initiatives work to affect learning outcomes when the programme is designed around at least two determinant factors of quality of learning, and when the programme design takes into account the local norms (Masino and Niño-Zarazúa 2016). Politics also matters in setting the quality of education, as education services are not provided in a vacuum. The multiple interests of political actors may jeopardize an education system, which eventually contributes to low quality of learning outcomes (World Bank 2018: 189–95). Hence, institutional factors, together with the influence of local and social norms on the provision of education services, should not be overlooked when assessing educational assistance and its link to changes in learning outcomes.

We aim to fill the gap and contribute to enhancing understanding of the role of institutional features in educational assistance and service provision in improving learning outcomes—by looking at these features within the context of a decentralized education system. This is particularly important as educational assistance is often provided at the level of subnational governments (e.g. municipalities). Decentralization refers to a government structure in which certain functions of central government, such as administration or political or economic responsibility, are delegated to and managed by independent smaller government units (Faguet and Sanchez 2008: 1296). It is argued that decentralization allows government to be more responsive to local needs; yet the end results are subject to local government capacity (Crook and Sverisson 1999). In the context of education, a decentralized education system has been found to improve education by adapting it to local education needs (Di Gropello and Marshall 2011) and by enhancing the sense of responsibility across actors (De Grauw 2005). In relation to this, the effect of educational assistance thus depends on the capacity of the local institutions that administer the programme.

Indonesia provides a relevant case to study educational assistance and changes in education quality within the context of a decentralized education system. Within the last two decades, the country has successfully recovered from the Asian financial crisis, joined the lower-middle-income countries, and halved its poverty rate. Nonetheless, inequality in education quality and quantity remains a challenge, particularly in remote and rural areas (World Bank 2013: 13), and despite the tripled government expenditure devoted to the education sector since 2000 (World Bank 2017). Educational assistance is central to addressing this challenge and, more importantly, has historically been designed as a part of key government anti-poverty policies, among others. It accounts for the largest share of total government social assistance expenditure (Yusuf and Sumner 2015: 344–45).

In addition, the Indonesian government undertook major reform by carrying out decentralization, which has affected the education system and its management throughout the country since 2001. It has resulted in the transfer of education management from the central government to the independent district education office. What makes Indonesia an interesting case study in this context is the rapid nationwide roll-out and the extent of the decentralization, which transformed the previously highly centralized government structure into one of 34 provinces, 413 districts, 9982 sub-districts, and 80,414 villages (Nasution 2016: 4). This makes it a relevant case study, as it is the district education office and local schools that administer government educational assistance, and the way educational assistance leads to changes in education quality will be subject to the capacity of these institutions.

Localities, which entail unique local and social norms, are another important factor when looking at how education services may affect learning outcomes. This is particularly relevant for a highly populated and geographically challenging country such as Indonesia. The country is also characterized by rich ethnic and religious diversity, with hundreds of native local languages. Considering this, Indonesia is unique in terms of how the education system has developed historically and the role of private education. The education system in Indonesia developed under the dominant influence of religious and local principles and political interests (Suratno 2014). Moreover, in contrast to the developed world, in Indonesia private education plays an important role in closing the education gap, providing education to the low-income and marginalized population (Bangay 2005: 170–71). Private education provides close to 40 per cent of lower- and upper-secondary school places and continues to be in demand because of the fact that it is mainly provided by communities themselves, and thus is influenced by their particular ethnic or religious orientation (Stern and Smith 2016). This raises an interesting question: what is the mechanism through which educational assistance, together with a decentralized education system, works towards changing students' learning outcomes within a fragmented society and education system?

To answer this question, we examine the evolution of educational assistance in Indonesia, assessing it as an indirect mechanism through which a decentralized education system affects quality of education. We argue that it affects education quality by influencing the provision of educational assistance to public and private schools, and that the institutional feature of education provision, which is subject to local norms, is an important mechanism behind it. To test this, we use information on education outcomes and characteristics of schools and their localities from a longitudinal study of the Indonesia Family Life Survey (IFLS) and analyse the impact of decentralization on education quality in Indonesia as measured by average student performance. Exploiting as exogenous rule the variation in the implementation of government decentralization, we use the data to compute difference-in-difference (DID) estimators using standard DID and semi-parametric DID.

We find indicative evidence that decentralization has facilitated collusion between village authorities and marginalized private schools, with substantial increases in financial resources, especially to religious schools. Interestingly, we find that despite dominant rent-seeking behaviour and self-interest motives, the increased allocation of public resources to private schools has had a positive impact on student achievement outcomes. Our results also emphasize the role of social norms in undermining the efficient allocation of public goods after decentralization.

The paper is structured as follows. Section 2 provides a brief overview of the research context. Section 3 explains the data and estimation strategy, and Section 4 provides the main results. Section 5 discusses the impact channels, and Section 6 concludes with discussion linking to the relevant broader literature and suggestions for further research.

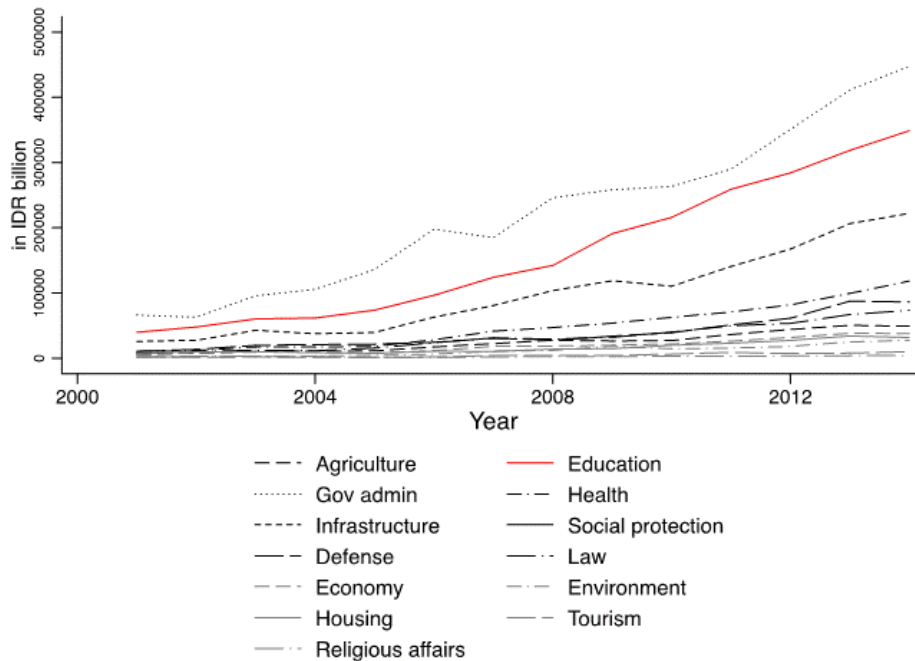
2 Research context: education quality, educational assistance, and decentralization in Indonesia

Successful recovery and impressive growth following the Asian financial crisis in the late 1990s have enabled Indonesia to grow from a lower-middle-income country to a confident G20 member, and to halve poverty from 24 per cent to 12 per cent between 1999 and 2012 (World Bank 2014: 4). Yet despite the positive developments, income inequality persists and growth has been described as ‘jobless’, leaving 65 million people to hover around the poverty line and vulnerability to poverty to remain high (Alatas and Newhouse 2010). Among other sectors, education remains important for the country as a means to progress out of poverty, as lack of education plays a key role in explaining the large share of working poor in the population in Indonesia (Priebe et al. 2014: 23). Levelling the quality of education at all levels is important in solving the skills shortage and to achieve the country’s aspiration of avoiding the middle-income trap (World Bank 2014).

Nevertheless, slow progress in improving education quality has proved to be a persistent challenge despite the country’s achievement in expanding access to education. Secular decline in returns to schooling between 1993 and 2007 reflect the fact that quality of education does not respond well to market demand (Purnastuti et al. 2013), and that the quality of education in Indonesia is comparatively lower than in other Asian and other less-developed countries (Purnastuti et al. 2015: 191). Learning outcomes have also been on a downward trajectory if compared globally. Vietnam ranks 8th while Indonesia ranks 62nd in science score, out of the 70 countries surveyed (Gurría 2016, citing 2015 OECD PISA data). Moreover, unequal access to good-quality education and unequal distribution of schools and high-quality teachers remain evident, particularly disadvantaging rural and remote areas (World Bank 2013: 13), where schools must fill in the gaps to provide education to poorer, rural, and remote areas (Bangay 2005: 170–71).

Since independence in 1945, the government of Indonesia has been aware of the challenges in providing equal access and educational experience across the regions, and has continued to address them through various education reforms and increased financial resources. One important thing to note is the shift in the strategy from providing hard infrastructure during the New Order era (1996–1998), such as buildings schools in villages, to direct targeting towards schools, teachers, and students—aiming to not only increase access to but also improve quality of schooling. The share of education spending in total government expenditure tripled between 2000 and 2012, becoming the second-largest area of spending after government administration (see Figure 1).

Figure 1: Trend in government expenditure by sector (2001–2013)



Source: Author's illustration based on the Indonesia Consolidated Fiscal Dataset (COFIS) (World Bank 2017).

Among other strategies, educational assistance is the key element to improving access to and quality of education, and is currently at the heart of social assistance programmes in Indonesia. The allocated budget for educational assistance has constituted the largest share of total government expenditure for targeted social programmes for a little over two decades, surpassing that of health, village, and community programmes (Yusuf and Sumner 2015: 344–45). This assistance is mainly provided in the form of direct cash transfers to schools and students, such as school subsidy (JPS), School Operational Assistance (BOS), scholarship for the poor (BSM), and cash transfer for children as part of the Family Cash Transfer Program (PKH).

Despite the expansion in the last two decades, however, evidence of the impact of educational assistance in improving education quality is still scarce and remains inconclusive, with a large bias towards assessment of participation in schooling, rather than of learning outcomes. A study using household information from survey data on 100 villages in Indonesia found that the public scholarship programme was effective in suppressing the drop-out rate among junior secondary school students by 3 per cent during crisis period (Cameron 2009: 314). On the other hand, a quasi-experimental study based on household survey data found that a school assistance programme during the oil crisis between 2003 and 2005 was not effective in reducing drop-out rate (Kharisma 2016: 10–12).

This resonates with evidence from other similar country contexts. An evaluation studying the impact of a programme of scholarship for the poor in Cambodia using regression discontinuity design (RDD) found that it increased school attainment but did not improve students' test scores in the medium term (Filmer and Schady 2014: 683–84). In Colombia, a CCT programme conditioned on children's school attendance (Familias en Accion) was found to increase school attainment, yet beneficiary and non-beneficiary children turned out to have equal scores in language, maths, and overall tests (Baez and Camacho 2011: 24–25). Interestingly, if combined with the right incentives, the same programme was found to raise children's learning outcomes in the long term, following eight to twelve years of programme exposure (Barrera-Osorio et al. 2017).

Corresponding to this story, Ganimian and Murnane (2016) reviewed more than 200 impact evaluation studies on different sets of education initiatives and concluded that simply reducing the cost of education for students did not translate into better levels of achievement. It takes components such as providing incentives to teachers, parents, and communities and putting a monitoring system in place for such programmes to translate such initiatives into better student performance (Ganimian and Murnane 2016: 739). In sum, the research stresses the weak link between educational assistance and learning outcomes and highlights the importance of institutional features in determining the success of such programmes.

Indeed, the crucial question is not whether such programmes help improve students' achievement, but what the mechanism is behind the weak link. Institutional capacity in the context of programme implementation is one important aspect to look at. For instance, Heinrich (2007: 122) assessed a CCT programme in Argentina aimed at improving human capital, and the non-experimental estimates suggest an improvement in the performance of students belonging to schools with better-equipped institutional capacity and management. Thus, our main contribution to the literature is to enhance the understanding of the role of institutional features of education provision and assistance in improving learning outcomes, by looking at the role of decentralized education. This is particularly relevant in a heavily populated and geographically challenging country such as Indonesia, in which local institutions—district education offices and local schools—are often responsible for administering government programmes.

The decentralized education system in Indonesia was instigated in 2001, as a part of the 'big bang' decentralization across government sectors, and led to major changes in education management throughout the country. What makes Indonesia a unique case study is that the decentralization occurred on a large scale and in all parts of the country simultaneously, transforming the previous constituencies into 34 provinces, 413 districts, 9982 sub-districts, and 80,414 villages, following nearly two decades of decentralization (Nasution 2016: 4). There are currently five levels of government: central government, province, *kabupaten* (district), *kecamatan* (sub-district), *kota* (municipality), and *kelurahan/desa* (village). The main change as a result of decentralization is the transfer of authority and fiscal responsibility from central government to the district and municipality levels of subnational government; they are now responsible for managing their own budget expenditure and provision of public goods, including the education sector (Nasution 2016: 7).

Prior to decentralization, education sector was highly centralized, whereby the Ministry of Education (MoEc) and Ministry of Religious Affairs (MoRA) were responsible for national planning and management of the national education system and its financing. Public teachers were thus central government employees, rather than being chosen by subnational governments or local communities. This is in contrast with post-decentralization, in which the district office now has the authority to allocate and design local education policies. This include managing education finance, design of local regulatory frameworks, development of the curriculum at school level, and provision of early childhood, basic, and secondary-level education (World Bank 2013). Thus, an

assessment of the changes in education quality in general needs to take into account the heterogeneity in the capacity of district education offices in managing these additional resources.

This is particularly so in the case of transfer of educational assistance. Agustina et al. (2009: 25) illustrate the role of institutions in managing public scholarship programmes, whereby districts and head teachers play a significant role in targeting and allocating beneficiaries at school level. While the quota is determined at central level (MoEc and MoRA) for each of the provinces, it is the school and district that decide whom to receive, and often the school principal who is in charge of fund disbursement when students or parents are not available at the right time to receive the educational assistance directly. Therefore, the role of institutions, in this case schools and the district, along with the community, should not be overlooked when assessing overall changes in education quality and the role of educational assistance.

3 Data and estimation strategy

3.1 Data

The analysis carried out in this study is based on the Indonesian Family Life Survey. The IFLS is a multipurpose ongoing longitudinal survey, which provides in-depth information on the economic and non-economic wellbeing of individuals, households, and community. It also collects information on public and private facilities available in the community. The survey is designed to study a wide array of topics, including poverty, income, behaviours, transfers, and health and wellbeing. The survey currently has five waves, covering a 21-year span from 1993 to 2014, and collects information from 13 out of 26 provinces in the nation. The sampling scheme is stratified at province level and urban/rural locations, and the 13 provinces represent up to 80 per cent of the population (Frankenberg and Thomas 2000: 4).

This study aims to test which hypothesis holds in explaining the role of decentralization in facilitating changes in education in Indonesia. We are particularly interested in exploring the possibility of misallocation of education financing and reduced school and community efforts. For estimation of the effect, we compare two groups: public schools as the treatment group and private schools as the control group. Table 1 shows the number of observations included in the analyses for each of the estimation strategies applied.

Table 1: Sample selection from IFLS 2000 and 2007

N of schools	Full sample	DID sample	SDID sample
Public	3275	1633	737
Private	1459	821	212
Total	4734	2454	949

Source: Author's calculation based on IFLS 2000 and 2007 rounds.

The unit of analysis in this paper is school level. The observations include all public and private schools. We apply some exclusions. First, we do not include Christian/Catholic schools because their performance is better than the average of private schools. We also exclude observations with extreme values in terms of education outcomes. We follow standard measurement of education outcomes, i.e. students' performance in test scores. The IFLS collects information on students' test scores in national examinations for mathematics and language subjects. The information was collected from a sample of students for each of the schools surveyed. Our key dependent variables for education outcomes are thus the average student score in mathematics and language tests in the national examination at school level.

In this study, we are interested to understand whether decentralization affects quality of education, particularly among the public schools that are affected by the policy. In order to estimate the effect, we need information not only on education outcomes when the public schools received the treatment, but also on outcomes in the absence of decentralization. Essentially, the effect of decentralization would be the difference in the average of the two. However, the challenge is that the latter information is not observed. Thus, estimating the effect would involve a measurement of information that one never observes. To counter this, we employ two methods that are popular in the literature of policy evaluation studies.

We exploit the natural experiment of decentralization which occurred in 2001, sample a repeated cross-section of data on schooling and education outcomes, and apply two estimation methods to estimate the impact of decentralization on education quality in Indonesia. We apply standard DID as illustrated in Athey and Imbens (2006) and semi-parametric DID (SDID) as demonstrated in Abadie (2005).

3.2 Estimating students' achievement

We follow a similar strategy for estimating the effect of decentralization on education quality in Indonesia as that illustrated in Leer (2016). Education quality is measured in terms of the average test scores in language and maths. The unit of analysis is school level. Education quality is determined by the following function:

$$Y = \alpha_0 + \alpha_1 \textit{Public} + \alpha_2 \textit{Public} \times \textit{PostDecent} + X + Z + \mu + \nu \quad (1)$$

where Y is the average outcome variable, \textit{Public} is a binary variable coded 1 for public school as the treatment group, $\textit{Public} \times \textit{PostDecent}$ is the variable of interest with α_2 capturing the impact of decentralization on the education quality of public schools relative to their private-school counterparts. X is a vector of covariates influencing the outcome variables. We control for geographical variations—urban/rural, and school and village characteristics. Table A1 in the Appendix lists and describes the variables. Standard errors are clustered at our unit of analysis—school level. Using DID and SDID, we also estimate the heterogeneity effect of decentralization in different settings: active vs passive communities, and religious vs non-religious schools.

3.3 Difference-in-difference

Difference-in-difference (DID) estimation is a popular method in the applied economic literature for measuring the impact of a policy change (Heckman et al. 1999: 30). It measures the effect of a policy or an intervention by comparing the outcome of interest in the treatment group before and after the intervention. This method is feasible for use with our data, as we observed the education outcome variables over time.

Using DID, we seek to estimate the average treatment effect (ATE)—in our case, the impact of decentralization on average education outcomes of students in public schools relative to the control group, private schools. Our parameter of interest is the interaction between the treatment group (a dummy; 1 is equal to public schools) and the treatment period variable (a dummy; 1 is equal to post-decentralization period). To ensure the causality of the DID estimate, we need to satisfy certain assumptions: the parallel trend and the treatment effect are constant across groups and across period. We follow the set-up of linear DID for a continuous outcome variable as illustrated in Athey and Imbens (2006) and Puhani (2012: 86).

The equation below captures the treatment effect:

$$\varphi = E[Y_1|T = 1, D = 1, X] - E[Y_0|T = 1, D = 1, X] \quad (2)$$

where Y_1 is the potential outcomes if treated, Y_0 is the potential outcomes if not treated, D is a binary indicating treatment status and coded 1 if the observation receives treatment and 0 otherwise, T is a binary indicating time variable and coded 1 if the observation is observed post-decentralization, and X is a vector of covariates.

The enrolment in the treatment is then specified as:

$$I = 1[T = 1, D = 1] = T \times G \quad (3)$$

where, $D=1$ indicates that DID in the linear model assumes the observation rule for the outcome of interest (Y), which is demonstrated in this equation:

$$Y = I \times Y_1 + (1 - I) \times Y_0 \quad (4)$$

The potential outcome Y_0 in the linear model is specified as:

$$E[Y|T, D, X] = \alpha T + \beta D + X\theta \quad (5)$$

Equation (5) implies an important assumption in the DID linear model: it assumes that the effect of time period α is constant across control and treatment groups. Also, the difference between the two groups β is constant across period.

Following the specification in equation (2) and equation (5), the equation can be rewritten as:

$$E[Y_1|T = 1, D = 1, X] = \alpha + \beta + \varphi + X\theta \quad (6)$$

If assumptions as implied in equations (3), (4), and (5) are satisfied, then the treatment effect can be obtained by the following:¹

$$\begin{aligned} EY|T, D, X] &= TD \times [\varphi + \alpha T + \beta D + X\theta] \\ &+ (1 - TD) \times [\alpha T + \beta T + X\theta] \\ &= \alpha T + \beta T + \varphi TD + X\theta \end{aligned} \quad (7)$$

The treatment effect φ is then captured by the interaction term between the treatment status variable D and the time period T .

3.4 Semi-parametric DID

We acknowledge that our set-up of public and private schools as treatment and control groups respectively might not be the ideal case to estimate the effect of decentralization on learning outcomes due to pre-treatment differences. The parallel trend of education outcomes shows that

¹ We use the diff Stata syntax developed by Villa (2016).

students of public schools on average score higher in both language and maths than private school students. The challenge in our study is to ensure that we address the imbalances in the characteristics of public and private schools prior to decentralization.

We apply SDID, as illustrated by Abadie (2005), to strengthen the reliability of our estimates. SDID can be used to examine the impact of an intervention and is particularly useful when longitudinal or repeated cross-sectional data are available. It addresses the imbalances in the characteristics of control and treatment groups using a reweighing technique (Houngbedji 2015: 1–2). The inference takes into account that the propensity score is estimated. The average treatment effect is obtained through the following equation:²

$$E\left(\frac{\Delta Y_t}{P(D=1)} \times \frac{D-\phi(X_0)}{1-\phi(X_0)}\right) \quad (8)$$

4 Results

4.1 Descriptives and balance checks

In this section, we briefly discuss the descriptive statistics of our sample and explain the results of balance checks on pre-treatment differences between private schools (as control) and public schools (as treatment group). Our study consists of information on observable characteristics of schooling and localities (i.e. village and community characteristics) in the baseline year 2000 and the follow-up year 2007. Table 2 provides descriptive statistics of the situation before the reform.

Table 2: Descriptive statistics for covariates pre-decentralization (2000)

Variables	Private	Public	Difference	t-coeff	sig. level
language test	5.336	6.270	-0.934	-11.484	***
maths test	4.535	5.725	-1.190	-17.436	***
sanitation	0.670	0.591	0.078	3.831	***
village revenue	109.743	120.317	-10.574	-1.080	
poor household (%)	23.379	26.982	-3.603	-3.117	***
urban	0.720	0.592	0.128	6.389	***
distance to district office	16.901	17.683	-0.782	-0.772	
community groups (n)	4.854	4.832	0.022	0.308	
teacher with primary education	0.000	0.001	-0.001	-0.701	
teacher with lower-secondary education	0.014	0.017	-0.003	-0.527	
teacher with upper-secondary education	0.010	0.004	0.007	1.934	
teacher with tertiary education	0.090	0.150	-0.060	-4.010	***
teacher_year	12.672	16.527	-3.855	-12.881	

Note: Survey weight applied.

Source: Author's calculation based on IFLS 2000 and 2007 rounds.

² In practice, we use the `absdid` Stata syntax developed by Houngbedji (2015) to carry the estimation.

We confirm that decentralization had taken place after the year 2000, which was indicated by the observed jump in the share of public schools managed by district education offices. Recall that MoEc and MoRA centrally managed public schools prior to the reform. Decentralization also affects the revenue and expenditure structure of villages and schools. The government contribution to total village revenue rose by approximately 20 per cent in 2007 and school revenue continued to double during the period 2007–2014 (Figure A2, Appendix). This was even more pronounced among the private schools (Figure A3, Appendix).

Despite the reform, the government still retains a significant role in providing education finance down from the village to school level. Government funding continues to account for 50–60 per cent of village and school revenue and contributes the largest share of finance to educational assistance in both public and private schools (Figure A4, Panel A, Appendix). The average value of government educational assistance has tripled in real terms since the reform, with a pronounced rise among the private schools (Figure A4, Panel B, Appendix). However, whether the increased education financing lead to changes in education outcomes will depend on institutional capacity and the effective allocation of spending.

Our data also show that public schools provide higher quality of education relative to private schools. On average, students in public schools consistently perform better in both language and maths tests, by 0.9 and 1.2 points respectively. This resonates with other studies and confirms the characteristics of private schools in Indonesia—they provide low-cost education to the poorer regions and have less access to education finance and resources, limiting the quality of the education experience provided (Bangay 2005: 171–72; Kristiansen and Pratikno 2006: 515). Our data show that the differences in the outcomes are driven by teachers’ effort—private schools on average have 5 per cent more teachers with tertiary education, but they spend fewer working hours relative to public schools (Table 2).

To arrive at non-biased estimates, it is important to ensure there are no significant observed differences between the two schools. Notice that there is a difference in our outcome of interest prior to decentralization. This posed a challenge in our estimation, as education outcomes among public schools could be the result of pre-existing characteristics, rather than an exogenous effect of decentralization. We respond to this by performing two estimation strategies as explained in Section 3. We no longer observed statistically significant differences in the average scores in either test, the quality of teachers or the share of poor households in the locality prior to decentralization (Table A2, Appendix). For robustness, we also examine parallel trend assumption for the outcome variables using data from two points prior to the intervention (1997–2000). The results confirm that parallel trends hold, despite the consistently better average performance of public-school students (see Figure A1, Panel A, in Appendix).

4.2 The impact of decentralization on education quality in Indonesia

We start the analysis by measuring the direct impact of decentralization on education quality in Indonesia, focusing on two outcome variables—average student score in language and maths tests. Table 3 displays the results for the calculated difference estimators. As there is a significant difference in education outcomes in the baseline period, we report results for both DID and SDID estimators using the original and reweighted samples.

Table 3: Impact of decentralization on education quality: DID and SDID estimation results

Estimation	Language test		Maths test	
	Basic	Extended	Basic	Extended
DID	-0.628***	-0.628***	-1.059***	-1.054***
s.e.	[-9.64]	[-6.02]	[-11.33]	[-6.92]
Obs.	4189	1966	4163	1950
SDID	-0.562***	-0.469***	-0.759***	-0.693***
s.e.	[-5.93]	[-3.70]	[-5.00]	[-3.49]
Obs.	834	560	831	559

Notes: DID shows the difference-in-difference estimators, obtained using the `diff` syntax developed by Villa (2016), and SDID shows the semi-parametric difference-in-difference results, estimated using `absdid` Stata syntax with the following specifications: `logistic` option to estimate the propensity score for calculating weight to reweight the original sample; drop observations with propensity score of less than 0.01 and greater than 0.99. Basic model controls no covariates and extended model estimates the treatment effect controlling for other factors—school, village, and geographical variations. Standard errors are reported in parentheses and clustered at school level. In this and subsequent tables, ***, **, * indicate significant level at 1%, 5%, and 10% respectively.

Source: Author's calculation based on IFLS 2000 and 2007 rounds.

We found a significant impact of decentralization on education quality in Indonesia as measured by average learning outcomes, and an interesting counterintuitive trend, whereby private schools seem to benefit more from decentralization. The estimated effects are statistically significant and robust to different econometric specifications and various sets of covariates.³ Following decentralization, the estimated difference in the average scores in language and maths tests are negative 0.4–0.6 and 0.6–1.0 points respectively. The differences are more evident for average maths test scores. We found that the difference-in-difference estimators tend to overestimate the changes in the average test scores. This is expected, as we observed a significant different in average education outcomes between public and private schools.

Nevertheless, it is important to carefully interpret the sign of the estimated coefficient. The coefficients show the estimated difference between the average performance of public schools and that of private schools, given the treatment of decentralization. Thus, our findings do not necessarily suggest that decentralization is detrimental to education quality. On the contrary, they counterintuitively demonstrate the ‘catching-up’ story of private schools. Recall that we observed an increase in average test scores among students in both public and private schools (Table A2, Appendix). The results simply indicate that the improvements in the education quality of public schools have been less significant than the improvements in the education quality of their private-school counterparts. In other words, private schools seem to have benefited more from decentralization than the public schools.

5 The mechanism

The interesting question is, then, why public schools do not benefit as much as private schools, which are theoretically not affected by the reform. We aim to go beyond just measuring the impact

³ For robustness, we ran the same DD and SDID estimations with a different set of controls added, and we found that the estimated decentralization impacts persist in sign and magnitude, and do not change across different models. Results are available upon request.

of decentralization on education quality, to also investigate the mechanisms that can explain the particular conditions and channels through which decentralization facilitates improvement in education outcomes. We are particularly interested in examining the role of education transfer as an indirect mechanism. In doing so, we explore three possible channels, focusing on the role of key development actors—local institutions, schools, and communities. Among other channels, we argue that decentralization facilitates collusion between district and village officials, resulting from a shift in preferences when allocating education finance towards private and religious-oriented schools—particularly in the form of increased provision of educational assistance to minority schools. We also found counter-evidence whereby schools and local communities do not contribute to increasing education outcomes. The next subsections describe the results in more detail.

5.1 Increased provision of educational assistance programmes

Recall that our main interest in the paper is to examine the extent to which decentralization transforms the provision of educational assistance available to students in public schools. Studies have examined the importance of educational assistance programmes in enhancing education quality, including increased enrolment rates (Sparrow 2007), school participation (Afridi 2011), and improved learning outcomes (Anand et al. 2009). We hypothesize that decentralization helps to improve education outcomes through increased provision of education transfer programmes. We investigate two possible mechanisms by examining (i) whether the decentralized education system increases access to educational assistance—measured by the share of students who received the education transfer; and (ii) the amount of educational assistance—measured by the average amount received per student. Both are examined at the school level. As decentralization naturally only affects public schools, we hypothesize that decentralization leads to an increase in educational assistance provided by government. To investigate the link, we estimate the following equation using DID and SID estimations, whereby the outcome variable is each of the measures of access to and amount of educational assistance.

$$transfer_{sp} = \alpha_0 + \alpha_1 \mathit{Public} + \alpha_2 S'_{sp} + \alpha_3 X'_{sp} + \epsilon_{sp}, \quad (9)$$

where $transfer_{sp}$ is each of the measures of access to (ratio of beneficiaries of educational assistance) and amount of (average amount of transfer received per student) educational assistance in school s in province p ; Public is our parameter of interest—indicating the treatment group (public school affected by decentralization); S' is a vector of variables controlling the school's characteristics; and X'_{vp} controls for time-variant village characteristics.

It is important to take into account the complex structure of education transfer programmes in the country, through which educational assistance is commonly provided by different institutions—communities, or parents through the school committee. Community and school committee involvement in providing education transfer has been increasing, although government is still the predominant contributor to the total share (Figure A4, Appendix). Thus, it is important not only to assess the impact of decentralization on cumulative educational assistance, but also to see how it affects different types of education transfer. For this purpose, we assess the extent to which decentralization changes provision of education transfer by further segregating the type of educational assistance into two: by provider and by type of benefits. We classify 'provider' as government, school committee, or community scholarship, while the type of benefits include education, cash, and in-kind education transfers.

First, we investigate whether decentralization increases access to educational assistance at school level. We measure it as the ratio of students who are engaged in such programmes; the results are

presented in Panel A of Table 4. Counterintuitively, we found that decentralization benefits private schools in terms of access to government educational assistance, but no significant effect was observed for the amount of education transfer (Panel B, Table 4). Decentralization reduces the share of beneficiaries of government scholarship by 0.5–3.0 per cent. On the other hand, we found a smaller increase in non-governmental educational assistance (provided e.g. by the school committee or the community) observed among private schools. Intuitively, this is consistent with private schools being the more marginalized schools. Also, decentralization leads to a 1.5–4.0 per cent rise in the share of educational assistance provided by the community among public schools, relative to private schools. This strongly suggests that decentralization increases education transfer by government to private schools more than to public schools. As government scholarship comprises more than 85 per cent of scholarship in schools, this is reflected in the catching up of education performance in private schools.

Table 4: The effect of decentralization on provision of educational assistance

Estimation	Panel A: Type of education transfer			Panel B: Type of education transfer	
	Government	School committee	Community	In-kind	Cash
Panel A: Ratio of beneficiaries					
DID	-2.875***	1.068	-2.955***	5.09	-1.753
s.e.	[-3.84]	[-1.62]	[-5.20]	[-0.77]	[-1.81]
Obs.	1756	1409	1392	72	1754
SDID	-0.612	3.859	1.477***	n/a	2.213
s.e.	(-0.59)	[-1.41]	[-8.71]	n/a	-1.39
Obs.	391	45	6	n/a	398
Panel B: Size of transfer					
DID	5.944	-4.587	25.04	-2.854	54.85
s.e.	[-0.69]	[-0.45]	[-0.4]	[-0.10]	[-1.69]
Obs.	1749	1402	1382	72	1751
SDID	-5.579	-1.741	25.04	n/a	9.597
s.e.	[-0.72]	[-0.20]	[-1.51]	n/a	[0.56]
Obs.	378	43	6	n/a	391

Source: Author's calculation based on IFLS 2000 and 2007 rounds.

We also test whether decentralized education leads to increased provision of different types of educational assistance, particularly in the case of cash and in-kind transfer. The idea is that if decentralizing an education system would lead to an increase in access to educational assistance and in the amount of that assistance in the form of greater cash transfer to private schools, this could be a potential explanation for the 'catching up' of quality among marginalized private schools in Indonesia. We found that decentralization improves the provision of educational assistance among public schools (relative to private schools) in terms of both access and amount of educational assistance, particularly in the case of cash transfer. It increased the ratio of beneficiaries of both in-kind and cash transfers more in public schools than in private schools, by approximately 5 per cent and 2 per cent respectively. It also increased the amount of education cash transfer in both types of school, although the impact is not statistically significant (Figure A4, Appendix).

5.2 Rent-seeking behaviour within local institutions

In our study, we argue that the key mechanism behind the ‘catching-up’ story of private schools is ‘rent-seeking’ behaviour among village and school officials. Extant literature has examined this rent-seeking behaviour (Mueller 2004; Cheikbossian 2008). Also, research has found that the effectiveness of public goods provision depends on the degree of ethnic or religious fragmentation in a society. This is particularly relevant in the case of Indonesia, where there are hundreds of ethnic groups (Alesina et al. 2014; Tajima et al. 2017). The impact of decentralization on the provision of goods or services will thus depend on the heterogeneity of preferences of communities.

In our context, this could occur if the authorities exercise their ‘self-interest’ and influence decision-making processes, thus leading to a bias in allocation of resources towards a particular type of school. Our data show that there is an increase in education finance following decentralization, with more resources allocated towards private schools. To test the hypothesis, we investigate the heterogeneous impact of decentralization on religious and non-religious-oriented schools. We run the same estimation with two different subsamples: non-religious schools and religious schools. It is also important to note that 90 per cent of private schools are Islam-oriented schools.

Table 5 displays the difference-in-difference estimations. We found heterogeneity in the impact of decentralization on education outcomes between the two types of schools, whereby positive coefficients were consistently observed among the religious-oriented schools. This suggests that religious-oriented schools benefit most from the decentralization, and this could be a result of higher allocation of government subsidy to schools with a religious orientation under MoRA (Kristiansen and Pratikno 2006: 515–16.).

Table 5: The heterogeneous impact of decentralization: religious vs non-religious schools

Estimation	Language test		Maths test	
	Non-religious	Religious	Non-religious	Religious
DID	-0.809***	0.526**	-1.940***	0.347
s.e.	[-5.44]	[3.19]	[-7.80]	[-1.49]
Obs.	1432	534	1427	523
SDID	-0.641	0.35	-0.748*	0.241
s.e.	[-1.25]	[-1.53]	[-2.48]	[-0.74]
Obs.	410	111	398	108

Source: Author’s calculation based on IFLS 2000 and 2007 rounds.

Nevertheless, recall that we are interested in understanding the mechanism through which private schools improve their education outcomes more following decentralization. Notice that the results for non-religious schools provide evidence that public non-religious schools improve their education by less 0.8 and 1.9 points relative to private non-religious schools. The results could be indicative of the ‘self-interest’ of village or community officials, who may favour channelling the extra education finance towards these schools, although we do not argue for this causality. We will further investigate this, by examining the role of community efforts.

5.3 School efforts and management

Teachers' effort. The other possible explanation behind the catching up in education quality among private schools is that the schools' effort to improve their students' performance has increased. Advocates of a decentralized education system argue that it provides schools with more financial resources coming from the community. Also, decentralization provides greater freedom for schools to tailor their expenditure based on the school's need. To test this, we proxy school effort with (i) teachers' behaviour and (ii) number of active school days, and estimate DID estimators for decentralization's effect on schools' efforts. We include three indicators to measure teachers' effort: average number of hours spent working in school, average number of hours spent in other jobs, and average monthly salary of teachers. The specification follows:

$$effort_{sp} = \alpha_0 + \alpha_1 Public + \alpha_2 S'_{sp} + \alpha_3 X'_{sp} + \epsilon_{sp}, \quad (10)$$

where $effort_{sp}$ is each of the measures of effort in school s in province p ; $Public$ is our parameter of interest—indicating the treatment group (public school affected by decentralization); S' is a vector of variables controlling schools' characteristics; and X'_{vp} controls for time-variant village characteristics.

Table 6 shows the results. Decentralization reduces education quality through a levelling off of teachers' efforts between public and private schools. As illustrated, decentralization has had a negative effect on the average number of teachers' working hours in public schools. In the presence of decentralization, teaching hours in public schools reduced by approximately five per week compared with private schools. This is an important finding with a crucial policy implication. Following the increase in the average monthly wage of public school teachers, their effort is now less in the presence of decentralization. This is confirmed by the positive effect we observed in the average number of working hours spent in another job (Panel B, right figure).

Table 6: The effect of decentralization on schools' efforts

Estimation	Teaching hours		Other working hours		School days	
	Basic	Extended	Basic	Extended	Basic	Extended
DID	-5.187***	-4.919***	3.571***	5.084***	0.0139	0.0527***
s.e.	[-8.67]	[-5.45]	[-6.09]	[-5.83]	[-8.65]	[-5.40]
Obs.	4228	2017	4220	2017	4383	2017

Source: Author's calculation based on IFLS 2000 and 2007 rounds.

This may be an indication of the absence of a strong performance monitoring system in place between the district education office and public schools. Post-decentralization, the district education office has responsibility for hiring teachers. Instead of improving the performance of current teachers, the extra resources were used to hire more teachers. This is in opposition to extant evidence, which asserts that increasing the number of teachers is often not correlated with improved student performance (World Bank 2013: 12). We also found limited evidence that decentralization facilitates an increase in the number of active school days (see Table 6).

School management. Recall that we found decentralization led public schools to improve less in terms of education quality than the average private school, and we are interested in observing whether collusion between village/community and school drives the trend. This relates to the literature on potential rent-seeking behaviour among school officials. The idea is that schools which are less dependent on the state or district government would improve their education quality

more, because they have the capacity to allocate resources based on the needs of the school, rather than allocation being tied up with universal guidelines from the education ministry. Testing this hypothesis, we categorize the schools into two classifications based on how the school head was elected: ‘non-democratic’ and ‘democratic’ schools. Non-democratic schools are those that have their school head elected by the state or by the district education office. Democratic schools are those whose school head was elected by the community, i.e. through a foundation or school committee.

Table 7: The heterogeneous impact of decentralization: by school head election type

Estimation	Type of schools			
	(I) All schools	(II) Central	(III) District	(IV) Community
Panel A: Language test				
DID	-0.628***	-0.621***	0.665***	-0.890*
s.e.	[-7.21]	[-7.39]	[-8.38]	[-2.25]
Obs.	1966	1933	1933	1933
SDID	-0.469***	-0.267	0.312	-0.219
s.e.	(-3.70)	(-0.23)	-1.62	(-0.40)
Obs.	560	372	19	48
Panel B: Maths test				
DID	-1.054***	-0.816***	0.825***	-0.302
s.e.	(-7.47)	(-6.82)	-7.09	(-0.71)
Obs.	1950	1917	1917	1917
SDID	-0.693***	-0.197	-0.187	-0.587
s.e.	(-3.49)	(-0.32)	(-0.34)	(-0.90)
Obs.	559	375	18	46

Source: Author’s calculation based on IFLS 2000 and 2007 rounds.

Table 7 displays the estimated effect of decentralization on the average test scores by different categories of schools. The results untangle two interesting stories. First, we found that private schools with a school head elected by the community improved their average test scores more than the respective public schools. This relates to the ‘rent-seeking behaviour’ line of explanation. This highlights the role of the community in improving education quality.

Another important finding from Table 7 is the suggestion that decentralization facilitates education outcomes only when there is a complete transfer of authority up to the level of district education office—in our case, where the district education office selects the school head among public schools. As shown, the negative coefficient is only seen among the democratic type of schools, particularly public schools with a head elected by central government, in which education outcomes improved by 0.6 and 0.8 points for language and maths tests respectively. On the other hand, public schools with a district-elected school head increased their students’ test score by 0.7 and 0.8 points for the respective tests, relative to the private schools. This implies that the public schools that have their school head elected by the government (i.e. by the state or the district education office) are the ones which suffer most from decentralization.

5.4 Community engagement

Another alternative mechanism through which decentralization may affect education outcomes is community efforts; we hypothesize that decentralization has a greater impact on education outcomes where there is an active community. This relates to a broader literature on the community role in development and in public service delivery (Stiglitz 2002; Bovaird 2007), and in improving education quality in particular (Kendall 2007; Pradhan et al. 2014). To test this, we examine the heterogeneity of decentralization’s impact on education outcomes by the schools’ locality—whether the school is located in an active or a passive community. Active communities are defined as those localities where the number of active social groups is above average and passive communities as localities where it is below average. The results are shown in Table 8.

Table 8: The heterogeneous impact of decentralization: active and passive communities

Estimation	Language test		Maths test	
	Passive community	Active community	Passive community	Active community
DID	-0.690***	-0.442*	-1.061***	-0.958***
s.e.	[-5.15]	[-2.44]	[-5.42]	[-3.64]
Obs.	973	993	959	991
SDID	-0.564**	-0.432*	-0.617*	-0.788
s.e.	[-2.91]	[-2.16]	[2.40]	[-1.90]
Obs.	224	336	222	337

Source: Author’s calculation based on IFLS 2000 and 2007 rounds.

As shown, we observed negative and significant DID estimators on the average test scores in both passive and active communities. This confirms the important role of communities, which facilitate improvement in education outcomes, particularly among private schools. Nevertheless, it is interesting to note that community engagement appears to have less impact on learning outcomes among public school students. This is perhaps due to the fact that the school committee in Indonesia has limited influence over decision-making on school budget and planning. A study using a randomized control trial found that the school committee in Indonesia has a strong impact on learning outcomes when it has linkages with village councils; thus, increasing community participation alone does not suffice (Pradhan et al. 2014: 123).

6 Discussion

Despite the expansion of participation in schooling, progress in improving the quality of education in developing countries remains slow. Educational assistance, among other initiatives, has been central in addressing the challenge, yet the success of such programmes is highly dependent on the capacity of the institutions administering them. With a popular shift towards a decentralized education system, our study attempts to answer the following questions: how does decentralized education play a role in the provision of educational assistance, and thus explain changes in education quality? As such, under what conditions does a decentralized education system lead to just distribution of educational assistance towards public and private schools? Do local and social norms enhance the institutional features of education provision in the process? In the first step, we utilize panel data on school information and estimate the difference-in-difference estimators on the effect of decentralized education on education quality, measured in terms of average student scores in language and maths tests. Our key findings highlight that decentralization in general

facilitates an improvement in student outcomes in both control and treatment schools. Counterintuitively, the impact is more evident among private schools.

Our study then takes a step further by looking at the mechanism, questioning under what conditions decentralization works to improve education outcomes, particularly among private schools. We are particularly interested in the role of educational assistance. We found that increased provision of education transfer by government and community, particularly among marginalized private schools, is one of the key mechanisms. Decentralization increases the ratio of beneficiaries of government and community scholarship among private schools. We observed no statistically significant impact of decentralization in terms of increases in cash or in-kind education transfer. This means that while decentralization may improve access to educational assistance, it does not trigger innovations in terms of the forms that educational assistance takes.

We also examine other mechanisms, attempting to find explanations behind the increased resources going towards private schools. We find that it is the religious-oriented schools that improved their education outcomes the most following decentralization. Religious schools account for more than 80 per cent of the private schools in our data. This resonates with the increased resourcing of private and religious schools after decentralization. We also found that decentralization affects education quality through increasing teachers' efforts, and is heterogeneous in terms of its relationship with the type of school management. The increase in teachers' working hours is more pronounced among private schools, and is heterogeneous depending on the characteristics of the locality—active vis-à-vis passive communities.

These results unravel an interesting twist in the story of the role of decentralization in explaining education outcomes. Through our results, we argue that there are two aspects to decentralization in improving education quality in a developing economy. First, we find an indication that decentralization facilitates collusion between village authorities and marginalized private schools, with substantial increases in government and community educational assistance and financial resources, especially to religious schools. Interestingly, we find that despite dominant rent-seeking behaviour and self-interest motives, the increased allocation of public resources to private schools had a positive impact on student achievement outcomes. Our results also emphasize the role of social norms in undermining the efficient allocation of public goods after decentralization. On the other side of the coin, we argue that it is the partial nature of decentralization that explains the moderate progress of education quality among public schools relative to private schools in the post-decentralization period. Our results suggest that decentralization only succeeds in facilitating an increase in education quality in public schools if there is a certain transfer of authority towards district and school levels. It is the public schools with a school head elected by the district education office (rather than by the central government) that experience more increases in average student achievement.

Our findings relate to the broader literature of decentralization and public service delivery, and the political economy behind them. They are related to the literature on decentralization and public service delivery through focusing on their effects on education quality (Faguet and Sanchez 2008; Di Gropello and Marshall 2011; Leer 2016). By looking at how decentralization affects the provision of educational assistance to public and private schools, we contribute to the literature on decentralization and social assistance (Bardhan and Mookherjee 2005). To unravel the key mechanism through which we argue for the indication of collusion between school authorities and village officials, we position our argument within the literature on the effects of social and ethnic fragmentation on public service delivery (Alesina et al. 2014; Tajima, et al. 2017), particularly on the concept of rent-seeking behaviour (Mueller 2004; Cheikbossian 2008). We also explore the role of community, which relates to the literature on community engagement in development and

public service delivery (Stiglitz 2002; Bovaird 2007) and in improving education quality in particular (Kendall 2007).

To conclude, the unintended consequences of decentralizing education management demonstrate a positive and promising story in providing inclusive education in Indonesia. Private schools play an important role in bridging the gap, providing access to education in rural and remote areas. While the private schools are, in general, worse off in terms of quality and facilities, their catching up would mean increased provision of a better quality of education to children from low-income families.

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Appendix

Table A1: List and description of variables

Variables	Description
Maths score	Average students' score in maths national examination test
Bahasa score	Average students' score in language national examination test
Post-decent	A dummy; 1=observations in 2007 (post-decentralization)
Public	A dummy; 1=public schools (as the treatment group)
Sanitation	A dummy; 1=sanitation facility is available in the village
Village revenue	Total village revenue
Poor households (%)	Average share of poor households in the village
Urban	A dummy; 1=village located in urban area
Distance to district office	Distance to the nearest district office from the village head office (in km)
Community groups (n)	Number of active community groups in the village
teacher_primary	Number of teacher with primary education in the school
teacher_lowersecondary	Number of teacher with lower-secondary education in the school
teacher_uppersecondary	Number of teacher with upper-secondary education in the school
teacher_tertiary	Number of teacher with tertiary education in the school
teacher_hrwork	Average number of hours teacher spent in the school
teacher_otherjobhr	Average number of hours teacher spent in other job
schoolhead_primary	A dummy; 1=school head's highest level of education is primary
schoolhead_lowersecondary	A dummy; 1=school head's highest level of education is lower-secondary
schoolhead_uppersecondary	A dummy; 1=school head's highest level of education is upper-secondary
schoolhead_tertiary	A dummy; 1=school head's highest level of education is tertiary

Source: Author's own.

Table A2: Balance of covariates across public and private schools (2000)

Variables	Original sample					Reweighted sample				
	Private	Public	diff	t-coeff	sig. level	Private	Public	diff	t-coeff	sig. level
language test	5.336	6.270	-0.934	-11.484	***	4.642	5.635	-0.992	-9.062	
maths test	4.535	5.725	-1.190	-17.436	***	4.642	5.635	-0.992	-9.062	
sanitation	0.670	0.591	0.078	3.831	***	0.657	0.540	0.117	3.029	***
village revenue	109.743	120.317	-10.574	-1.080		98.910	107.096	-8.186	-0.538	
poor household (%)	23.379	26.982	-3.603	-3.117	***	27.521	26.859	0.662	0.304	
urban	0.720	0.592	0.128	6.389	***	0.645	0.543	0.101	2.618	***
distance to district office	16.901	17.683	-0.782	-0.772		18.064	20.342	-2.278	-1.184	
community groups (n)	4.854	4.832	0.022	0.308		4.700	4.763	-0.063	-0.480	
teacher with primary education	0.001	0.001	0.001	0.501		0.005	0.001	0.004	0.956	
teacher with lower-secondary education	0.073	0.052	0.021	2.060		0.093	0.055	0.038	1.956	*
teacher with upper-secondary education	0.135	0.158	-0.023	-1.450		0.186	0.142	0.044	1.539	
teacher with tertiary education	0.913	0.851	0.062	4.270	***	0.902	0.874	0.028	1.081	
teacher_year	12.672	16.527	-3.855	-12.881		12.626	16.054	-3.428	-6.477	***

Note: Original sample is the sub-sample used for standard DID estimation and estimating using diff syntax in Stata developed by Villa (2016). Reweighted sample is used for estimating Abadie (2005) semi-parametric DID and the results are obtained by using absdid Stata syntax developed by (Houngbedji 2015). Survey weight applied.

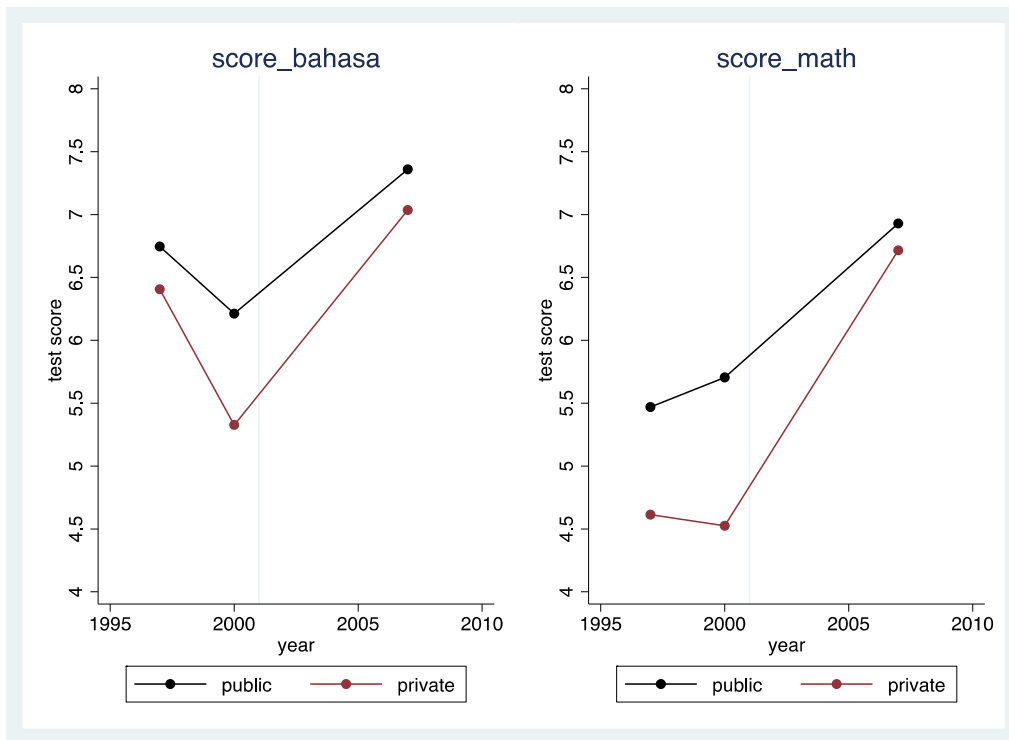
Source: Author's calculation based on IFLS 2000 and 2007 rounds.

Table A3: Estimates of differences in education quality

	Year 2000		Year 2007	
	Language test	Maths test	Language test	Maths test
Private (=control)	5.327	4.525	7.035	6.71
s.e.	[0.040]	[0.057]	[0.029]	[0.048]
Obs.	820	818	674	646
Public (=treatment)	6.211	5.703	7.36	6.926
s.e.	[0.027]	[0.037]	[0.019]	[0.028]
Obs.	1630	1628	1653	1658
diff.	-0.884***			
DD estimate				

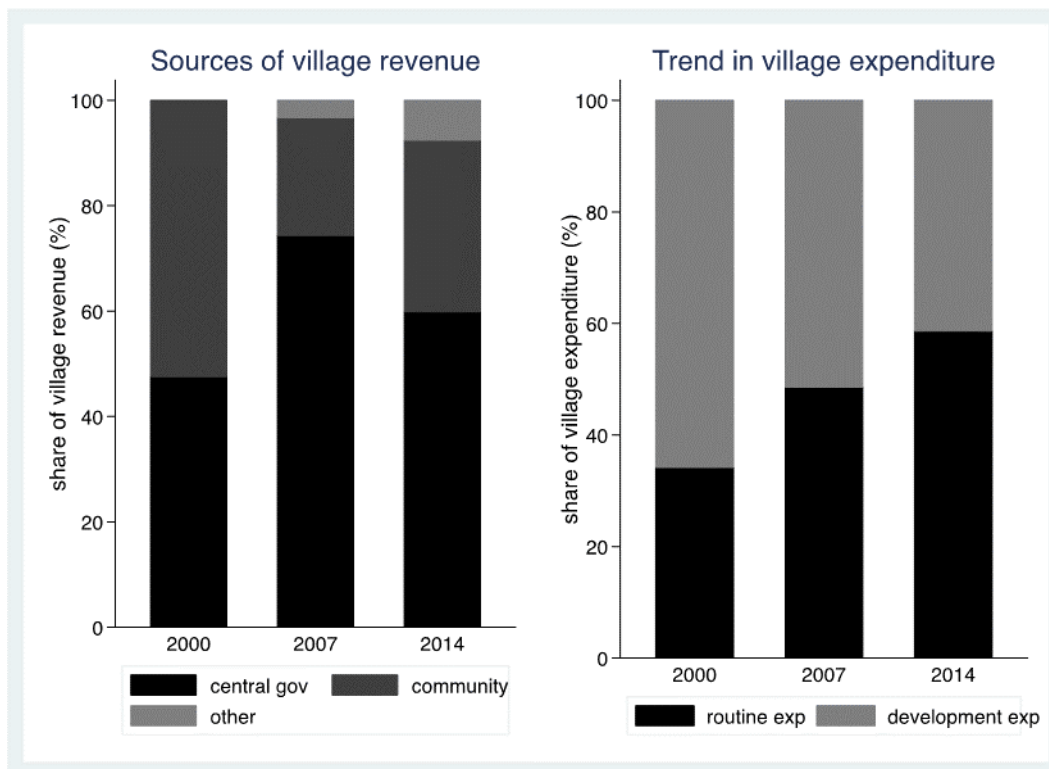
Source: Author's calculation based on IFLS 2000 and 2007 rounds.

Figure A1: Parallel trend in the average language and maths test scores prior to matching (original sample, 1997–2007)



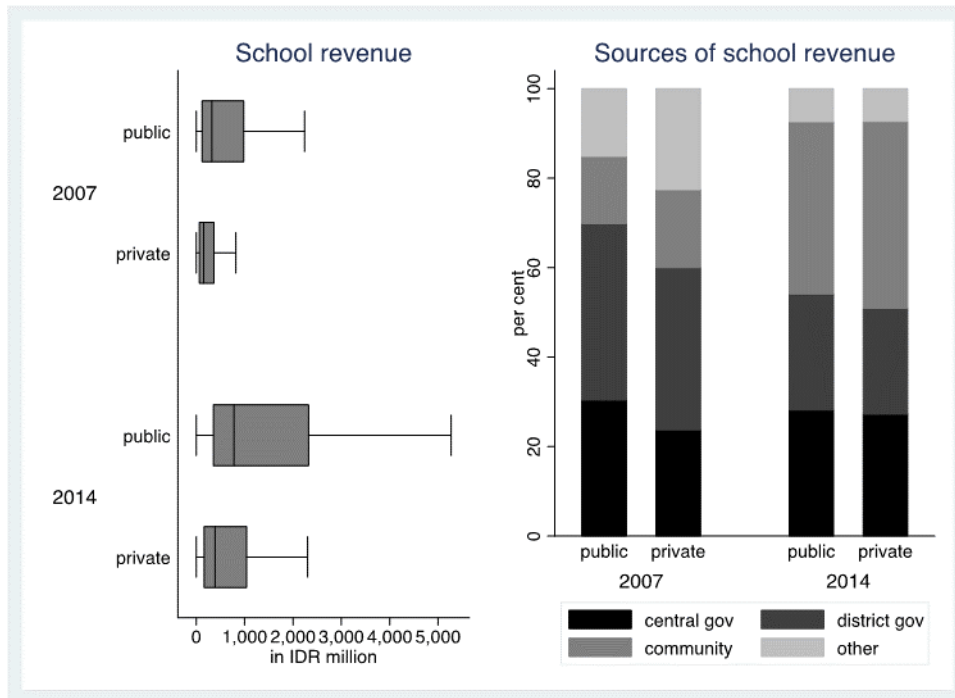
Source: Author's own calculation based on IFLS rounds.

Figure A2: Trend in village revenue and expenditure (2000–2014)



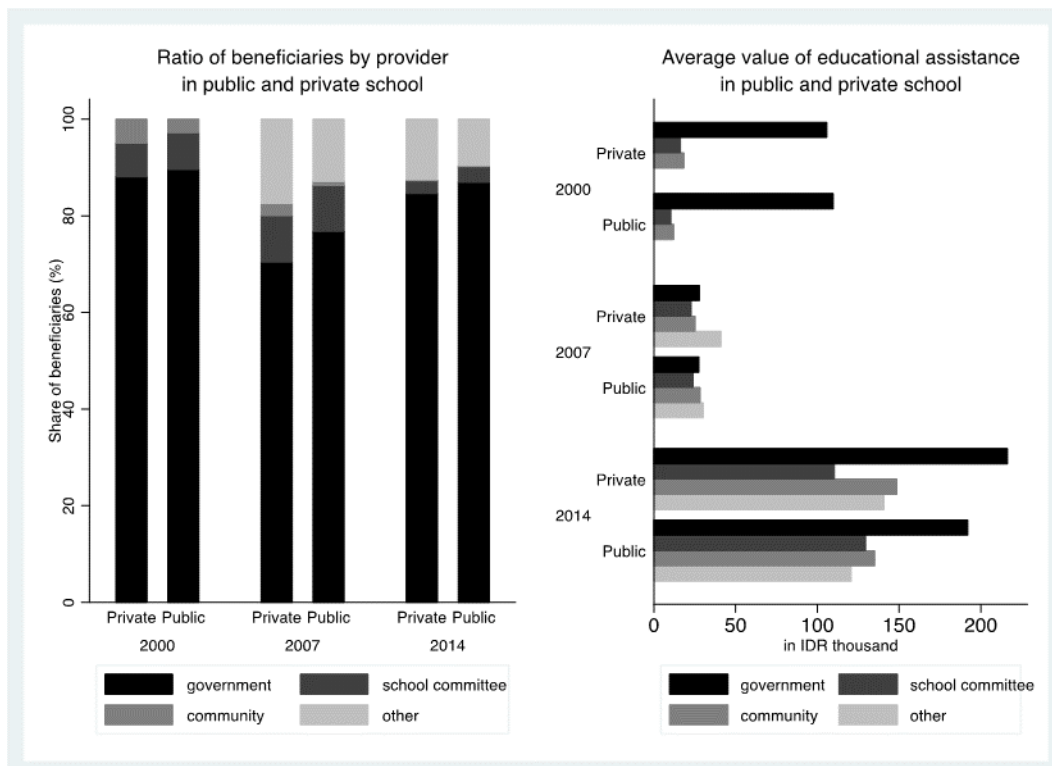
Source: Author's own calculation based on IFLS rounds.

Figure A3: Trend in school revenue (2007–2014)



Source: Author's own calculation based on IFLS rounds.

Figure A4: Trend in education assistance by provider (2000–2014)



Note: The amounts shown in Panel B are in real values.

Source: Author's own calculation based on IFLS rounds.