



After the Big Bang: Estimating the effects of decentralization on educational outcomes in Indonesia through a difference-in-differences analysis



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ABSTRACT

Proponents of decentralization argue that bringing decisions closer to the people improves school quality and efficiency by ensuring that schools are more responsive to local educational needs. In practice, the effects of decentralization vary substantially, given that the implementation of these reforms relies on local resources and management capacity. In this paper, I estimate the effects of decentralization on educational outcomes in Indonesia using a difference-in-differences model. I find no overall effect on achievement, but a negative effect on teacher effort, particularly in rural areas and among schools with inactive school committees.

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1. Introduction

Education policy makers around the world are faced with the same question: should education be the responsibility of the central government, or should education provision be decentralized? Over the last several decades, decentralization has been one of the most hotly debated policy issues affecting countries across the income spectrum. Proponents of decentralization claim that local stakeholders, who are less constrained by state bureaucracy and more in touch with the local context, are better equipped to provide education than central authorities. In this way, it is argued that decentralization reforms have the potential to improve student achievement by increasing schools' efficiency, ensuring that schools are more aligned with local educational needs and preferences, and empowering local communities to hold schools accountable for providing quality education (Barrera-Osorio et al., 2009; Jimenez et al., 1986; World Bank, 2011).

Despite the proliferation of these reforms, the empirical evidence of the capacity of decentralization to improve educational quality and equity is limited. To a certain extent, the lack of

consistency in the literature on decentralization is not surprising, considering that decentralization relies on local resources and institutional capacity, both of which vary significantly across contexts. Despite the uneven nature of communities' responses to decentralization reforms, however, few studies have explored the role of decentralization in perpetuating or alleviating educational disparities.

My study explores the effects of decentralization on educational outcomes in elementary and junior secondary schools in Indonesia. Indonesia makes for an interesting case study of decentralization for several reasons. The Indonesian public education sector has gone from being one of the most highly centralized in the world to one of the most decentralized. These reforms are often referred to as "Big Bang Decentralization," given the swiftness with which the decentralization policies were enacted and the contrast they pose to the country's previously tightly centralized governance structure (Chen, 2011). Decentralization occurred at the same time as dramatic growth in primary and secondary enrollment. Despite this expansion, however, regional and socioeconomic disparities persist in both enrollment and achievement, particularly at the secondary level (Arze del Granado et al., 2007; World Bank, 2013). My study addresses the role of decentralization in improving school quality and alleviating these disparities.

Leveraging school level data spanning fifteen years, I estimate the effects of decentralization on school quality using a difference-in-differences mode. Specifically, I compare before and after

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changes in educational outcomes in Ministry of Education and Culture (MoEC) schools to the analogous changes in outcomes in a comparison group of schools that have always been decentralized—private school¹. I find no effect of decentralization on math and language achievement, although there is a weak negative effect on math achievement among schools with inactive school committees. I also measure the effects of decentralization on teacher effort, as measured by the number of hours that teachers spend in the classroom per week, and I find a negative effect, particularly in rural areas and among schools with inactive school committees. These findings contribute to the growing body of literature challenging the assumption that decentralization improves school quality. Given the global popularity of decentralization, it is essential that policy makers understand the mechanisms through which these reforms can influence achievement, and the resulting implications for educational equity. My findings contribute to this understanding.

2. Theoretical and empirical background

At its most basic, decentralization refers to the devolution of fiscal responsibility and decision-making power from the central government to local authorities. In practice, of course, no education system is completely centralized nor completely decentralized, and a great deal of variation exists across school systems in terms of the division of responsibilities between central and local authorities. The policy debate revolves around the degree of fiscal responsibility and decision-making power that should be decentralized, and to whom authority should be granted at the local level (e.g., provincial governments, district governments, school committees, or even private firms or individuals).

The assumption is that by reducing the role of the central government, and allowing schools to operate in a quasi-market framework, schools will be more flexible, innovative, and responsive to local needs (Barrera-Osorio et al., 2009; Carnoy, 1999; Jimenez et al., 1986). In this sense, decentralization is one of the market-based reforms that have dominated education planning since the 1990s, especially among the development aid community, where decentralization has been a favored policy item on the “menu” of education reforms promoted by the World Bank and other multilateral agencies (Mundy, 2007, 2002; Riddell, 1998). Indeed, the popularity of these reforms is here to stay: local autonomy is one of the World Bank’s primary strategies for strengthening education systems through 2020 (World Bank, 2011). In the following, I describe the theoretical assumptions underlying decentralization and the empirical evidence of the relationship between decentralization and educational outcomes.

First, decentralization is based on the assumption that bringing decisions closer to the people improves the efficiency of the education system. In the context of low and middle-income countries, for example, decentralization may ensure that teachers are paid on time via the introduction of a more direct payment model, in which teachers are paid by district governments, rather than central governments (Di Gropello and Marshall, 2009). Similarly, by eliminating the bureaucratic “middle-man” role of the central government, decentralization can ensure that schools adapt more quickly to local educational needs and labor markets.

A second mechanism through which decentralization can improve school quality is by strengthening the accountability mechanisms between schools and communities. In countries like

Indonesia, where teacher absenteeism is common, increased community monitoring (not to mention the possibility of withholding pay) may serve as an incentive for improved teacher performance (Asian Development Bank and OECD, 2015; Di Gropello and Marshall, 2009).

Finally, a third reason for the popularity of decentralization is the notion that these reforms will stimulate a shared sense of responsibility for educational outcomes between teachers, principals, families, and community members (De Grauwe, 2005). It is assumed that decentralization empowers communities to work together to support schools; parents will promote students’ educational efforts at home and in school, families will visit classrooms and help out with academic and extracurricular activities, and community members and local businesses will work together to ensure that schools are adequately supplied, for example.

Empirically, the capacity of decentralization to meet these assumptions is contested. Evidence from Chile suggests that decentralization (in the form of state-subsidized privatization) does not improve the overall efficiency of education provision (McEwan and Carnoy, 2000). McEwan and Carnoy (2000) find that the achievement gains in private (Catholic) schools are offset by the higher cost of Catholic school education as compared to public education. Thus, the relative efficiency of private schools and public schools is similar. An additional threat to the assumption that decentralization improves efficiency is the possibility of elite capture of public funds (Bardhan, 2002). This is particularly relevant in the context of Indonesia, widely recognized as one of the most corrupt countries in the world (Suryadarma, 2012). Indeed, Suryadarma (2012) finds that public spending in less corrupt regions of Indonesia has a positive effect on enrollment, while in more corrupt regions the relationship between public education spending and enrollment is negligible. This suggests that a significant portion of public funds in these more corrupt regions never makes it to schools.

A growing body of research from Latin America and sub-Saharan Africa focuses on the capacity of decentralization to improve educational outcomes through school-based management. Studies show that autonomous schools improve school participation and student achievement vis-à-vis increased parental involvement in schools (Duflo et al., 2014; Gertler et al., 2008; Jimenez and Sawada, 2014, 1999) improved teacher effort (Di Gropello and Marshall, 2009; Duflo et al., 2014), and increased community-based investments in educational resources, such as library books (Carnoy et al., 2008; King and Ozler, 2005). These studies suggest that localized school governance can improve school quality by strengthening the accountability mechanisms between parents and schools, incentivizing teacher effort, and engaging communities in school management.

However, community engagement is not automatic, and is particularly problematic in rural or lower income contexts where parents with low levels of education may not feel it is their role to participate in school management, or may not be financially able to dedicate the time required to participate (Gunnarsson et al., 2009; King and Ozler, 2005; Meade and Gershberg, 2008). In this regard, research from Mexico finds that the positive effects of a pilot school-based management program largely disappeared when the program was taken to scale (Santibañez et al., 2014). Despite positive effects of the pilot program, when implemented at scale the school-based management program did not substantially change parents’ involvement in school decision-making, even though most parents reported being aware of their role in school management.

Moreover, even when decentralization does increase parental and community engagement in schools, parents, community members and local authorities do not always make optimal school

¹ By comparing differences in changes in achievement between MoEC and private schools, rather than differences in absolute achievement levels, I account for time-invariant differences between these two school types (such as the fact that private schools are mostly Islamic, while MoEC schools are secular). The assumptions underlying this difference-in-differences estimate are described in Section 5.

management decisions. In Honduras, for example, [Di Gropello and Marshall \(2009\)](#) find that school councils are more likely than central authorities to hire teachers with lower levels of experience (and lower salary rates), which reduces the positive effect of school autonomy on achievement.

Likewise, parental and community involvement in schools is not always welcome. A recent randomized controlled trial evaluation in Niger finds that school-based management increased parental monitoring of teacher attendance, but teacher attendance itself *decreased* (the program had no effect on student achievement) ([Beasley and Huillery, 2014](#)). The authors find that teachers resent parental involvement in schools because it undermines their authority as representatives of the central government. These findings demonstrate the need to further explore the role of decentralized school management and parental participation in contexts where the education sector has historically been tightly controlled by central authorities, or where parental involvement in schools has traditionally been minimal (as is the case in Niger, as in Indonesia) ([Bjork, 2003](#); [Parker and Raihani, 2011](#)).

To a certain extent, the lack of consistency across studies of the effects of decentralization and school-based management on achievement is not surprising, considering that these policies rely on local resources, management capacity, culture, and the political will to self-manage, all of which vary substantially across contexts. Given the heterogeneous nature of communities' responses to decentralization, these reforms have the potential to increase educational disparities between schools. Conversely, if the assumptions of decentralization hold, and local authorities are better able to ensure school quality, then decentralization could reduce the achievement gap between urban and rural schools, or high-income and low-income schools, for example. Few studies have addressed this issue empirically.

Research from Bolivia and Colombia points to the latter hypothesis—suggesting that decentralization can enable poorer districts to catch up to their wealthier neighbors. [Faguet \(2004\)](#) and [Faguet and Sánchez \(2008\)](#) find that municipal authorities are more likely than the central government to invest in education where the need is greatest (e.g., where enrollment levels are lowest, or where illiteracy rates are highest). In turn, municipal education investments under decentralization are associated with increased enrollment in these more vulnerable localities. Research from Argentina paints a different picture, however. [Galiani et al. \(2008\)](#) find that the devolution of school governance to provincial authorities has a positive effect on test scores on average, but not among schools located in poor municipalities. Likewise, in an experimental study from The Gambia, [Blimpo et al. \(2015\)](#) find that local capacity (as measured by average district level adult literacy) moderates the effect of school-based management on educational outcomes. The authors estimate that a minimum of 45 percent adult literacy is needed for school-based management to affect learning outcomes ([Blimpo et al., 2015](#)).

In sum, existing research suggests that decentralization can improve educational outcomes, but only when local governments, communities and schools have the resources and political will to self-manage. The assumption that autonomy will automatically improve efficiency and quality is problematic in practice. However, despite the uneven nature of communities' responses to decentralization, few studies outside of Latin America have assessed the impact of nationwide decentralization policies on educational quality and equity. My study addresses this gap by estimating the effects of decentralization on achievement and teacher effort in Indonesia. In order to further unpack the mechanisms through which decentralization can affect educational equity, I explore how these effects vary across urban and rural locations and according to the degree of community engagement in school management.

3. Decentralization in Indonesia

Indonesia provides a unique case study for testing the theoretical assumptions of decentralization, not only because the Indonesian education system is the fourth largest education system in the world ([World Bank, 2015](#)), but also given the country's experience of rapid decentralization coupled with persistent regional and socioeconomic disparities in both attainment and achievement ([Asian Development Bank and OECD, 2015](#)).

Basic education in Indonesia consists of six years of elementary school and three years of junior secondary school. Responsibility for basic education falls under the authority of two sectors: 84 percent of schools are governed by the Ministry of Education and Culture (MoEC); while the remaining 16 percent of schools are governed by private community foundations (mostly Islamic foundations), which are overseen at the national level by the Ministry of Religious Affairs (MORA) ([Asian Development Bank and OECD, 2015](#)). Since the 1970s, the Indonesian government has made strides toward the unification of these two systems, namely through the 1976 decree which made Islamic schools responsible for teaching the national curriculum in addition to the traditional religious curriculum. In practice, however, private schools, particularly private Islamic schools, lag behind MoEC schools in terms of overall school infrastructure quality, teacher qualifications, school completion, and achievement ([Raihani, 2013](#)). MoEC and private schools also differ in terms of governance. Despite receiving varying degrees of government funding, private schools, by definition, operate largely autonomously from the central government. MoEC school governance, on the other hand, was highly centralized until 2001 when the decentralization process began ([Raihani, 2013](#)).

Decentralization emerged in response to the political turmoil and economic crisis of the late 1990s, which put a severe strain on the legitimacy and fiscal power of the central government. In 2001 the central government transferred administrative and fiscal responsibility for health and secular education to district governments. Under these reforms, district governments are responsible for teacher salaries, general school operational costs, and most aspects of school management ([Raihani, 2007](#)). Districts cover about 60 percent of school finance, the central government provides 35 percent, and provinces cover the remaining 5 percent ([Arze del Granado et al., 2007](#)). District spending is primarily limited to nondiscretionary routine expenditures (e.g., teachers' salaries), while the central government maintains responsibility for development expenditures (e.g., school construction) ([Arze del Granado et al., 2007](#)).

School-based management followed decentralization in 2003, when the government mandated the role of school committees in educational planning and supervision ([Bandur, 2009](#)). In Indonesia's version of school-based management, school governance responsibility is primarily delegated to principals, who are expected to work in collaboration with school committees comprised of teachers, parents, and community members who are elected by the community. Officially, school committees have the authority to set the school's mission and vision, determine learning standards, raise school funds, develop extra-curricular activities, contribute to the development of localized curriculum, encourage linkages between schools and external organizations, allocate non-salary components of the school budget, and hire non-contract teachers ([Bandur, 2009](#)).

Following decentralization in the MoEC system, the government passed a series of sector-wide reforms directed at all schools, including private schools. First, the Education Act of 2003 officially declared all citizens' right to tuition-free basic education. To facilitate this law, the government launched a massive grant

program, the *Bantuan Operasional Sekolah* (BOS) (Raihani, 2007). As of 2005, almost all MoEC and private elementary and junior secondary schools receive annual BOS grants, which are determined on a per-pupil basis and distributed directly to schools (Barrera-Osorio et al., 2009). BOS funds are meant to cover routine expenditures such as student registration, textbooks, extra-curricular activities, student examination fees, teacher development and training, remuneration of honorary (non-permanent) teachers, and learning materials (Arze del Granado et al., 2007).

Additional legislation passed in 2005 defined national standards in the following seven areas: content, process, graduate competency, teacher qualifications, school facilities, funding, and assessment (Asian Development Bank and OECD, 2015). The implementation of these national standards has been slow, however. As of 2009, only 38 percent of primary school teachers and 73 percent of junior secondary school teachers met the minimum education requirements of a four-year college degree (Raihani, 2013). Resource shortage and teacher absenteeism have also been persistent concerns, particularly in rural areas, where on any given school day up to 50 percent of teachers are likely to be absent (Asian Development Bank and OECD, 2015). Indeed, the educational disparities in Indonesia are well documented. Junior secondary school enrollment rates among rural and lower-income communities lag behind urban and wealthier communities by as much as 50 percent (Arze del Granado et al., 2007). There are also significant socioeconomic and urban/rural gaps in achievement (Raihani, 2007), and the difference in the quality of educational resources between high-income and low-income schools, and between urban and rural schools, is one of the largest among all PISA-participating countries (OECD, 2013).

Descriptive studies indicate that there have been significant challenges to the implementation of decentralization and school-based management in practice. Efforts to train and support communities in establishing the necessary accountability mechanisms have been minimal (SMERU, 2006). A nationally representative survey of primary school communities finds that over 80 percent of parents do not participate in school improvement activities, such as helping in the classroom or serving on classroom committees, and 30 percent had never talked to their child's teacher (Chen, 2011). Lack of parental awareness about school-based management policies, lack of clarity in the central government's guidelines for decentralization, and low levels of local capacity impede school leaders' ability to implement decentralization (Amirrachman et al., 2008; Bandur, 2012a; Chen, 2011; Kristiansen and Pratikno, 2006; Yeom et al., 2002). Thus, despite the rhetoric of community engagement, the current system emphasizes top-down supervision and monitoring, vis-à-vis district school inspection visits, for example, rather than bottom-up pressure from parents and community members (Amirrachman et al., 2008; Chen, 2011). This is partly explained by the fact that, parents – particularly those with lower levels of education – feel it is not their place to intervene in school affairs, given that this role has historically been limited to authority figures (Parker and Raihani, 2011). Similarly, participation in school management is difficult for low-income parents who must take time away from wage-earning activities to attend school committee meetings and visit schools (Parker and Raihani, 2011).

Far from stimulating local democracy and shared decision-making power, in some cases decentralization has empowered local interest groups to increase their control over community resources, leading to the perception among rural parents and teachers that decentralization will result in competition between wealthy, well-connected, urban schools and their poorer rural counterparts (Amirrachman et al., 2008; Kristiansen and Pratikno, 2006). Opinions diverge, however. A case study of the Ngada Educational District, for example, finds that over 90 percent of

Table 1
School observations per year.

	1993/1994	1998/1999	2000/2001	2007/2008
Ministry of Education & Culture (MoEC)	1208	1201	1267	1277
Private schools	454	510	547	477

teachers, parents and school leaders believe that student achievement has improved as a result of decentralized management (Bandur, 2012b; Bandur and Gamage, 2009).

Several studies suggest that decentralization has played a role in exacerbating educational disparities in Indonesia. Toi (2010), for example, finds that school budgets and teacher qualifications decreased among poor schools following decentralization, but remained largely stable among wealthier schools. Arze del Granado et al. (2007) demonstrate that although regional (between-province) disparities in primary and secondary school enrollment have decreased since decentralization, between-district disparities increased from 1998 to 2004, likely linked to the transfer of educational spending responsibilities from the central to district level. My research builds on these studies by empirically testing the effect of decentralization on school quality—namely, student achievement and teacher effort, and exploring how these effects are shaped by community characteristics.

4. Data

My dataset contains information on 2561 MoEC schools and 1251 private schools from the Indonesian Family Life Survey (IFLS), an ongoing longitudinal panel survey conducted by the RAND Corporation in collaboration with the University of California, Los Angeles (UCLA) and Lembaga Demografi, University of Indonesia². I use all available waves of the IFLS survey: the IFLS 1, collected in 1993/4, the IFLS 2, collected in 1997/8, the IFLS 3, collected in 2000/1, and the IFLS 4, collected in 2007/8. The IFLS data are representative of about 83 percent of the Indonesian population, spanning 13 of Indonesia's 27 provinces (Frankenberg et al., 1995)³.

The school level data in the IFLS are representative of the schools available to the households in the sample communities. In each wave of the IFLS, three elementary schools and three junior secondary schools were randomly selected from a list of existing schools based on information provided by surveyed households and village leaders in each community. The total number of MoEC and private schools observed each year is relatively consistent, at around 1200 MoEC schools and 500 private schools each year (see Table 1). Although the data are not explicitly intended to be panel data, about 70 percent of schools are observed more than once, particularly in smaller communities, where the likelihood of

² Private schools in this analysis are classified as such if the school organizer is listed as a private foundation or the Ministry of Religious Affairs (MoRA). MoRA serves as the top authority on the Islamic curriculum and provides varying degrees of funding to Islamic schools, but the ministry itself plays a limited role in school governance, as MoRA schools have always operated in a decentralized fashion (Raihani, 2013; UNESCO, 2010). MoEC schools are classified as such if the school organizer is listed as the Ministry of Education and Culture (MoEC) or District Office of Education schools. As a robustness check, I conduct two separate difference-in-differences analyses, one in which I restrict the comparison group sample to include only MoRA schools, and one in which I restrict the comparison group sample to include only private foundation schools. The results of both analyses are consistent with the reported results.

³ Provinces were selected to maximize population representation and capture Indonesia's cultural and socioeconomic diversity. See Frankenberg et al. (1995) for more information.

Table 2
Sample composition.

Elementary schools				Junior secondary schools			
Full sample		Balanced panel		Full sample		Balanced panel	
MoEC	Private	MoEC	Private	MoEC	Private	MoEC	Private
1608	343	321	44	953	908	280	134

being randomly selected from the community roster is greater. I conduct my analysis on the full sample of 1951 elementary schools and 1861 junior secondary schools as well as the balanced panel sample of 365 elementary schools and 414 junior secondary schools observed at baseline (2000) and post-decentralization (2007)⁴. The final sample is presented in Table 2.

My primary outcome variable is student achievement, defined as school mean performance on math and Indonesian Bahasa language test scores from the Indonesian National Exam, *Ujian Nasional* (UAN). The UAN (previously called the EBTANAS) is a standardized test that is mandatory for all students in the last year of primary school, junior secondary, and senior secondary school. Although the test items have undergone some changes in the period from 1993 to 2007, UAN scoring has remained relatively constant (Asian Development Bank and OECD, 2015). Moreover, these changes affect both MoEC and private schools equally (the test is the same for both sectors). As such, these minor changes do not threaten the internal validity of my estimate. However, students' eligibility for the next level of schooling is determined on the basis of UAN scores, which makes the UAN a high stakes exam (Asian Development Bank and OECD, 2015). This poses a potential threat to the validity of this construct as a proxy of achievement, since students and teachers have an incentive to manipulate scores.

For each school-by-year observation, I observe the math and language test scores of a randomly selected sample of 25 students in grade six for each primary school and grade nine for each junior secondary school⁵. For ease of interpretation, and in order to account for potential differences in scoring across years and school levels, I standardize test scores by year and school level⁶. I report both math and language test scores, but the math score is likely a more reliable estimate of achievement, given Indonesia's linguistic diversity (Bahasa is the language of instruction in Indonesia, but a large percentage of students speak a different language at home) (Raihani, 2013). The school level IFLS data does not include information on the percent of students at each school for whom Bahasa is a second language.

My second outcome of interest is teacher effort, as measured by the average number of hours per week that teachers spend in the classroom, standardized within each year. As of 2013, only 44 percent of teachers teach the minimum number of hours required (Asian Development Bank and OECD, 2015). Thus, teachers' hours spent in the classroom are a reasonable proxy of teacher effort in Indonesia. Likewise, teacher absenteeism is one aspect of school quality that is expected to improve through community monitoring under school-based management (Bandur, 2012a). For each school in the first three waves of the IFLS, I have information on self-reported hours spent teaching for two

randomly selected teachers (one math teacher and one Bahasa language teacher). The 2007 survey collected information on only one teacher (math or Bahasa language teacher). Thus, these data are not necessarily representative of the average teacher at each school. However, since many schools in my sample have only one math and language teacher per grade level, most of the teachers interviewed taught the students for whom I have test scores, which makes these data a meaningful representation of the quality of teaching at the schools in my sample.

5. Identification strategy

In order to estimate a causal relationship between decentralization and educational outcomes I need to identify what educational outcomes in MoEC schools would have been in the absence of decentralization. In an ideal world, my counterfactual would be a "control" group of schools that did not implement decentralization, but that are otherwise identical to the "treatment" group of schools that did implement decentralization. This would require an experimental research design, in which "treatment" and "control" is randomly assigned to a group of schools that have similar characteristics at baseline. However, decentralization was not randomly assigned in Indonesia. Rather, these reforms were implemented universally among MoEC schools. Thus, I rely on a quasi-experimental method, in which I compare trends in educational outcomes among MoEC schools to trends in educational outcomes among a comparison group of schools that were not affected by the decentralization reforms: private schools.

Specifically, I use a difference-in-differences model to estimate the effects of decentralization on student achievement and teacher effort. In this model, I compare changes in educational outcomes before and after decentralization among MoEC schools to changes in outcomes before and after decentralization among private schools. MoEC schools serve as the "treatment" group, and private schools represent the "control group." By comparing changes between these two groups, I control for observed and unobserved time invariant characteristics as well as time-varying factors common to both groups that might be correlated with both decentralization and educational outcomes. The change in the comparison group of private schools is an estimate of the counterfactual; or in other words, how outcomes in MoEC schools would have changed in the absence of decentralization.

The estimation equation is as follows:

$$y_{scjt} = \alpha + \beta_1 \text{MOEC}_{scj} + \beta_2 \text{Post}_t + \beta_3 (\text{MOEC}_{scj} \times \text{Post}_t) + X'_{scjt} + Z'_{cjt} + \mu_t + v_j$$

where:

- y_{scjt} is the average outcome (student achievement or teacher effort) for school s in community c , district j and year t ;
- MOEC_{scj} is an indicator variable that takes the value of 1 if the school is a MoEC school;
- Post_t is an indicator variable equal to 1 for all observations after decentralization (e.g., all observations in 2007 wave of the IFLS);
- X'_{scjt} is a vector of time variant school characteristics (the number of recorded test scores and teacher's education);
- Z'_{cjt} is a vector of time variant community characteristics (the community's urban/rural classification and the number of households in the community)⁷;

⁴ Observations with missing data on achievement and school characteristics, schools listed as "other" (e.g., not MoRA, foundation or MoEC), and schools with inconsistent information regarding school type (e.g., schools classified as MoEC in one year and MoRA in another year) restricts my sample from 7547 school-by-year observations to 6918 school-by-year observations.

⁵ 20 percent of school-by-year observations include test scores for less than 25 students. I control for the number of tests recorded per school-by-year observation in all models.

⁶ Scores are standardized after having restricted my sample to include only treatment (MoEC) and control (private) observations.

⁷ Given that the data span 15 years, communities' urban/rural classification is time variant. By including schools' urban/rural classification in my model, I account for time variant factors that might be associated with both urbanization and achievement, such as population growth and economic development.

- μ_t is pre-treatment year fixed effect (a binary variable equal to 1 for observations in 1993/4 and 1998/9);
- ν_j are district fixed effects;
- π_s represents school fixed effects; and
- ϵ_{scjt} is the idiosyncratic error term.

The causal variable of interest is β_3 , the interaction between the time period of decentralization and the binary variable indicating whether or not MoEC administers the school. The coefficient on this term represents the difference in outcomes before and after decentralization between MoEC and private schools. β_1 represents the pre-decentralization difference in outcomes between MoEC and private schools, and β_2 represents the difference in outcomes post-decentralization that is common to all schools.

This model estimates the effect of six years of fiscal and administrative decentralization and four years of school-based management in MoEC schools. Since 2005, however, both private schools and MoEC schools have received annual block grants through the BOS program, which are contingent on the formation of a school committee. In practice, this aspect of the BOS program has been weakly monitored, particularly among private schools, which are already governed by community level associations (SMERU, 2006). Regardless, it is possible that the BOS program encouraged private schools to adopt some aspects of school-based management. Therefore, the treatment contrast I observe in 2007 is the effect of switching from centralized management to decentralized management including four years of exposure to school-based management among MoEC schools, relative to always being decentralized plus two years of exposure to school-based management among private schools. In this way, my study moves beyond previous studies by isolating the effects of changes in governance from the provision of additional inputs that accompany these reforms. Since both private schools and MoEC schools benefit equally from the BOS funds, any changes I find among MoEC schools can be attributed to changes in school governance, rather than increased school inputs⁸.

6. Results

In the following sections I compare educational outcomes between MoEC and private schools before and after decentralization. I find no overall effect of decentralization on math and language achievement and no evidence of heterogeneous effects according to the school's urban/rural location. However, I find a weak negative effect on math achievement among schools with inactive school committees. I also explore the effect of decentralization on teacher effort, and I find a negative effect on the number of hours that teachers spend in the classroom, particularly in schools located in rural communities and schools with inactive school committees.

6.1. Achievement

Figs. 1 and 2 present mean standardized math and language achievement scores from 1993 to 2007. From 1993 to 1999, the difference in achievement between private and MoEC schools is relatively consistent. Math achievement among MoEC schools increased slightly from 1993 to 2000, and then decreased slightly from 2000 to 2007. In private schools, math achievement decreased from 1993 to 2000 and increased slightly from

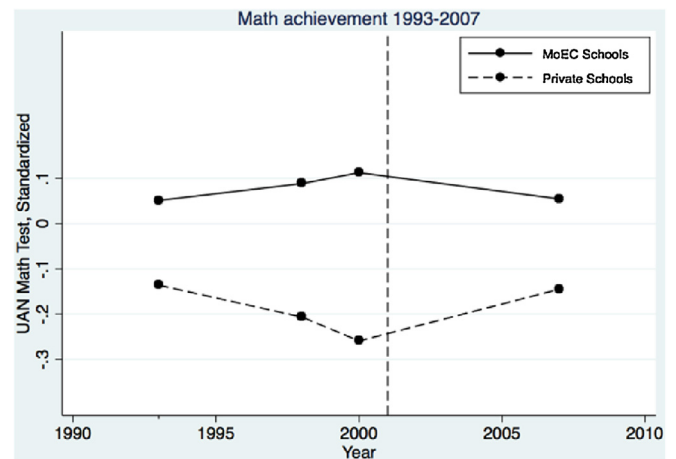


Fig. 1. Trends in math achievement from 1993 to 2007. Note: Data presented are from the full sample.

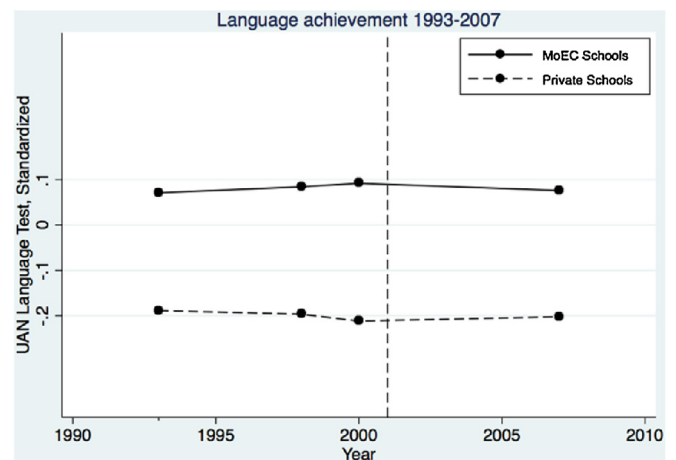


Fig. 2. Trends in language achievement from 1993 to 2007. Note: Data presented are from the full sample

2000 to 2007. Language achievement, meanwhile, remained relatively constant from 1993 to 2007 in both MoEC and private schools.

Tables 3 and 4 respectively present the difference-in-differences estimate of the effect of decentralization on math and language achievement, for the combined sample and separately for elementary and junior secondary schools. I report the estimates conducted with the full sample and the balanced panel sample. The balanced panel sample is more representative of schools from small, rural communities, where schools are more likely to be observed more than once. However, unlike the full sample, the balanced panel estimate is free from any bias caused by schools entering and leaving the sample. The coefficient of interest, the interaction between being a MoEC school in the post-treatment period, is given in the first row (Post × MoEC). For both math and language achievement, the overall effect of decentralization is negative but not statistically significant.

6.2. Teacher effort

Teacher effort, as measured by the number of hours per week that teachers spend in the classroom, increased from 31 to almost 35 h in MoEC elementary schools from 1993 to 2000 and then decreased slightly to about 31 h per week in 2007. Teachers at

⁸ One threat to the validity of my difference-in-differences model is the possibility that decentralization resulted in selective migration from private schools to MoEC schools (or vice-a-versa), especially if the per-student funding nature of the BOS program encouraged schools to compete for students. I discuss this and other threats to internal validity in Section 6.4.

Table 3
Estimated effect of decentralization on math achievement.

	Elementary		Junior secondary		Total	
	Full sample	Balanced panel	Full sample	Balanced panel	Full sample	Balanced panel
Post × MoEC	0.096 (0.401)	−0.195 (0.482)	−0.121 (0.165)	−0.163 (0.186)	−0.071 (0.149)	−0.188 (0.168)
Constant	0.731 (0.468)	1.488 (0.920)	−0.160 (0.428)	0.085 (1.179)	0.466* (0.265)	1.367** (0.600)
Observations	3529	730	3389	828	6918	1558
R-squared	0.722	0.634	0.751	0.713	0.730	0.661

Robust standard errors in parentheses. All models include school and district fixed effects as well as the following time variant school and community covariates: teachers' education, the number of test scores recorded per school, the community's urban/rural classification, and the total number of households in the community. Models conducted with the full sample include pre-treatment year fixed effects.

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table 4
Estimated effect of decentralization on language achievement.

	Elementary		Junior secondary		Total	
	Full sample	Balanced panel	Full sample	Balanced panel	Full sample	Balanced panel
Post × MoEC	−0.190 (0.175)	−0.230 (0.271)	0.0179 (0.140)	0.008 (0.164)	−0.075 (0.102)	−0.107 (0.136)
Constant	0.232 (0.704)	0.796 (0.736)	−0.197 (0.418)	1.399 (0.905)	0.109 (0.363)	1.056* (0.570)
Observations	3529	730	3389	828	6918	1558
R-squared	0.744	0.697	0.770	0.742	0.752	0.708

Robust standard errors in parentheses. All models include school and district fixed effects as well as the following time variant school and community covariates: teachers' education, the number of test scores recorded per school, the community's urban/rural classification, and the total number of households in the community. Models conducted with the full sample include pre-treatment year fixed effects.

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table 5
Teacher effort (hours in the classroom per week), by school type and year.

Elementary schools		1993/1994	1998/1999	2000/2001	2007/2008
MoEC	Mean	31.318	33.147	34.485	30.770
	SD	5.660	8.002	6.532	6.183
Private	Mean	30.679	30.904	30.038	30.507
	SD	8.746	9.798	9.778	7.831
Junior secondary schools		1993/1994	1998/1999	2000/2001	2007/2008
MoEC	Mean	22.628	22.413	24.229	28.382
	SD	5.832	5.931	7.094	8.433
Private	Mean	20.429	21.45	21.941	27.068
	SD	7.833	8.130	8.581	10.017

Note: Data presented are from the full sample.

private elementary schools, meanwhile, spent around 30 h in the classroom per week consistently from 1993 to 2007. At the junior secondary level, both MoEC and private school teachers increased the amount of time spent in the classroom from between 20 and 24 h from 1993 to 2000, to about 28 h in 2007. Table 5 and Fig. 3 present these trends.

The difference-in-differences estimate of the effect of decentralization on teacher effort is presented in Table 6. In the combined sample of elementary and junior secondary schools, I find a negative effect on hours spent in the classroom, in the magnitude of 0.3 standard deviations, only significant in the balanced panel sample. This represents about two fewer hours per week spent in MoEC classrooms.

6.3. Heterogeneous effects

I examine heterogeneous effects across two school characteristics. First, considering the educational disparities between urban

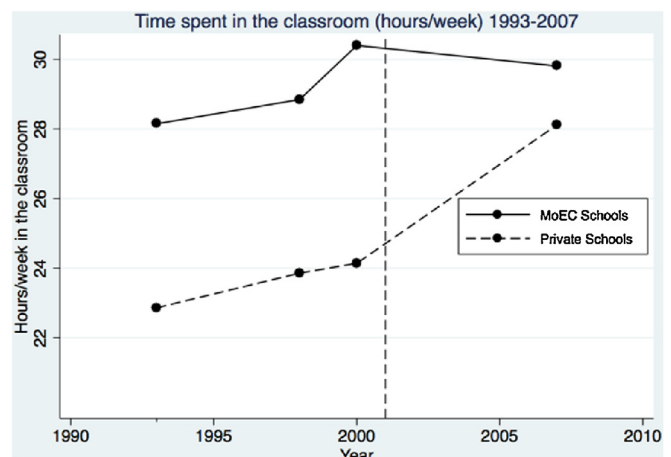


Fig. 3. Trends in teacher effort from 1993 to 2007.

Table 6
Estimated effect of decentralization on teacher effort.

	Elementary		Junior secondary		Total	
	Full sample	Balanced panel	Full sample	Balanced panel	Full sample	Balanced panel
Post × MoEC	−0.229 (0.187)	−0.344 (0.317)	0.0833 (0.192)	−0.026 (0.205)	−0.243 (0.154)	−0.316** (0.154)
Constant	0.747** (0.321)	0.820 (0.764)	−1.096* (0.621)	−2.728** (1.170)	−0.039 (0.303)	−0.914 (0.798)
Observations	3506	725	3375	826	6881	1551
R-squared	0.667	0.620	0.681	0.589	0.731	0.594

Robust standard errors in parentheses. All models include school and district fixed effects as well as the following time variant school and community covariates: teachers' education, the number of test scores recorded per school, the community's urban/rural classification, and the total number of households in the community. Models conducted with the full sample include pre-treatment year fixed effects.

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table 7
Heterogeneous effects of decentralization by school location.

	Math achievement		Language achievement		Teacher effort	
	Urban	Rural	Urban	Rural	Urban	Rural
Post × MoEC	−0.205 (0.172)	0.0679 (0.193)	−0.122 (0.133)	−0.069 (0.168)	−0.141 (0.210)	−0.457* (0.238)
Constant	0.813** (0.380)	0.158 (0.320)	0.441 (0.414)	−0.311 (0.436)	−0.126 (0.657)	0.0625 (0.388)
Observations	4335	2583	4335	2583	4317	2564
R-squared	0.777	0.635	0.793	0.676	0.740	0.741

Robust standard errors in parentheses. All models use the full sample and include pre-treatment year fixed effects, school fixed effects and district fixed effects as well as the following time variant school and community covariates: teachers' education, the number of test scores recorded per school, and the total number of households in the community.

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

and rural schools in Indonesia (Asian Development Bank and OECD, 2015), I split the sample according to the baseline urban/rural classification of the community within which schools are located. Second, in order to explore the role of school committees in implementing decentralization and school-based management, I divide the sample into two groups according to the number of times per year that school committees meet. This information is based on principal-reported data from the 2007 IFLS survey. On average, school committees meet four times per year. I define school committees as highly active if the committee meets six or more times per year and inactive if the committee meets two or fewer times per year. Eighteen percent of MoEC schools observed in 2007 have highly active school committees and 33 percent have inactive school committees. To maintain statistical precision, I conduct both sub-group analyses on the combined sample of elementary and junior secondary schools.

I find no evidence of a heterogeneous effect on achievement by school location. In terms of teacher effort, however, I find large a negative effect on teacher effort in rural schools, in the magnitude of −0.457 standard deviations, significant at the ten percent level. This represents almost three fewer hours per week spent in the classroom. Table 7 presents these results.

I find slight evidence of a negative effect of decentralization on math achievement among schools with an inactive school committee (see Table 8). These effects are present in the full sample and balanced panel sample, but are less robust to the inclusion of school fixed effects⁹. The effects on teacher effort among schools with inactive school committees, on the other hand, are large and robust to the inclusion of school fixed effects (see Table 9). The effect on teacher effort is larger among inactive

⁹ School fixed effects account for time-invariant differences between schools that could confound the treatment estimate. As such, models with school fixed effects provide the most robust estimate (but also the most conservative estimate).

Table 8
Effects of decentralization on math achievement among schools with inactive school committees.

	Full sample		Balanced panel	
	Model 1	Model 2	Model 3	Model 4
Post × MoEC	−0.270** (0.113)	−0.334 (0.200)	−0.297** (0.132)	−0.367* (0.212)
Constant	−0.789*** (0.220)	0.466 (0.505)	−0.465 (0.288)	0.456 (0.728)
Observations	1302	1302	502	502
R-squared	0.110	0.611	0.156	0.637
School FE	No	Yes	No	Yes

Robust standard errors in parentheses. All models include district fixed effects as well as the following time variant school and community covariates: teachers' education, the number of test scores recorded per school, the community's urban/rural classification, and the total number of households in the community. Models conducted with the full sample include pre-treatment year fixed effects.

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

school committees than it is among rural schools, representing around 3 fewer teaching hours per week. There is no effect of decentralization on achievement or teacher effort among schools with highly active school committees.

6.4. Robustness checks

The internal validity of these estimates relies on the assumption that changes in outcomes in private schools provide an unbiased estimate of how outcomes would have changed in MoEC schools (Angrist and Pischke, 2009). At face value, the validity of this assumption seems potentially spurious, given the visual differences in trends between MoEC and private schools evident in Figs. 1 and 2. While I cannot directly test this assumption, I perform several robustness checks to address potential sources of bias.

Table 9
Heterogeneous effects of decentralization by school committee engagement.

	Math achievement		Language achievement		Teacher effort	
	Inactive SC	Active SC	Inactive SC	Active SC	Inactive SC	Active SC
Post × MoEC	−0.334 (0.200)	0.322 (0.477)	−0.228 (0.149)	0.308 (0.390)	−0.535** (0.237)	−0.427 (0.725)
Constant	0.466 (0.505)	2.231 (1.467)	−0.373 (0.711)	0.201 (1.429)	−0.300 (0.457)	−0.740 (1.143)
Observations	1302	306	1302	306	1292	305
R-squared	0.611	0.688	0.706	0.723	0.644	0.649

Robust standard errors in parentheses. All models use the full sample and include pre-treatment year fixed effects, school fixed effects and district fixed effects as well as the following time variant school and community covariates: teachers' education, the number of test scores recorded per school, the community's urban/rural classification, and the total number of households in the community.

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table 10
Pre-decentralization artificial "treatment" effect.

	Full sample	
	Model 1	Model 2
Post × MoEC	0.021 (0.067)	0.035 (0.073)
Constant	0.036 (0.155)	0.537** (0.232)
Observations	4895	4895
R-squared	0.115	0.827
School FE	No	Yes

Robust standard errors in parentheses. Both models include a pre-treatment year dummy variable for 1993/4 and control for district effects, the number of completed tests recorded for each school, the school's urban/rural location, and the number of households in the community.

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

One way to examine the internal validity of a difference-in-differences model is to ensure that the treatment effect does not precede the implementation of treatment. To do so, I set an artificial "baseline" and "post-treatment" year to 1998 and 2000, respectively, and conduct the same difference-in-differences estimate. The presence of a statistically significant "effect" of this artificial treatment would indicate that any effect I find in 2007 is confounded by changes in MoEC schools that began prior to decentralization. Table 10 presents the results of this robustness check. I find no evidence of an artificial treatment effect prior to decentralization.

A second potential source of bias stems from the presence of omitted time variant factors that vary uniquely between MoEC and private schools at the onset of decentralization. One way this could happen is if schools were selected for decentralization based on location-specific, time-varying information. This is unlikely, however, given that decentralization was implemented universally in all MoEC schools and my comparison group is a set of schools that have always been decentralized. A second way in which omitted time variant factors could bias the difference-in-differences estimate is through changes in policies or environmental factors that affect MoEC schools differently than private schools, such as the 2004 Indian Ocean tsunami and subsequent relief efforts. This is also unlikely, however, given that both types of schools are located in the same districts and communities, such that changes in policies and environmental factors that affect one group are just as likely to affect the other group. In addition, I include covariates at the community and school level in order to address possible bias from time-variant shocks affecting educational outcomes.

A third threat to internal validity arises from the possibility of selective migration. If wealthier families responded to decentralization by switching their children from MoEC schools to private

schools, the difference-in-differences estimate would be underestimated by changes in the socioeconomic composition of students. Likewise, it is possible that decentralization increased enrollment in MoEC schools among children from lower socioeconomic groups who were previously excluded from the school system. This would also underestimate the treatment effect. Using IFLS household survey data from the same communities for which I have school level data, I test for (but do not report) a difference-in-differences effect of decentralization on a proxy of students' socioeconomic status: parents' mean years of education. The coefficient of the treatment effect of decentralization on mean parental years of education in MoEC schools is negative, suggesting that student migration from MoEC to private schools may partially explain the jump in achievement observed in private schools. The coefficient is not statistically significant, however.

In addition, in the years since SBM was launched, the Indonesian government has received support from the World Bank and the United States Agency for International Development (among other donors) to implement pilot programs directed at strengthening the capacity of school committees to improve the implementation of SBM (Heyward and Cannon, 2011; Vernez, 2012). If schools in my sample also participated in these donor-supported pilot programs this would upwardly bias my estimate, but I cannot identify schools that participated in these programs. However, given the small size of my sample, as well as the small size of the donor-funded pilot programs, it is unlikely that more than a few (if any) schools from my sample received this extra support.

7. Discussion

Decentralization reforms have figured prominently in the policy landscape for the last several decades and will likely continue to do so for years to come. The results of my study highlight the tenuous link between decentralization and school quality in contexts where the education sector has historically been tightly managed by the central government. I find no effect of decentralization on math and language achievement, although there is a weak negative effect on math achievement among schools with inactive school committees. I also explore the effect of decentralization on teacher effort, and I find a significant negative effect on the number of hours that teachers spend in the classroom, particularly in schools located in rural communities and in schools with inactive school committees.

My findings challenge the assumption that decentralization improves school quality by making schools more accountable to local communities. There are several explanations for this disconnect. First, it could be that local authorities perform worse (or at least, no better) than the central government. This interpretation would suggest that district and school level authorities make poor

school management decisions or are uninterested in supporting education.

A more likely explanation is that my findings reflect the result of incomplete decentralization. In this regard, a null effect of decentralization on achievement provides empirical evidence to support the descriptive claims that decentralization has done little to change what happens in the classroom (Bjork, 2003; Yeom et al., 2002). This is aligned with what Amirrachman et al. (2008) refer to as “centralized decentralization”, in which educational governance remains top-down, despite the rhetoric of community participation. An important question emerges from these findings: what does it take to achieve complete decentralization in contexts with low – or heterogeneous – levels of local resources and management capacity? Can decentralization ever be complete in these contexts?

The null effect on achievement may also be explained by the timing of my analysis. I examine schools six years after the implementation of fiscal and administrative decentralization and four years after the implementation of school-based management. The effects of these major policy reforms on achievement may take more than several years to identify. However, I do find negative effects on a potential mediator of the relationship between decentralization and achievement: the number of hours that teachers spend in the classroom per week. This indicates that local communities have not assumed the responsibility for teacher supervision and support. It may also be the case that school committees do not have the authority to supervise teacher effort. Indeed, qualitative evidence suggests that principals and district education boards maintain all real authority over school governance, while school committees serve a superficial “rubber stamp” role in signing school budgets once a year (Kristiansen and Pratikno, 2006; SMERU, 2006).

It is also possible that the negative effect on teachers' time spent in the classroom is caused by an increase in the number of teachers that work in each school. If this is the case, it may be that decentralization had no effect on the total number of teaching hours available to students, despite the fact that individual teachers spend less time in schools. A simple analysis of trends over time suggests that the number of teachers per school has indeed grown steadily over time in both MoEC and private schools (from an average of 18 teachers per school in 1993 to 25 in 2007 in both groups). However, I find no difference-in-differences effect of decentralization on the number of teachers per school.

Likewise, although my model meets the standard robustness checks of difference-in-differences models, the IFLS data are not representative of private schools and MoEC schools nationwide. Given the jump in achievement that private schools in my sample experienced from 2000 to 2007, it could be that the provision of BOS funds affected these schools differently than private schools and MoEC schools nationwide. Future research should explore how the utilization of these funds differs between these groups.

Together, my findings contribute to the emerging body of research illustrating the limits of decentralization in resource-constrained settings, such as in rural schools in Indonesia. Like Galiani et al. (2008), I find evidence that decentralization can further the gap between advantaged and disadvantaged communities—the negative effect on teachers' time spent in the classroom is more than 50 percent greater in rural schools than in urban schools (and only statistically significant in rural schools). Like Jimenez and Sawada (2014) and Di Gropello and Marshall (2009), my findings highlight the importance of engaging communities in school management—I find a slight negative effect of decentralization on math achievement and a large negative effect on teacher effort among schools with inactive school committees. However, I cannot rule out the possibility that differences between active and inactive school committees are primarily driven by differences in

parents' socioeconomic capacity to participate in school management. Future research is needed to isolate the effects of engaging parents in school management in this context.

Rather than ruling out the potential of decentralization to improve school quality, my findings remind policymakers that autonomy is not synonymous with knowledge or empowerment. To be effective, decentralization should be accompanied by efforts to ensure that local communities know how to assess school quality and have the resources and political will to do so. This will require further research about how decisions are made at the school level, in addition to research that explores how to encourage communities to collaboratively support school quality, above and beyond providing operational funds.

A second area for future research has to do with the relationship between decentralization and other aspects of school quality—namely, access. My findings apply to students who are enrolled through junior secondary school, but the most vulnerable children in Indonesia are those who remain excluded from the education system. Future studies should explore how localized school governance affects not just achievement but enrollment, drop out, and transitions.

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