Improving Student Performance in Public Primary Schools in Developing Countries: Evidence from Indonesia

Daniel Suryadarma, Asep Suryahadi, Sudarno Sumarto

SMERU Research Institute

and

F. Halsey Rogers*

World Bank

ABSTRACT

This paper investigates the correlates of student performance in mathematics and dictation tests among schoolchildren in Indonesia. This is the first such study to use a new nationally representative sample of Indonesian primary-school students. Our dataset includes unique data on teacher absenteeism collected through direct observation, the first ever in Indonesia. We find that teacher absenteeism is indeed a significantly negative correlate of student performance, while availability of school facilities predicts better performance. We also find a significant non-monotonic concave relationship between pupil-teacher ratio and student's mathematics performance. Finally, we discuss the policy implications of the results.

Keywords: achievement; absenteeism; primary school; public school; Indonesia.

JEL classification: I21, I28.

* Corresponding author: Daniel Suryadarma, SMERU Research Institute, Jl. Pandeglang 30, Jakarta 10310, Indonesia. Email: dsuryadarma@smeru.or.id. We would like to thank Wenefrida Widyanti for research assistance, Syaikhu Usman, Nina Toyamah, Akhmadi, seminar participants at the Global Education Research Conference in Prague, and two anonymous referees for their comments and suggestions.

I. INTRODUCTION

Over recent decades there has been a massive effort by developing countries to put their children in school. Educational attainment, especially primary education, is perceived as one of the main vehicles for spurring economic growth and improving living standards in developing countries.

Given the vast resources invested in education, understanding what factors and investments most efficiently improve student learning is of crucial importance. This paper takes a first step toward that goal in the case of Indonesia. Surprisingly, given Indonesia's size and importance, few studies have investigated the correlates of student achievement in this country. In this paper, we use a unique new nationally representative dataset that includes not only primary-student performance data, from math and dictation tests that we administered, but also data on characteristics of the students' teachers and schools.

Having achieved universal primary education by the late 1980s, Indonesia is focusing increasingly on other aspects of schooling, particularly the quality of schools and teaching. The most obvious way to evaluate the quality of formal education is to test students. This approach has the advantage of providing an objective measure of quality, assuming the test is well designed; if it is nationally standardized, it allows comparison among schools in different regions.

But there are also disadvantages with tests as an evaluation tool. First, teachers may be tempted to teach to the test and ignore subjects that are not tested, especially true if the test dates and materials are already known in advance (World Bank, 2003). Second, teachers or administrators may try to manipulate the results. Third, differential student-specific factors such as family background and socioeconomic conditions, differential access to facilities, and inherent ability typically explain much of a student's test performance, making it hard to disentangle what portion of the student's performance is attributable to the school. Strong performance may simply reflect the student's innate ability or prior preparation, rather than the school's contribution.

This paper explores the correlates of performance in tests of Indonesian fourth-grade students in public schools in detail, and assesses how well factors like teacher quality and school facilities predict test results, compared to household and student-specific factors such as parents' level of education. Because elements of teacher quality and school facilities are found to be significant factors, it also explores what policy measures might be taken by stakeholders to improve student performance.

The detailed analysis focuses on public schools, because those schools educate the vast majority of primary-school students—93 percent of students in 2003 (Ministry of National Education, 2003). Moreover, government-run schools generally have similar organizational structures and are subject to a strict standardized national curriculum; these commonalities may make it easier to distinguish the effects on performance of differences in school management and family background factors.

The test administered in our survey, although simple, is a step forward in a key respect: it is the first test reported on a random sample of primary-school students. And it overcomes two of the disadvantages noted above: it was not announced ahead of time, so there was no "teaching to the test"; and it was administered by SMERU researchers, so there was no risk of manipulation by teachers or administrators.[1] Because time and budget constraints limited us to administering the test to a cross-section of students, however, the third disadvantage listed above is an issue for this paper. In order to establish how much value is added by the school, we would need data on student performance prior to entering a particular school or grade, but in this study, we lack baseline pre-enrollment test scores.[2] We include some variables that are likely to capture some aspects of student preparation or ability, but with this cross-sectional data, we recognize our inability to assess value-added with any certainty; our primary goal is therefore to establish correlations as a first step towards understanding primary-student performance in Indonesia.

[1] In fact, since the test was administered by our team and had no consequences for the schools, teachers and administrators had no obvious incentive to manipulate scores.
[2] Todd & Wolpin (2003) discuss this issue in their paper.

Another contribution of this analysis is that in addition to the usual explanatory variables, we include a measure of teacher effort and input quality—the teacher absence rate. This is the first study that has included teacher absence as an explanatory variable in Indonesia, because until recently good data on absenteeism was unavailable. This variable may provide us with valuable insights regarding its correlation to student achievement.

The rest of the paper is organized as follows. Section II gives an overview of the Indonesian primary education system. Section III discusses the survey where data was collected. Section IV reviews the literature on determinants of student achievement. Section V explains possibilities of bias and steps that we employ to deal with them. Section VI explains the model used for this investigation and data summary. Section VII discusses the estimation results. Section VIII provides conclusions and policy implications.

II. INDONESIAN PRIMARY EDUCATION SYSTEM

Indonesia has two kinds of public primary schools. The first, the Madrasah Ibtidaiyah Negeri (MIN), are overseen by the Ministry of Religious Affairs and use a curriculum designed by the department that is based on Islam. Thus, MIN schools are Islamic schools. The second, much larger category of schools is non-Islamic schools, which we will refer to as "regular" public schools, to avoid any confusion caused by the diverse names given to these schools. Two of the more popular names for regular public schools are SDN (Sekolah Dasar Negeri or Public Primary Schools) and SD Inpres (SD Instruksi Presiden or Presidential Instruction Primary Schools).[3] Regular schools are supervised by the Ministry of National Education, and they use a secular curriculum; religion is only one of the courses rather than serving as the curriculum's foundation. In addition to these two categories of public schools, there are also private primary schools, known as SDS (Sekolah Dasar Swasta) and MIS

[3] SD Inpres is a name given to schools that were constructed during a massive national school building program in the 1970s, based on President Soeharto's instruction, which explains the origin of the moniker "Presidential Instruction". Around 60,000 primary schools were built around the country in that era. The effect of this policy is discussed in Duflo (2001).

(Madrasah Ibtidaiyah Swasta). SDS include both secular and religion-based private primary schools.

In terms of attainment, Indonesia achieved universal primary education by the late 1980s. Two main government programs made this achievement possible. First, the SD Inpres school construction program mentioned above succeeded in building around 60,000 primary schools in a little over a decade. Second, in 1984, after most of these schools had been constructed, the government enacted a National Compulsory Education program requiring children to finish primary school. This program proved highly successful, and by 1988 the government reported that 99.6 percent of children were enrolled in primary schools or had finished six years of education (Government of Indonesia, 1998).

More recently, in January 2001, the government enacted a major regional autonomy law, which has had a substantial impact on the education sector. From an organizational standpoint, since 2001 regular public schools are controlled and supervised by district governments, although they are still using the curriculum designed by the national government's Ministry of National Education. By contrast, the Madrasah public schools are still under the same organizational structure as prior to 2001.

Moreover, education decentralization delegates school management directly to the schools themselves, through Manajemen Berbasis Sekolah (School-based Management). This mechanism gives individual schools the authority to manage facilities and human resources, and to involve stakeholders in the delivery of education. The new initiative has been supported by the creation of two new independent institutions: Dewan Pendidikan (Education Board), which operates at the district level, and Komite Sekolah (School Committee), which conducts activities at the school level. Dewan Pendidikan is the body that enables the community where schools are located to participate and assume responsibilities in school management and policies. Although the Dewan work with government agencies at the district level, they are independent and have their own authority, within the constraints set by local laws. On the other hand, members of Komite Sekolah are comprised of teacher, parent, and

community member representatives. These committees' main function is to assist the school in making strategic decisions, including setting annual school budgets and amount of fees charged to students.

Public schools in Indonesia have the right to charge fees in addition to the government transfers that they receive every year. The size of the government transfers is based on the number of enrolled students and location of school, with remote schools receiving more money. Meanwhile, the extra school fees charged to students are determined by the school committee and are used to fund many expenses, from purchasing stationery to paying for teacher overtime. Another fee charged by the school is the school committee fee, which is a form of membership dues that parents of each student must pay. This fee is traditionally used to pay for expenses during school committee meetings, for example to buy refreshments, although the school principal has full discretion on how to spend it.

Public schools have two types of teachers: government employees (civil servants) and contract teachers. Prior to the decentralization law, the first group of teachers were employees of the national government. Their salary scale is the same as that of other government employees, except that they receive an additional "functional subsidy" for being teachers. In addition, these civil servant teachers have high job security: they are virtually guaranteed a teaching position until retirement and then receive a government pension. In assessing compensation of these civil servants, it is crucial to note under this pre-decentralization system, the national salary scale paid similarly ranked teachers the same salary regardless of where they were stationed, although teachers in remote schools receive an additional bonus. As a result, a teacher living in a relatively poor and low-cost area would have had a higher real salary, while a teacher living in a high-cost area might have had to work extra jobs in order to fulfill his or her basic needs. In our dataset, which includes both contract and civil servant teachers, the outside occupations reported by teachers are very diverse. The three main occupations are: teaching in other school(s), with or without permission (12 percent); becoming a storekeeper (24 percent); and farming (27 percent).

After the decentralization in 2001, however, teachers become employees of district governments.[4] Although the base salary scale still follows that of the national government, district governments typically provide further financial incentives to teachers. Richer districts usually provide higher incentive to enable teachers to keep up with the higher cost of living without having to moonlight. This could lure top teachers to move to rich districts, although so far no study in Indonesia has focused on the impact of extra pay on teacher movement.[5] However, there are bureaucratic difficulties for a civil servant in one district to move away and become an employee of another district government, which could act as a major barrier for mass teacher migration.

The second type of teachers is contract teachers. These teachers are usually employed on a short-term basis, either by the school or the district government to meet teacher shortages. If hired by the school, their salary is determined by the school principal, whereas if hired by the district government, their salary is determined by the district education office with a different, generally lower, salary scale from civil servant teachers. Furthermore, contract teachers receive neither the benefits that the government employees do, such as pension and financial incentive, nor the job security (although there are cases where a contract teacher teaches in a school for a long period of time). Because contract teachers receive lower salaries, it is quite common for them to teach in more than one school or have other jobs unrelated to teaching.

In terms of education level, a person wishing to become a primary-school teacher used to start his or her training by going to Teacher Training School (SPG) instead of regular senior secondary school. However, starting in the 1980s the government gradually abolished SPGs and increased teacher education requirements to at least D2 level, which means aspiring

[4] This only affects primary and secondary school teachers. University lecturers are regulated differently.

[5] Chomitz et al. (1999) estimates the size of salary premia that would be necessary to induce doctors to accept posts in rural areas in Indonesia, and find that a combination of modest salary incentives and hiring from the region could achieve the desired staffing levels in rural areas. We know of no similar study for teachers.

teachers must take a two-year teacher training course beyond senior secondary school.[6] Although this means teachers should have at least attended SPGs, in some parts of the country this regulation is waived due to teacher shortages.

III. DATA

The data for this study was collected through an education provider survey conducted by the SMERU Research Institute in cooperation with the World Bank. The survey was part of World Bank's multi-country survey project that also included Bangladesh, Ecuador, India, Peru, and Uganda, as described in Chaudhury et al. (forthcoming).

The data collection took place during two separate rounds, in October 2002 and February 2003 respectively. Each school in the sample was visited twice, both to improve the accuracy of the estimates on several variables (in particular teacher absence) and to gauge the similarity of the responses from the two visits.

The sample was a stratified, clustered, nationally representative random sample. The survey was conducted in eight randomly chosen provinces, out of a total of 30 provinces in Indonesia. After stratification of the country into four regions, a total of 10 districts were chosen randomly based on a probability-proportionate-to-population sampling (PPS) basis: five urban districts—Cilegon (Banten), Bandung (West Java), Surakarta (Central Java), Pasuruan (East Java), and Pekanbaru (Riau)—and five rural districts—Gowa (Southern Sulawesi), Lombok Tengah (West Nusa Tenggara), Rejang Lebong (Bengkulu), Magelang (Central Java), and Tuban (East Java). In each district, 10 villages were chosen at random on a PPS basis, and in the chosen villages up to three primary schools were surveyed at random with at least one private school (if one existed), and one public school being included.

The student performance data used in this paper was collected during the second visit to each school in February 2003. Enumerators administered a brief interview and test to a randomly selected sample of 10 students from the fourth grade in each of 110 public schools,

[6] This requirement has been recently extended to D4, or a four-year college education, by Teachers and Lecturers Law No. 14/2005.

yielding a total sample of 1,089 students. The math test consisted of 13 questions, covering all basic arithmetic operations. Meanwhile, the dictation consisted of four sentences in Indonesian, which were read twice by enumerators.

Almost all schools had only one fourth-grade cohort. Although the students knew that the tests would not affect their grades in school, the enumerators reported and documented that the students took the tests very seriously.

IV. LITERATURE REVIEW

The literature on determinants of student performance is too large to be summarized in depth here; we focus generally on the recent studies most relevant to the themes of this paper. The majority of studies on student performance have examined developed-country settings. Many of them have related student performance to various aspects of education, such as school quality, teaching quality, teacher remuneration, class size, and gender. The main methodological problem is that the unmeasurable inputs may be as important as the measurable ones, but there are a host of other issues to address – for example, the concern that because students are taught by more than one teacher, it is difficult to link the performance of a particular student to a particular teacher (Kingdon & Teal, 2002).

Todd & Wolpin (2004) use a longitudinal dataset and find that the effect of current home inputs is of the same magnitude and significance as lagged home inputs. This means using contemporaneus home input variables does not bias the results. They also find that school inputs are significant only in non-fixed effects specification, although they argue that the imprecision is caused by the level of aggregation of school inputs that is different from home inputs.

A study on schools in India investigated the relationship between performance-related pay and student achievement (Kingdon & Teal, 2002), addressing the important issue of endogeneity in the relationship between pay and achievement. The authors found strong evidence that performance-related pay in the private sector affects student achievement, but no evidence of a similar cause-effect relationship in public schools.

There are conflicting results regarding the effect of class size on student achievement, in both developing and developed countries. On the positive side, a comparative study of public schools among US states found that in Tennessee, smaller class sizes contribute positively to student learning, particularly in fields like elementary reading (Darling-Hammond, 2000). In another assessment, Angrist & Lavy (1999) use regression-discontinuity design and find that reducing class size increases fourth- and fifth-grade test scores in Israeli public schools. Similarly, Case & Deaton (1999) separate their sample of South African data into races, notably Blacks and Whites, and look at the impact of pupil-teacher ratio on education attainment, enrollment, and numerical and literacy test scores. Especially for the test score results among Blacks, they find that when school facilities and education attainment are included as controls, a higher pupil-teacher ratio has a negative effect on math score but a positive and insignificant effect on literacy. They also find that among Whites, the pupil-teacher ratio has a positive albeit insignificant effect on both tests. Finally, Krueger (1999) uses data from Tennessee's STAR project. Using both OLS and 2SLS models with various controls, he finds that students from small classes achieve higher SAT scores than do students sitting in regular classes. He also shows that students assigned to a small class during their early years enjoy a permanent increase in achievement.

By contrast, other studies find that small class sizes are either not significant or even detrimental to student performance (Hanushek, 1995; Hoxby, 2000; and Urquiola, 2001). In addition, Jones (2001) reviews 277 econometric studies on the effect of class size on achievement and finds that 28 percent of the studies report statistically significant estimates but 13 percent of those report a negative sign. A recent study of secondary schools in Bangladesh (Asadullah, 2005) finds an insignificant positive sign on the class size variable in determining student achievements, using both OLS and IV regressions. The author concludes that a reduction in class size may not be useful in a developing country like Bangladesh.

Regarding the importance of teachers, Archer (1999) and Armentano (2003) argue that teachers are the most important influence on student progress, even more important than socioeconomic status and school location. Furthermore, Darling-Hammond (2000) concludes

that measures of teacher preparation and certification are by far the strongest correlates of student achievement in reading and mathematics. Meanwhile, Banerjee et al. (2005) conduct a randomized experiment study in India and find that being in a remedial program, where a student sits in an afterschool tutoring, significantly increases the student's learning.

Many studies also discuss parental school choice and the impact of school type on achievement, although the majority use developed country data and many involve Catholic schools. Altonji et al. (2005) find that Catholic school students have much higher probability of graduating from high school and entering college, but there is no difference in terms of test scores.[7] Similarly, Hanushek et al. (2005) investigate charter schools in Texas and find that average student achievement there is not significantly different from regular schools. Meanwhile, Kingdon (1996) uses urban Indian data and finds that selectivity term into public or private schools to be only weakly significant. This means parents in urban India do not prefer one school type over the other.

Teacher absenteeism, an observable indicator of teacher effort and performance, has been the focus of several recent studies. Chaudhury et al. (forthcoming) report on surveys in six developing countries that yield observational data on absence of teachers and health workers. Averaging across the six countries, they find an absence rate of 19 percent among primary school teachers. Indonesia's estimated absence is 19 percent, thus ranking it as a typical country in the sample—with lower teacher absence than India (25 percent) or Uganda (27), but higher absence than Peru (11), Ecuador (14), or Bangladesh (16). Two other project studies have yielded preliminary results on the correlation between absence and student performance: in India, higher primary-teacher absence is correlated with a small but strongly significant reduction in predicted test scores (Kremer et al. 2004), while in Bangladesh, teacher absence predicts lower scores in English but not math (Chaudhury et al. 2004).

Meanwhile, Das et al. (2005) use a panel dataset on student and teachers in Zambia, also based on classroom observation of teacher attendance, and find that a 5 percent increase

[7] The debate on the impact of Catholic schooling is long and also riddled with contrasting results. See Altonji et al. (2002) for discussion.

in teacher's absence rate resulted in a decline in learning by 3.75 percent in English and 4 percent in mathematics of the average gains over the period. One of the first studies that related student achievement to teacher absenteeism, Ehrenberg *et al*. (1991) relate teacher absenteeism—measured by leave days used, taken from administrative records—to student pass rates in various tests using data from schools in New York. They treat teacher and student absenteeism as exogenous variables and find teacher absenteeism to lower student pass rates only in one elementary level test, while having no impact on high school level tests.

Relatively few papers appear to have examined sources of student achievement in Indonesia. Johnstone & Jiyono (1983) test student achievement in language and mathematics in rural and semi-urban Yogyakarta. They find that a student's background is more important than his or her individual characteristics and attitudes towards school, and family encouragement is more important than family wealth or socioeconomic conditions. Furthermore, out-of-school factors are found to affect language scores most and math scores least, which suggests that teacher absence should have a greater effect on mathematics than language aptitude – an implication that we test below.

Meanwhile, Mohandas (2000) uses the result of 1997 TIMSS (Third International Mathematics and Science Study) instruments in measuring the mathematics and science achievements of junior secondary students. He finds that gender (boys outperformed girls), age, and socioeconomic status and home background of students were significant student-level determinants of achievement.

Finally, Newhouse & Beegle (2005) use IFLS (Indonesian Family Life Survey) data to investigate the difference in student achievement between different junior secondary school types in Indonesia. They find that students in public school and non-Muslim religious private schools performed better than those in Muslim schools and secular private schools.

In a related work, James, King, and Suryadi (1996) analyze data from a national survey of Indonesian primary schools carried out by the Ministry of Education and Culture in 1991-92. That data included the school-level average scores on a sixth-grade national examination in math and Indonesian language, but no student-level score information.

Moreover, their study focused on determinants of school costs, with exam scores entered as a control for quality. Nevertheless, while their findings are not directly comparable, they do suggest hypotheses to explore here: first, "at the low funding levels at which most Indonesian schools operate, money counts", in that higher resources lead to higher exam scores; and second, that private and local sources of funds improve efficiency of spending (that is, raise quality for a given total resource envelope).

V. POSSIBILITIES OF BIAS

Many studies have documented that student performance regressions may suffer from biased coefficients. One potential bias stems from the potential correlation of student performance with unobservables, such as the student's ability to learn or educability. This variable is difficult to measure accurately, even if some sort of aptitude test is available, but is certainly an important element in the educational production function. If the unobserved variable is correlated with other regressors, such as parental education or income, omitting it will therefore introduce bias.

To address this problem, we include several variables that are likely to correlate with student educability—parental educational attainment and parental attention to the student's progress—while recognizing that these are imperfect measures of unobserved student ability or motivation. We included parental education because most studies find that children whose parents have higher education achieved better results.[8]

Similarly, Todd & Wolpin (2003) argue that using cross-section data is inconsistent with behavior optimization theory, because it assumes that schooling inputs do not change based on a student's ability endowment. Hence, using it requires two assumptions: current input measures capture the entire history, and current inputs are unrelated to unobserved child endowment.

These assumptions are not completely implausible in the Indonesian context. First, the majority of students in public primary schools face the same inputs over time, especially

[8] For example Chevalier (2003) and Black et al. (2003).

in terms of school quality and accessible facilities. Moreover, it is quite common to find multigrade teachers in public primary schools, so that a child may be taught by the same teacher from the first grade all the way to graduation from primary school. Furthermore, we use school averages for the teacher and school explanatory variables, which should help in removing the bias. As for second required assumption, a child usually attends the nearest primary school, regardless of his or her parents' perception of the child's ability. This is certainly true in rural areas, and, in addition, our enumerators note that even in urban areas most parents still send their children to the nearest primary school.

Various potential sources of endogeneity could also bias our econometric results. One such source is parental choice of school for their children. If that choice is correlated with characteristics that are observed by parents or school administrators but not by the econometrician, then the analysis may incorrectly attribute to the school or teachers' performance effects that actually stem from individual characteristics. However, the condition that we mention in the preceding paragraph removes this bias from our results.

Endogenous student assignment to classes could similarly be a source of bias if students are assigned based on unmeasured characteristics correlated with performance. As already mentioned in Section III, however, most schools in our sample have only a single fourth-grade cohort. In any event, our data on teacher characteristics are not class-specific, but are averages for each school. While taking averages will reduce our ability to distinguish teacher effects from noise, it should eliminate this potential source of bias.

Another potential source of bias is the possibility that parents enroll their children in extracurricular classes or tutoring—so that the measured public-schooling inputs do not capture all formal educational inputs. Theoretically, the direction of this bias is not easy to predict: poor-performing students may be sent to tutoring to get remedial attention, but it is also possible that high-ability students with motivated parents receive tutoring to compensate for inadequacies in public schooling.

To deal with this issue, we utilize as instrument the fact that in our data, there exists a school clustering in terms of taking extracurricular courses, which is exogenous to a student's

score but may influence parents' decision to enroll their children in such courses. As can be seen from Figure A1 in the appendix, 61 percent of schools (67 out of 110) report no students taking extracurricular courses, while in 4 percent of schools nearly every student is enrolled in extracurricular courses.

Finally, as we have mentioned in the introduction, the role of teachers and school quality is measured by how much value is added to students. Therefore, one needs panel dataset of student achievement to accurately measure the effects. Unfortunately, we have no such data. However, we believe that our results at the very least would be able to help establish the correlates of student performance, drawn from a new dataset with potentially important explanatory variables that have not been studied before.

VI. THE MODEL AND DESCRIPTIVE STATISTICS

The model for student performance adopted in this study follows a common firm production function.

$$\text{Ln } S_{ij} = F\ (G_{ij},\ Q^{P}_{ij,}\ \text{Ln } Q^{T}_{j},\ \text{Ln } Q^{S}_{j},\ \text{Ln } F^{S}_{j},\ u)$$

where S_{ij} is the score in math and dictation tests of the i^{th} student in the j^{th} school, and the independent variables are: G_{ij}, the gender of the student; $Q^{P}_{ij,}$ a matrix of the characteristics of the student's parents; Q^{T}_{j}, a matrix of the teacher's characteristics in the j^{th} school; Q^{S}_{j}, a matrix of the quality of the j^{th} school; and F^{S}_{j}, any fees received by the j^{th} school from both the government and the parents; while *u* is the error term in the model. We include district fixed effects in the regression, and since each district is either an exclusively urban or rural area, there is no need to include dummy for rural areas in the model. The complete variable list and descriptive statistics are in Appendices 1 and 2 respectively.

Especially for the fees variables, in theory one might expect any effects of transfers and fees to be mediated by the teacher and school quality variables, if the fees affect student performance primarily by allowing purchase of better inputs into the educational process. Nevertheless, we include fees in the regression, because some dimensions of quality are without doubt unobservable or at least immeasurable, and fees seem likely to correlate with

these dimensions and therefore with student performance. For example, a school that charges higher fees may be able to provide more books in the school library or higher-quality tables and chairs for students. Furthermore, including the three sources of funds separately may provide a test of which type of accountability is most effective in inducing strong performance by the school—accountability to government agencies, to individual "clients", or to school organizations.

VI.1 Quartile Analysis of Math Score

We first divide the student test scores into quartiles and look at the characteristics of the schools, students, and teachers of each quartile. Table 1 documents this exercise for math scores. The highest score in the math test was 100, while the lowest score was 0. The actual completion time of the math test varied from 5 to 22 minutes, with an average of 16 minutes. Unsurprisingly, and consistent with evidence from other countries, this new evidence from Indonesia shows that the average level of education of fathers increases with the test-score quartiles (from lowest to highest). In the first quartile, most fathers only have a primary school certificate, while in the fourth quartile most fathers have at least a high school certificate. The proportion of fathers who have a high school certificate continues to rise in higher quartiles. In the bottom quartile, only 17 percent of fathers have a high school certificate, while in the top quartile 40 percent of fathers do. The same pattern holds true for mothers: although the majority of mothers in all quartiles completed only primary school, the percentage of mothers who have a high school certificate increased from 10 percent in the first quartile to 29 percent in the fourth quartile.

[TABLE 1 ABOUT HERE]

Other variables that correlate with performance include gender, school infrastructure, source of funds, and parental involvement variables. Girls are the majority among high scorers: 56 percent of students in the highest quartile are girls, compared with 45 percent in

the lowest quartile. The proportion of female teaching staff also increases with student performance, from 58 percent in the first quartile to 65 percent in the fourth quartile. While some indicators of the quality of school facilities do not vary much across quartiles, others such as the existence of a library and toilets also increase between the first quartile and the fourth quartile. In addition, although the amount of transfers received from the government is relatively equal for all quartiles of students, the schools of higher-quartile students charge higher school committee and school fees. Finally, more parents of the children who performed better in the math test had met teachers in the one to six months prior to the test.

VI.2 Quartile Analysis of Dictation Score

Table 2 provides the quartile analysis of dictation test scores. The scores range from 0 to 100, while the time that students took to complete the test ranged between 2 and 39 minutes, and the average was 6 minutes. In terms of trends in the movement between quartiles, the findings on bivariate correlates of dictation test scores are broadly consistent with the findings for the math test. The main difference is in government transfers: schools with more children who performed well in the dictation test received significantly more funds. Schools of students in the higher quartiles are also more likely to be connected to electricity.

[TABLE 2 ABOUT HERE]

Another finding from the data is that students in higher quartiles attend schools with fewer teachers who report other income-earning activities. Also, the average class size (for fourth-grade classes) and the pupil-teacher ratio (for the school) both show that, in terms of simple correlations, students whose scores are in higher quartiles are in schools that have more students in a class or, other words, more students per teacher.

VI.3 Comparison of Test Scores between Public and Private Primary Schools

Although we focus on public primary schools, it is useful to compare their results with the results from our smaller private-school sample, which consisted of 319 students from 35 schools. The comparison between both schools for both tests is in Table 3.

[TABLE 3 ABOUT HERE]

On average, students in private schools perform marginally better than their counterparts in public schools, but the only statistically significant difference is in math performance. Furthermore, the mean differences are slight—less than 3 points on a 0-100 scale, or 0.11 standard deviations. This suggests that the difference in performance between public and private schools may not be large. The relatively limited number of observations, however, prevents us from analyzing private schools further.

VII. ESTIMATION RESULTS

To estimate the correlates of student performance, we use both OLS and IV regressions, with standard errors adjusted for heteroskedasticity using school clusters. As already explained in Section V, the instrumented variable is *extra_courses*, while the instrument is proportion of classmates taking extra courses. The instrument fulfills the requirement of being highly correlated with the instrumented variable and exogenous to the dependent variables.[9]

Therefore, we estimate two regressions for each test type. The results are provided in Table 4.

[TABLE 4 ABOUT HERE]

[9] The correlation coefficient between the instrument and *extra_course* is 0.75, while its correlation coefficients with scoremath and scoreword are 0.14 and 0.19 respectively.

In the math regression, the coefficient of *extra_courses* switches signs from negative in OLS to positive in IV, while in the dictation regression the sign is positive in both regressions. However, in none of the specifications is the coefficient statistically significant. Secondly, other variables show similar coefficients and signs using both estimation methods, with some variables weakly significant in IV but significant at the 5 percent level when using OLS. Finally, both specifications yield similar R-squared coefficients. Since there is not much difference between using OLS and IV, subsequent discussion is mainly based on the results from the OLS regression, which yields marginally higher significance levels.

In both the math and dictation tests, girls performed significantly better than boys did, confirming the unconditional relationship revealed in the quartile comparisons. The education level of fathers, while having positive coefficients, does not significantly correlate to performance. By contrast, the education level of mothers appears to matter: students whose mother completed any level of education performed significantly better in math than students with illiterate mothers, and those whose mothers completed high school performed significantly better than those with illiterate mothers on the dictation test. This indicates the importance of a mother's role in her child's learning process, confirming a result that has become standard in the literature (see, for example, Rosenzweig and Wolpin 1994). This finding is also consistent with the more general existence of a strong inter-generational education link found in many other countries, although there is still controversy on its reasons between education spillover (e.g. Chevalier, 2003) and genetics (e.g. Black et al., 2003). Given that only the mother's education level is significant here, our result is more supportive of the education-spillover explanation.[10]

Several teacher characteristics correlate with performance. First, teacher absence significantly and negatively correlates with student performance on the math test, though not on the dictation test.[11] As noted above, the regressor here is the average absence rate for the

[10] If the cause is genetics, then we would expect that education level of both parents to be significant.
[11] This is consistent with the finding of Johnstone & Jiyono (1983).

school. If we were able to measure the absence rate of the child's own teacher with any precision—which was not possible here, as the data include only two observations for each teacher—the effect would presumably be much larger. Nevertheless, this finding suggests that the absence of teachers from math-related subjects must be taken more seriously. The lack of significance on absence in the dictation regression may simply reflect the lack of precision, but it could also point to a difference in the teacher's role in developing a child's mathematical and language skills, as discussed above. Because of the lack of data on teacher absence rates in the past, this is one of the first studies to verify empirically a link between teacher absenteeism and student performance.[12]

Other teacher variables also emerge as significant correlates. The proportion of permanent teachers—which means civil servant teachers—in schools is significant but is negatively correlated with math scores, while being positive but insignificant in dictation test. This result may indicate that teachers with secure jobs work less hard, but that any lack of effort affects only students' math skills, for the same reason as in the case of absence: because whereas children have many opportunities to practice their language skills at home or during non-school hours, they can rigorously work on their math skills mostly in class.

The outside employment of teachers also appears to matter. Attending a school with a higher proportion of teachers with a second job correlates negatively with math performance. The correlation with dictation scores is also negative, but it is insignificant. One obvious possibility is that this relationship is causal: teachers who moonlight cannot concentrate fully on teaching and hence do not teach their students as well. Other explanations are also possible, but establishing a correlation is a useful step forward.

Finally, the proportion of female teachers in a school has a negative and significant correlation with math performance, while the correlation with dictation performance is positive but insignificant. A simplistic interpretation of our results would be that females make better students but poorer teachers in math-related subjects, but the story is more complex than that. In Table 5, we segregate male and female students and run math

[12] Others include Das et al. (2005) for Zambia and Kremer et al. (2004) for India.

performance regressions separately for each sub-sample. The results show that the proportion of female teachers is uncorrelated with the performance of female students but correlates negatively and significantly with male students' performance.[13]

[TABLE 5 ABOUT HERE]

We turn now to school conditions and characteristics. First, the language used in the school was correlated with test performance. Students at schools that use Indonesian as their official language of instruction perform significantly better in both tests, even with the various controls that we have included. It is not surprising that these students performed better on the dictation test, given that it was conducted in Indonesian, but they also achieved significantly higher math scores. Along the same lines, students attending schools where instruction is in a different language from their mother tongue received significantly lower scores on the dictation test. Math scores, by contrast, were not influenced by this second language variable.

Another set of school variables relates to class size. One such measure that we included is the average fourth-grade class size. This variable has a negative but insignificant coefficient in both math and dictation regressions. In contrast, the pupil-teacher ratio for the school has a positive correlation with test scores while its square has a negative correlation, although only significant in math score.[14] Simple calculations using the point estimates suggest that the student-teacher ratio that is associated with the highest math performance is 25. At first blush, this result is at odds with the usual assumption that lower pupil-teacher ratios *always* improve learning outcomes, and may also shine some light on the conflicting

[13] This result contrasts with findings from some other Muslim-majority Asian countries: in Pakistan (Kim, Alderman, and Orazem 1998) and Bangladesh (Khandker 1996), the evidence suggest that the presence of female teachers may increase educational achievement for girls, as measured by enrollment (cited in World Bank, 2001).

[14] Note that the pupil-teacher ratio for the school is calculated based on the total number of teaching staff (both permanent and contract teachers) and total enrollment reported by the principal.

results found in other studies mentioned in Section IV. At the same time, endogeneity concerns warn against reading too much into these results.

Thirdly, in terms of school facilities, students at schools with at least one functioning toilet performed better on the math test. Interestingly, Table 5 shows that the effect is significant for girls, but not for boys. This is consistent with evidence from Bangladesh and elsewhere, where it has been argued that availability of toilets is particularly important in increasing the number of girls enrolled and their educational attainment (World Bank, 2001).

Finally, in terms of school management, students at schools that have held recent staff meetings received higher scores on both the math and dictation tests. This result is simply suggestive at this point, but one interpretation might be that schools managed more actively by their principals—or, alternatively, those managed in a more participatory way—tend to perform better.

Interestingly, none of the finance variables (transfers and fees) yielded significant coefficients. This suggests that although money may be important in raising achievement, its effects are already captured in the input variables included in our regressions; in other words, it improves student performance only to the extent that it buys inputs that have significant effects.[15]

VIII. CONCLUSION

This paper estimates empirically the correlates of student performance in public primary schools in Indonesia using a nationally representative sample of fourth graders. We model performance using a common firm production function model, and estimate separate sets of regressions for math and dictation scores.

An interesting finding is that higher teacher absence significantly correlates with lower student scores in the math test. Because prior studies of student achievement in

[15] Toyamah & Usman (2004) showed that 95 percent of the government's education budget is earmarked to pay teachers' salaries, leaving virtually nothing for other expenditures; so it is also possible that the additional non-teacher funds are simply too small to affect performance. A third possibility is that fees are endogenous to performance: if poor performance leads to increased parental contributions to finance supplementary education, then this would bias the coefficient downward.

Indonesia lacked access to data on teacher absence in Indonesia, this correlation has not been observed before. While our data does not allow us to establish causality, this result is consistent with the view that teacher absenteeism is either a cause or a symptom of problems related to service delivery in the education sector. Another paper using this dataset explores in detail the extent and possible causes of teacher absenteeism, with a view to suggesting policies that might reduce the absenteeism rate (Rogers et al., 2004) and increase the quality of schooling.

In general, most of the other teacher and school characteristics variables that correlate with performance yield the expected signs—negative coefficients on the proportion of teachers who have other occupations, class size, and a dummy indicating different languages spoken at school and at the student's home, and a positive coefficient on a measure of school infrastructure (whether the school has functioning toilets). Other results are less standard: first, the negative correlation between math scores and the proportion of permanent teachers and second, the negative coefficients on variables measuring the school's accessibility (like proximity to paved roads) and quality of facilities (such as the existence of playgrounds) in both the math and dictation regressions.

Another result that should be reiterated is the non-monotonicity of the correlation with pupil-teacher ratio. If we could interpret this result causally, it would suggest that too few students in a class might be as detrimental as too many, and that the optimal ratio is in between.

Another interesting result is the relative insignificance of the fees variables. This implies that any effect of financial support in improving student performance is mediated entirely by the school and teacher characteristics variables included in the regression. Of course, it makes sense that money should be important if, and only if, it is used to enhance the quantity and quality of schools and teachers; but what is interesting is the relatively small number of regressors that apparently captured these quantity and quality dimensions effectively.

By contrast, it is quite surprising to see that indicators like the proportion of teachers above SPG is insignificant in all specifications and the proportion of teachers dissatisfied with their salaries is also insignificant. This means that teachers who are dissatisfied with their salaries provide the same level of input to student performance as the satisfied ones. In addition, teachers who have training above the SPG level do not provide any significantly better improvement in student performance than those only of SPG level or below.

Although these cross-sectional results do not establish causality, they do highlight several policy options that could be tested as vehicles for raising student achievement. The first is improving *school facilities*, and not just those directly related to pedagogy. Girls at schools with functioning toilets have significantly higher scores; as noted above, a result that echoes findings in South Asia linking toilet facilities to the number of girls enrolled and their educational attainment.

Second, it is likely that reducing *teacher absence* would raise student performance. We recognize that poor performance and high absenteeism may both stem from the same underlying factors, such as poor school management and unmotivated students, but the effect persists even when we include proxies for those factors. Moreover, a recent experimental intervention by Duflo & Hanna (2005) establishes that providing incentives for attendance can both raise attendance and improve test scores.

Third, measures that succeed in reducing the incidence of teachers' *outside employment* may improve their students' performance. This may require, among others, an improvement in teacher remuneration, accompanied by an improvement in monitoring and discipline (Chaudhury et al., forthcoming).

Fourth, there is no robust evidence—after controlling for absence—that schools with more *permanent teachers* (as opposed to contract teachers) perform better. This finding might encourage experimentation with greater use of contract teachers, conditional on measures that reduce their high absenteeism rate.[16]

[16] Contract teachers' absenteeism rates are higher than that of permanent teachers in Indonesia, 28 percent compared to 18 percent (Rogers et al., 2004).

Finally, the results provide some evidence that pupil-teacher ratios below the current average level are not associated with better performance, *ceteris paribus.* It is worth exploring further the possibility that educational resources might better be spent elsewhere.

This analysis is a first attempt at understanding the degree and sources of variation in primary student performance in Indonesia, and further work is clearly necessary. First, other explanatory variables should be added once the data becomes available--variables such as measures of the student's time allocation (to work and study) outside school (even if this is somewhat endogenous); parental financial or tutoring assistance for students; and the number of siblings and birth order. Second, it would be ideal to be able to retest the same students and generate a panel dataset, so that we could investigate the correlates of educational value-added.

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Table 1. Descriptive Characteristics of Variables Based on Math Scores Quartiles

Variable	Quartiles of Math Scores				Total
	1st	2nd	3rd	4th	
Math score					
Mean	40.70	65.24	80.23	94.05	70.08
Std Dev	13.18	4.53	3.82	4.98	21.21
female	0.45	0.50	0.51	0.57	0.51
teachers have met parents within the past 6 months	0.56	0.63	0.66	0.68	0.63
father education level is unknown	0.15	0.09	0.13	0.08	0.11
father education level is below primary level	0.05	0.03	0.01	0.01	0.02
father finished primary level education	0.36	0.41	0.34	0.27	0.35
father finished junior high level education	0.16	0.15	0.16	0.17	0.16
father finished high school or above	0.17	0.26	0.27	0.40	0.28
mother education level is unknown	0.21	0.08	0.16	0.11	0.14
mother education level is below primary level	0.06	0.04	0.03	0	0.03
mother finished primary level education	0.38	0.44	0.39	0.36	0.39
mother finished junior high level education	0.11	0.16	0.16	0.14	0.14
mother finished high school or above	0.11	0.18	0.18	0.29	0.19
student is taking extracurricular courses	0.11	0.14	0.15	0.21	0.15
absence rates for teachers in school	0.22	0.20	0.18	0.19	0.20
average experience of teachers	17.42	18.13	18.41	18.3	18.07
proportion of permanent teachers	0.93	0.93	0.90	0.90	0.92
proportion of teachers who have other occupations	0.42	0.45	0.45	0.44	0.44
proportion of female teachers	0.58	0.64	0.64	0.65	0.63
proportion of teachers who are dissatisfied with current salary	0.36	0.33	0.30	0.30	0.32
proportion of teachers whose education are above SPG	0.64	0.66	0.69	0.68	0.67
school official language is Indonesian	0.98	0.97	0.96	0.98	0.97
school official language is different from majority of students' mother tongue	0.82	0.79	0.68	0.68	0.74
average size of fourth grade class in school	32.71	31.61	33.13	35.09	33.13
student per teacher ratio in school	23.90	23.28	21.90	22.35	22.86
there is paved road within school complex	0.13	0.19	0.26	0.27	0.21
paved road within one hundred meters from school	0.54	0.56	0.55	0.49	0.54
paved road between one hundred meters and one kilometer	0.24	0.19	0.15	0.19	0.19
a library is available in school	0.61	0.67	0.68	0.77	0.68
school has at least one functioning toilet	0.80	0.89	0.89	0.93	0.88
school has access to electricity	0.81	0.85	0.90	0.87	0.86
school has maps and charts	0.93	0.91	0.92	0.91	0.92
school has playground	0.94	0.93	0.94	0.92	0.93
school has staffroom	0.88	0.88	0.89	0.92	0.89
staff meeting has occurred within the past 6 months	0.96	0.93	0.95	0.95	0.95
government transfer	4.29	3.51	3.88	4.14	3.95
average monthly school fees	12.33	17.50	19.85	20.79	17.62
average monthly school committee fee	2.75	3.50	4.70	5.76	4.18

Pekanbaru	0.04	0.10	0.09	0.10	0.08
Rejang Lebong	0.13	0.14	0.08	0.04	0.10
Bandung	0.06	0.07	0.10	0.10	0.08
Magelang	0.08	0.07	0.08	0.10	0.08
Surakarta	0.01	0.04	0.12	0.16	0.08
Tuban	0.06	0.08	0.12	0.11	0.09
Pasuruan	0.06	0.13	0.17	0.16	0.13
Cilegon	0.25	0.17	0.11	0.10	0.16
Lombok Tengah	0.15	0.08	0.05	0.08	0.09
Gowa	0.15	0.11	0.07	0.05	0.10

Table 2. Descriptive Characteristics of Variables Based on Dictation Scores Quartiles

Variable	Quartiles of Dictation Scores				Total
	1s	2nd	3rd	4th	
dictation score					
Mean	54.83	88.28	95.76	99.33	84.56
Std Dev	25.94	2.97	1.60	1.19	21.94
female	0.43	0.47	0.55	0.58	0.51
teachers have met parents within the past 6 months	0.6	0.63	0.62	0.67	0.63
father education level is unknown	0.10	0.10	0.13	0.11	0.11
father education level is below primary level	0.03	0.03	0.02	0.01	0.02
father finished primary level education	0.35	0.44	0.29	0.30	0.35
father finished junior high level education	0.17	0.16	0.18	0.14	0.16
father finished high school or above	0.19	0.21	0.32	0.37	0.28
mother education level is unknown	0.10	0.13	0.17	0.16	0.14
mother education level is below primary level	0.05	0.04	0.01	0.03	0.03
mother finished primary level education	0.46	0.46	0.35	0.31	0.39
mother finished junior high level education	0.14	0.13	0.14	0.15	0.14
mother finished high school or above	0.12	0.14	0.22	0.27	0.19
student is taking extracurricular courses	0.06	0.14	0.19	0.22	0.15
absence rates for teachers in school	0.20	0.20	0.20	0.19	0.20
average experience of teachers	18.19	18.02	18.1	17.96	18.07
proportion of permanent teachers	0.92	0.93	0.91	0.91	0.92
proportion of teachers who have other occupations	0.47	0.44	0.43	0.42	0.44
proportion of female teachers	0.57	0.62	0.65	0.67	0.63
proportion of teachers who are dissatisfied with current salary	0.37	0.33	0.29	0.30	0.32
proportion of teachers whose education are above SPG	0.60	0.64	0.70	0.72	0.67
school official language is Indonesian	0.97	0.96	0.97	0.99	0.97
school official language is different from majority of students' mother tongue	0.89	0.81	0.64	0.63	0.74
average size of fourth grade class in school	29.95	30.39	35.75	36.44	33.13
student per teacher ratio in school	22.28	22.3	23.27	23.56	22.86
there is paved road within school complex	0.11	0.17	0.29	0.27	0.21
paved road within one hundred meters from school	0.57	0.59	0.46	0.52	0.54
paved road between one hundred meters and one kilometer	0.21	0.17	0.21	0.18	0.19
a library is available in school	0.60	0.67	0.72	0.74	0.68
school has at least one functioning toilet	0.82	0.88	0.90	0.91	0.88
school has access to electricity	0.73	0.84	0.90	0.96	0.86
school has maps and charts	0.91	0.93	0.90	0.92	0.92
school has playground	0.98	0.93	0.90	0.92	0.93
school has staffroom	0.87	0.91	0.89	0.89	0.89
staff meeting has occurred within the past 6 months	0.92	0.97	0.96	0.95	0.95
government transfer	2.78	4	4.39	4.64	3.95
average monthly school fees	13.8	17.46	18.36	20.86	17.62

average monthly school committee fee	2.46	3.41	5.40	5.44	4.18
Pekanbaru	0.05	0.06	0.10	0.13	0.08
Rejang Lebong	0.16	0.12	0.08	0.05	0.10
Bandung	0.02	0.06	0.11	0.15	0.08
Magelang	0.18	0.09	0.05	0.01	0.08
Surakarta	0.01	0.04	0.15	0.12	0.08
Tuban	0.03	0.10	0.10	0.13	0.09
Pasuruan	0.11	0.17	0.14	0.11	0.13
Cilegon	0.14	0.16	0.15	0.17	0.16
Lombok Tengah	0.14	0.11	0.05	0.06	0.09
Gowa	0.16	0.08	0.08	0.06	0.10

Table 3. A Comparison of Performance between Private and Public Primary School Students

	Test	Mean	Std. Dev.	Min	Max
Private School					
	Mathematics	72.53	22.18	7.7	100
	Dictation	86.28	20.87	0	100
Public School					
	Mathematics	70.08	21.21	0	100
	Dictation	84.56	21.93	0	100
Mean Difference	Mathematics	2.45*			
	Dictation	1.72			

note: * significant at 5%

Table 4. Correlates of Student Performance in Indonesia

	Mathematics				Dictation			
	OLS		IV		OLS		IV	
	Coefficient	Std Error	Coefficient	Std Error	Coefficient	Std Error	Coefficient	Std Error
female	0.084 *	0.041	0.084 *	0.041	0.282 **	0.094	0.272 **	0.094
teachers have met parents within the past 6 months	-0.008	0.041	-0.008	0.040	-0.046	0.087	-0.056	0.087
father education level is unknown	0.059	0.116	0.059	0.115	0.284	0.231	0.274	0.230
father education level is below primary level	0.092	0.123	0.093	0.123	0.414	0.359	0.419	0.359
father finished primary level education	0.084	0.119	0.084	0.119	0.346	0.243	0.353	0.241
father finished junior high level education	0.006	0.148	0.006	0.148	0.297	0.256	0.303	0.255
father finished high school or above	0.095	0.131	0.094	0.131	0.316	0.266	0.290	0.265
mother education level is unknown	0.168	0.119	0.168	0.119	0.048	0.168	0.050	0.168
mother education level is below primary level	0.131	0.150	0.131	0.150	0.355	0.196	0.355	0.196
mother finished primary level education	0.269 *	0.132	0.269 *	0.132	0.098	0.167	0.098	0.166
mother finished junior high level education	0.277 *	0.134	0.277 *	0.134	0.274	0.187	0.272	0.187
mother finished high school or above	0.332 **	0.124	0.330 **	0.124	0.350 *	0.164	0.317	0.167
student is taking extracurricular courses	-0.007	0.042	0.007	0.070	0.050	0.077	0.275	0.180
absence rates for teachers in school	-0.071 *	0.032	-0.071 *	0.033	-0.053	0.079	-0.063	0.081
average experience of teachers	-0.906	0.549	-0.905	0.552	-1.485	1.888	-1.467	1.947
average experience of teachers squared	0.212	0.115	0.212	0.115	0.265	0.376	0.261	0.385
proportion of permanent teachers	-0.575 **	0.199	-0.579 **	0.200	1.155	0.752	1.104	0.762
proportion of teachers who have other occupations	-0.059 *	0.030	-0.059	0.030	-0.052	0.060	-0.048	0.060
proportion of female teachers	-0.156 **	0.061	-0.156 *	0.060	0.021	0.127	0.027	0.127
proportion of teachers who are dissatisfied with current salary	-0.001	0.014	-0.001	0.014	-0.032	0.036	-0.032	0.036
proportion of teachers whose education are above SPG	-0.026	0.052	-0.025	0.053	-0.015	0.107	0.007	0.107
school official language is Indonesian	0.149 *	0.073	0.145	0.076	0.641 **	0.201	0.578 **	0.198
school official language is different from majority of students' mother tongue	-0.040	0.052	-0.040	0.052	-0.305 **	0.111	-0.316 **	0.116
average size of fourth grade class in school	-0.157	0.099	-0.158	0.100	-0.241	0.197	-0.265	0.196
student per teacher ratio in school	1.962 **	0.674	1.963 **	0.677	0.977	1.751	0.982	1.735
student per teacher ratio in school squared	-0.305 **	0.108	-0.306 **	0.108	-0.159	0.282	-0.162	0.279
there is paved road within school complex	0.091	0.142	0.092	0.142	-0.532	0.338	-0.513	0.334

paved road within one hundred meters from school	0.144	0.128	0.143	0.128	-0.576	0.339	-0.593	0.338
paved road between one hundred meters and one kilometer	0.130	0.134	0.131	0.134	-0.675 *	0.328	-0.656 *	0.322
a library is available in school	0.006	0.057	0.007	0.057	-0.172	0.168	-0.161	0.166
school has at least one functioning toilet	0.177 *	0.077	0.177 *	0.078	0.265	0.192	0.258	0.191
school has access to electricity	0.097	0.086	0.096	0.087	0.055	0.194	0.031	0.194
school has maps and charts	-0.117	0.145	-0.118	0.144	-0.825	0.518	-0.834	0.516
school has playground	-0.161 *	0.062	-0.158 *	0.064	-0.442 **	0.174	-0.382 *	0.174
school has staffroom	0.007	0.081	0.007	0.081	0.254	0.196	0.247	0.191
staff meeting has occurred within the past 6 months	0.245 *	0.124	0.244	0.125	0.704 *	0.341	0.680 *	0.341
government transfer	-0.003	0.006	-0.003	0.006	0.006	0.014	0.002	0.015
average monthly school fees	0.000	0.008	0.000	0.008	-0.022	0.016	-0.018	0.017
average monthly school committee fee	0.016	0.014	0.017	0.014	-0.013	0.018	-0.011	0.019
Pekanbaru	0.476 **	0.153	0.475 **	0.153	1.531 **	0.521	1.518 **	0.513
Rejang Lebong	0.313 *	0.150	0.312 *	0.150	1.251 *	0.514	1.244 *	0.505
Bandung	0.231	0.144	0.226	0.145	1.408 **	0.516	1.334 **	0.500
Magelang	0.169	0.179	0.166	0.180	0.500	0.568	0.464	0.561
Surakarta	0.511 **	0.167	0.506 **	0.171	1.540 **	0.551	1.463 **	0.539
Tuban	0.376 **	0.143	0.375 **	0.143	1.702 **	0.529	1.682 **	0.521
Pasuruan	0.417 **	0.155	0.412 **	0.156	1.597 **	0.554	1.520 **	0.537
Cilegon	0.172	0.144	0.172	0.144	1.246 *	0.567	1.248 *	0.560
Lombok Tengah	0.013	0.193	0.014	0.192	0.921	0.537	0.948	0.532
Constant	0.962	1.142	0.972	1.153	4.283	2.959	4.435	3.037
Observation	1089		1089		1089		1089	
R-squared	0.153		0.153		0.167		0.164	

Notes:

** = 1% significance; * = 5% significance

All non-dummy variables are in logs

The omitted variables are: other education level; paved road more than one km from school; and Gowa

Standard errors are robust to heteroskedasticity with clustering at school level

In the IV model, the instrumented is extra_course, with instrument proportion of classmates taking extra courses

Table 5. OLS Results of the Correlates of Student Performance by Gender

	Mathematics				Dictation			
	Girls		Boys		Girls		Boys	
	Coefficient	Std Error	Coefficient	Std Error	Coefficient	Std Error	Coefficient	Std Error
absence rates for teachers in school	-0.034	0.039	-0.100 *	0.041	-0.054	0.057	-0.095	0.120
average experience of teachers	-0.005	0.620	-2.106 *	0.835	-1.186	1.150	-1.922	2.972
average experience of teachers squared	0.042	0.132	0.444 *	0.180	0.258	0.248	0.313	0.595
proportion of permanent teachers	-0.072	0.216	-0.989 **	0.342	0.007	0.359	1.987	1.177
proportion of teachers who have other occupations	-0.026	0.031	-0.100 *	0.050	-0.046	0.037	-0.057	0.103
proportion of female teachers	-0.152	0.087	-0.169 *	0.077	0.001	0.113	0.010	0.182
proportion of teachers who are dissatisfied with current salary	-0.012	0.017	0.009	0.023	0.018	0.030	-0.098	0.060
proportion of teachers whose education are above SPG	-0.067	0.050	0.043	0.085	-0.098	0.087	0.067	0.165
school official language is Indonesian	0.091	0.085	0.078	0.144	0.053	0.152	1.079 **	0.374
school official language is different from majority of students' mother tongue	-0.019	0.059	-0.030	0.072	-0.062	0.078	-0.389 *	0.175
average size of fourth grade class in school	0.102	0.149	-0.366 *	0.141	0.033	0.148	-0.441	0.297
student per teacher ratio in school	1.774 *	0.897	3.137 **	0.912	0.491	1.663	1.789	2.485
student per teacher ratio in school squared	-0.287 *	0.140	-0.490 **	0.145	-0.059	0.272	-0.324	0.400
there is paved road within school complex	-0.044	0.140	0.141	0.208	-0.579 **	0.216	-0.579	0.564
paved road within one hundred meters from school	0.052	0.130	0.144	0.189	-0.692 **	0.216	-0.613	0.586
paved road between one hundred meters and one kilometer	0.006	0.138	0.179	0.201	-0.847 **	0.239	-0.666	0.552
a library is available in school	-0.059	0.057	0.064	0.082	-0.237 *	0.105	-0.120	0.280
school has at least one functioning toilet	0.324 **	0.101	0.052	0.107	0.310	0.164	0.202	0.310
school has access to electricity	0.139	0.141	0.100	0.120	0.106	0.147	-0.070	0.298
school has maps and charts	-0.064	0.135	-0.229	0.212	-0.646 **	0.229	-1.010	0.847
school has playground	-0.033	0.068	-0.173	0.129	-0.417 **	0.159	-0.624	0.351
school has staffroom	-0.080	0.092	0.070	0.114	0.070	0.145	0.549	0.331
staff meeting has occurred within the past 6 months	0.069	0.088	0.424	0.233	0.030	0.141	1.192	0.577
government transfer	-0.001	0.007	-0.011	0.008	0.005	0.010	-0.009	0.024
average monthly school fees	0.009	0.016	-0.012	0.010	-0.028 *	0.012	-0.010	0.025
average monthly school committee fee	-0.018	0.018	0.041 *	0.020	-0.014	0.018	-0.018	0.024

Constant	-0.203	1.250	1.147	1.474	4.525 *	2.181	4.104	4.416
District dummies	Yes		Yes		Yes		Yes	
Observation	552		537		552		537	
R-squared	0.190		0.204		0.168		0.230	

Notes:

** = 1% significance; * = 5% significance

All non-dummy variables are in logs

The omitted variables are: paved road more than one km from school; and Gowa

Standard errors are robust to heteroskedasticity with clustering at school level

Parent characteristics and district fixed effects variables are included in the regression but the coefficients are not shown

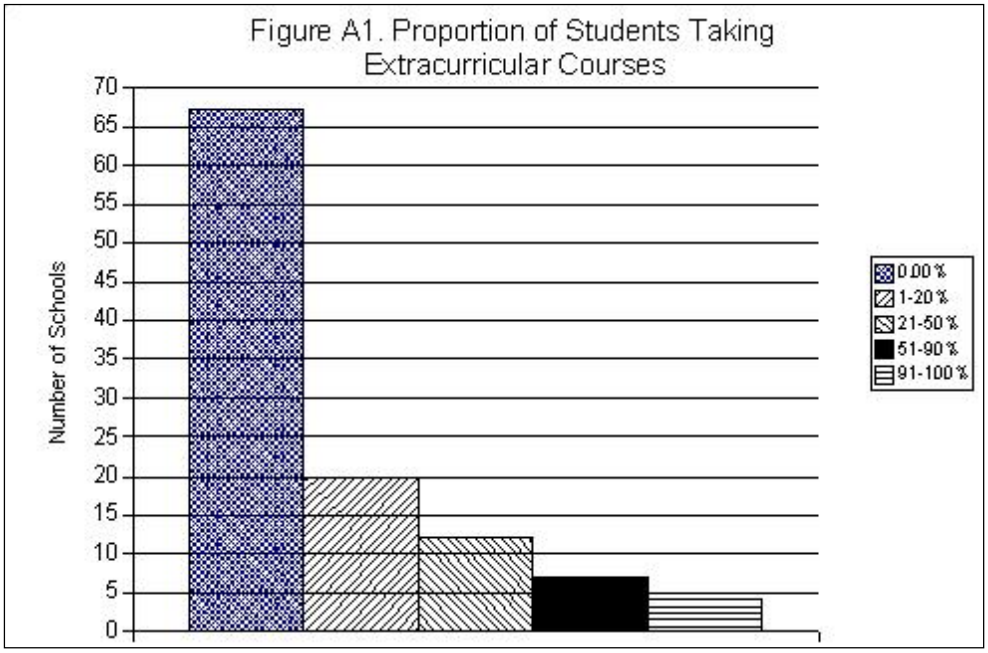
Figure A1. Proportion of Students Taking Extracurricular Courses
Number of Schools
70
65
60
55
50
45
40
35
30
25
20
15
10
5
0
0.00%
1-20%
21-50%
51-90%
91-100%

Appendix 1
Variables Description

Dependent Variables	
scoremath	score in mathematics test
scoreword	score in words test
Gender	
female	dummy of gender. 0 = male, 1 = female
Parents Quality and Attention	
meet parents	dummy of whether teachers have met parents within the past 6 months
fe_unspecified_edu_level	dummy that has the value of 1 if the father education level is unknown
fe_not_comp_sixgr	dummy that has the value of 1 if the father education level is below primary level
fe_comp_sixgr	dummy that has the value of 1 if the father finished primary level education
fe_comp_jun_school	dummy that has the value of 1 if the father finished junior high level education
fe_hs_above	dummy that has the value of 1 if the father finished high school or above
fe_unspecified_edu_level	dummy that has the value of 1 if the mother education level is unknown
fe_not_comp_sixgr	dummy that has the value of 1 if the mother education level is below primary level
fe_comp_sixgr	dummy that has the value of 1 if the mother finished primary level education
fe_comp_jun_school	dummy that has the value of 1 if the mother finished junior high level education
fe_hs_above	dummy that has the value of 1 if the mother finished high school or above
extra_courses	dummy of whether the student is taking extracurricular courses
Teacher Quality and Condition	
abs_rate_total	total absence rates for teachers in a school
avg_experience	average experience of teachers in a school in years
prop_perm_teacher	proportion of permanent teachers in a school
prop_teacher_othjobs	proportion of teachers who have other occupations
prop_female_teacher	proportion of female teachers
prop_teacher_diss	proportion of teachers who are dissatisfied with current salary
prop_teacher_above_SPG	proportion of teachers who are above SPG
School Condition and Characteristics	
main_lang_indo	dummy of whether school official language is Indonesian
main_lang_diff	dummy of whether school official language is different from majority of students' mother tongue
avg_class_size	average size of fourth grade class in a school

student_per_teacher	student per teacher ratio in a school (not only the fourth grade)
paved_road_within	dummy of whether there is paved road within school complex
paved_road_one_hun_met	dummy of whether there is paved road within one hundred meters from school
paved_road_one_km	dummy of whether there is paved road between one hundred meters and one kilometer
library_avail	dummy of whether a library is available in school
has_toilet	dummy of whether school has at least one functioning toilet
has_electric	dummy of whether school has access to electricity
has_maps	dummy of whether school has maps and charts
has_playground	dummy of whether school has playground
has_staffroom	dummy of whether school has staffroom
teacher_meet	dummy of whether staff meeting has occurred within the past 6 months
Fees	
amount_received	government transfer per student in 2001/2002 in millions of rupiah
total_fees	average monthly exam fees and other fees per student in thousands of rupiah
monthly_SC_fee	average monthly school committee fee per student in thousands of rupiah

Appendix 2. Descriptive Statistics of Variables		
	Mean	Standard Deviation
math score	70.078	21.211
dictation score	84.563	21.940
female	0.507	0.500
teachers have met parents within the past 6 months	0.629	0.483
father education level is unknown	0.111	0.314
father education level is below primary level	0.025	0.156
father finished primary level education	0.345	0.476
father finished junior high level education	0.161	0.367
father finished high school or above	0.275	0.447
mother education level is unknown	0.141	0.349
mother education level is below primary level	0.031	0.174
mother finished primary level education	0.392	0.488
mother finished junior high level education	0.141	0.349
mother finished high school or above	0.189	0.392
student is taking extracurricular courses	0.153	0.360
absence rates for teachers in school	0.197	0.138
average experience of teachers	18.067	3.929
proportion of permanent teachers	0.918	0.110
proportion of teachers who have other occupations	0.439	0.208
proportion of female teachers	0.628	0.205
proportion of teachers who are dissatisfied with current salary	0.321	0.229
proportion of teachers whose education are above SPG	0.667	0.247
school official language is Indonesian	0.972	0.164
school official language is different from majority of students' mother tongue	0.743	0.437
average size of fourth grade class in school	33.134	11.984
student per teacher ratio in school	22.856	8.134
there is paved road within school complex	0.211	0.408
paved road within one hundred meters from school	0.535	0.499
paved road between one hundred meters and one kilometer	0.193	0.395
a library is available in school	0.682	0.466
school has at least one functioning toilet	0.875	0.331
school has access to electricity	0.857	0.350
school has maps and charts	0.917	0.275
school has playground	0.933	0.250
school has staffroom	0.891	0.312
staff meeting has occurred within the past 6 months	0.949	0.221
government transfer	3.953	4.713
average monthly school fees	17.622	20.313
average monthly school committee fee	4.180	3.848
Pekanbaru	0.083	0.275
Rejang_Lebong	0.101	0.301
Bandung	0.083	0.275
Magelang	0.083	0.275
Surakarta	0.083	0.275
Tuban	0.092	0.289
Pasuruan	0.131	0.338
Cilegon	0.156	0.363
Lombok_Tengah	0.092	0.289
Gowa	0.097	0.297