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## Determinants of School Educational Outcomes: School Resources and Incentives

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(Draft - Do Not Quote Without Permission)

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# Determinants of School Educational Outcomes: School Resources and Incentives

## 1 Introduction

The key objective of this paper is to examine the effect of governance on educational outcomes. Governance will be assessed by the use of incentives embodied in the type of contract used for employing teachers. The indicator for educational outcome is the proportion of students passing the examination at the upper primary level, that is, attaining elementary education. In the Indian context, with the current (unfinished) goal of universal elementary education and a renewed emphasis on achieving this goal since 2001, are more children completing the elementary education cycle, that is, attaining the upper primary level of schooling? What factors facilitate or hamper this attainment? What mechanisms can be developed to overcome binding constraints such as budgetary limits and teacher shortage? Our conjecture is that good governance leads to better educational attainment. First, enhancing school resources leads to better school performance in terms of the proportion of students attaining elementary education or the upper-primary level of schooling. In particular, the availability of an adequate number of teachers is a must. Shortage of teachers would adversely affect attainment or the proportion of students passing the upper primary examination. Given this shortage, enhancing teaching time by the use of contract or para teachers (fixed-term, e.g., annual) is one solution and this is examined here.

To improve achievement, regular or permanent teachers may be better. At one level, with risk mitigated by permanent contracts, permanent/regular teachers would supply optimal input. So, regular or permanent teachers are to be

preferred. However, complete job security with no loss from shirking would reduce teaching input. Then, some form of incentives are required to elicit optimal input and prevent shirking. In this context, the use of fixed-term renewable contracts with the threat of non-renewal can provide the required incentive to discourage shirking. However, if the appointment of contract teachers leads to higher teacher turnover, mean teacher experience will be lower which may imply lower levels of on-the-job teaching skills accumulation, implying a less optimal supply of teaching input over the longer term. The second part of our conjecture is to do with incentives and teacher contracts - that enhancing teaching time through a new type of teachers through the use of a different contract may not be sufficient; incentives may have to extend beyond type of contracts.

## **2 The Issues**

The focus on expanding access to education by all has led to an emphasis on expanding enrollments especially for elementary education. According to the “Annual Status of Education Report (ASER) 2006” household data, enrollment is 93.2 percent for the 6-14 years’ age group. However, 25 percent of 14-year old children will not have completed 8 years or elementary level of schooling - 13.5 percent are out of school and the rest are enrolled in grade/class 6 or lower. From the NSS report number 517 entitled “Status of Education and Vocational Training in India, 2004-05” based on the 61st round employment survey of households, for 2004-05, the current attendance rate for the age group 5-14 years of age is 82.1 percent. Again, while students are enrolled, attendance is less. According to the “Selected Education Statistics 2003-04,” the drop-out rate at the elementary stage of education is 52 percent. So, while enrollment is expanding, attendance is lower, the drop-out rate is very high and students are not retained in the school system.

In looking at enrollment, attendance, drop-out rates, there is little evidence of actual learning outcomes. ASER conducts learning tests from its households' sample survey but this is not linked to schools. So, while universal access and hence 100 percent enrollment is a clear policy target, it is also not sufficient; examining the schooling and student performance is also necessary. The information on and analysis of school performance in terms of student educational attainment (and achievement) is little.

In examining school performance, the adequacy of school resources and hence the need for enhancing resources is clearly important. However, it is also pertinent to examine the use of these resources and the role incentives can play in optimizing the use. Hanushek (2003) provides a review of the US and international evidence on the effectiveness of enhancing resources and contrasts the impact with that of differences in teacher quality (not systematically related to school resources) and describes alternative performance incentive policies. This paper uses recently available schools data that provide the opportunity to test more directly whether school resources matter to student performance. The analysis here is relevant for developing countries who are dealing with the problems of finding more resources, both funds and teachers, for education. It is also relevant for developed countries that are searching for and experimenting with education innovations to address shortage of teachers.

### **3 The Methodology and Regression Equations**

The methodology is to specify linear regression equations based on an education production function that can be estimated using data at the micro/unit

or school level. Assuming a representative school at an aggregated level such as a village/town or higher (block or district/county or state/province) level, this function can also be estimated at that level of aggregation. However, it is instructive to consider the education process in more detail.

### 3.1 Education production function

The education production function detailed below explains the interaction between students, teachers, and the school. Then, we have

$$E_{ijk} = f(P_i, T_j, S_k; \cdot)$$

$P_i$  = pupil attributes of student  $i$

$T_j$  = teacher attributes of teacher  $j$

$S_k$  = school characteristics of school  $k$

$\cdot$  = other variables, e.g., location, student peer effects

$E_{ijk}$  = education/learning indicator for student  $i$  taught by teacher  $j$  in school  $k$

The empirical form of the above education production function can be written as below.

$$E_{ijk} = f(P_i, T_j, S_k; \varepsilon)$$

$\varepsilon$  = error term

We can now describe specific student, teacher and school attributes; and student peer effects that capture learning synergies from peers. First, the DISE dataset that is used here provides an examination result, one result for the upper primary class. Thus,  $E_{ijk}$  is actually  $E_k$ . Below we explain how the empirical equation is amended and the implications of doing so. There are no data on individual students - examination result or student characteristics. As we do not have matched student-teacher data within the school, we are obliged to use

school level aggregated data. Thus, for example, instead of having information about the performance of the individual child, we have data on the average performance (number of students passing) of all students of grade 7 in a school. Similarly, for teachers, even though we know individual teachers' contract type, the grades they teach, and the broad category of subjects they teach (for example, languages), we do not have information about the performance of the students each type of teacher teaches (for example, by subject taught by the individual teacher). For grade 7, we can calculate the percentage of teachers in the school with particular contract types. However, even these data were not available until recently and ours is the first paper, to our knowledge, to make use of the DISE data to fit an attainment production function.

Detailed teacher variables are used. Teacher qualifications include education levels below secondary, secondary, senior secondary, graduate (Bachelor's degree), post-graduate (Master's degree) and research degrees (Master of Philosophy or M.Phil. and Doctor of Philosophy or Ph.D.). Teacher training includes junior and senior basic training (J.B.T. and S.B.T.), bachelor of education (B.Ed.) and master of education (M.Ed.) levels. Teacher demographics include age, gender and caste. Also available are the year of joining the service and the year of starting in the present school allowing calculations of experience and tenure. In-service training to teachers refers to training in teaching aids etcetera at three levels - the block resource centre (BRC), the cluster (of blocks) resource centre (CRC), and the District Institute of Education and Training (DIET). Training offered to teachers is a school-choice variable.

Student demographics variables include ratio of specific social groups' students to total students. Social groups are scheduled castes, scheduled tribes, and other backward castes. These are available for the student body in the school as a whole as also for grade 7 (the last year of elementary school, whose attainment

level is our dependent variable) but not for individual students. Scholarships to students are called student incentives and are scholarships for textbooks, uniforms, stationery and attendance. School variables include characteristics of teaching - student strength of the upper primary class, classrooms (number of sections) for the upper primary class, classrooms for the school and pupil-teacher ratio (PTR) of the school. Also included are school infrastructure and facilities - playground, electricity, and so on. Distance proxy is the distance of the school from the block headquarters.

The key variable under scrutiny is teacher incentives and specifically refers to the use of fixed-term contract or para teachers. Para-teachers policy was a part of the large multi-state programme for Education for all (EFA) called District Primary Education Programme (DPEP) in the late 1990s and is now a part of the national programme for EFA called Sarva Shiksha Abhiyan (SSA) since 2001. The para teacher is hired on an annual basis for a salary lower than that of the regular teachers. In most states, the contract is annually renewed at the recommendation of the village education committee by the district education officials. 95 percent of para teacher contracts are reportedly renewed (Govinda and Josephine, 2004). The threat of non-renewal exists. The incentive is the prospect of a paid job and of possible future regularization as a permanent teacher. The policy and government officials don't indicate the incentive explicitly, except in some states, such as Gujarat and Bihar. Nonetheless, the incentive has attracted local youth to this job.

Also included should be the effects of sorting by students and teachers - sorting by students to schools with other (good) students and (better) teachers and sorting by teachers to (better) schools. So, students would choose schools where other students have superior performance and where teachers are known to be better. Similarly, teachers would choose schools with better governance. How-

ever, since the DISE dataset provides one examination result per upper primary class-school, that precludes controlling effects of individual student characteristics, teacher-student matches as well as student-student matches within the class/grade. In the rural areas there is usually only one school in the village, sorting by students is likely to be lower compared to urban areas. However, if more ambitious students are prepared to travel to nearby villages for schooling then there could still be sorting of students into particular schools on the basis of their (unobserved) traits such as ambition or ability. Government/public school teachers are assigned to schools and sorting is again likely to be low (though anecdotal evidence about influencing transfers across schools can be found). We assume that the effects of sorting are low but cannot rule them out.

Education is a cumulative process. Past inputs in schooling and past performance have a bearing on current results also. Without panel data on individual students, these human capital investments cannot be completely accounted for. For the upper primary class as a whole, students' human capital is controlled, at least to some extent, since only the relatively well-achieving children are likely to have continued on (or survived) to grade 7. Past accumulations to human capital for both students and teachers are embodied in respective observed variables. Moreover, since neither the attributes of individual students nor their individual examination results are available, it is not possible to disentangle the effects of own background from the background of other students. Hence, we use the class-wise examination/test result with class-wise student attributes. Student peer effects are captured through characteristics of either the grade 7 student population or the school-student population. So, the student-teacher-school interaction exists at the class/grade-school level.

### 3.2 The Regression Equation

The education production function may be re-written as below.

$$\begin{aligned}
 E_{ijk} &= f(T_j, P_i, S_k; \varepsilon) \\
 &= f(T_{qjk}, T_{trjk}, T_{dmgjk}; T_{itrjk}, T_{incntjk}; \\
 &\quad P_{incntik}; P_{dmgik}; P_{dmg-ik}; \\
 &\quad S_{tchgk}, S_{Ik}, S_{distk}; \mathbf{O}; \varepsilon_{sk})
 \end{aligned}$$

becomes

$$\begin{aligned}
 E_k &= f(T_{qk}, T_{trk}, T_{dmgk}; T_{itrk}, T_{incntk}; P_{incntk}; P_{dmgk}; \\
 &\quad S_{tchgk}, S_{Ik}, S_{distk}; \mathbf{O}, \varepsilon_{sk} ) \\
 \mathbf{O} &= \left( \sum_j O_{tj}, \sum_i O_{pi} \right) \\
 k &= \text{school}; j = \text{teacher}; i = \text{pupil}
 \end{aligned}$$

and,

- $q$  = qualifications (teacher)
- $tr$  = professional training (teacher)
- $dmg$  = demographics (age, gender, caste)
- $itr$  = in-service training
- $incnt$  = school incentives (contracts for teachers, scholarships for students)
- $tchg$  = teaching variables (class size, PTR, no. of instructional days)
- $I$  = infrastructure, school
- $dist$  = distance of school (for students from their habitation)
- $O_{tj}$  = teacher motivation, unobserved, omitted variable
- $O_{pi}$  = student ability, unobserved, omitted variable
- $\varepsilon_{sk}$  = random error, innovations to school governance

The remaining omitted variables are the unobserved individual student ability and teacher motivation. So, the composite error term comprises unobserved

student ability and teacher motivation, and random schooling shocks.

A linear regression equation to be estimated using ordinary least squares (OLS) can thus be specified as below. For some terms (such as average teacher age and experience) quadratic terms are used also.

$$E_k = \alpha + \beta_1 T\_q_k + \beta_2 T\_tr_k + \beta_3 T\_dmg_k + \beta_4 T\_itr_k + \beta_5 T\_incnt_k \\ + \beta_6 P\_incnt_k + \beta_7 P\_dmg + \beta_9 S\_tchg_k + \beta_{10} S\_I_k + \beta_{11} S\_dist_k + u_k$$

As explained above, the composite error term includes unobserved student ability and teacher motivation, and schooling random shocks. The unobserved variables are in the nature of fixed endowments and hence un-correlated with the random shock. Hence, the random error is assumed to follow a mean-zero normal distribution. However, it would be prudent to investigate whether and to what extent the unobserved variables can cause bias.

Student ability would clearly lead to differences in examination performance. Its omission would therefore be cause for potential bias in coefficients of included regressors. Hence, to the extent that student ability co-varies positively with any included regressor, for example, with family background such as caste (if the student's parents are upper caste and have better access to nutrition, health-care, and early education then all of these will improve pupil ability, enabling better examination performance), the coefficient associated with that (observed) regressor will be biased. However, if we assume the absence of sorting by students (in the rural areas) which is not totally implausible, each upper primary class will have a random mix of student-abilities and the collective result - the number of students that pass the upper primary examination - is unlikely to be systematically related to individual student ability.

Teacher motivation might be correlated with individual teacher attributes. Teachers from weaker social groups such as scheduled castes (SC), scheduled

tribes (ST) and other backward (OB) castes may have achieved becoming teachers/professionals because they are motivated individuals who overcame obstacles (specific to their communities) to become teachers. So, if teacher-SC has an estimated coefficient that is positive, there might be an upward bias; the positive effect may be due to the underlying unobserved motivation rather than due to caste. Similarly, acquisition of academic qualifications such as M.Phil. or Ph.D. by school-teachers may be indicative of more motivated teachers and their positive coefficient, if any, may be partially due to the higher motivation level rather than due to their high educational qualification.

While school governance in government/public schools is driven by the relevant authority, there is a possibility of a school-specific fixed governance effect. It could be the school administrator (school principal or head master) or the village education committee. If the village education committee members are forward looking, then this may drive them to opt for newer solutions (to the problem of teacher shortage) such as hiring para teachers. So, a part of the effect of the para teachers might be due to the underlying unobserved school committee motivation. Similarly, given school resources, superior management of all school resources may cause an upward bias in a positive coefficient on school resources. In these cases, the relevant coefficients would be upper bounds of their effect on attainment.

Also, there exists possibility of reverse causality. Examination results and the regressors are simultaneously determined and it is not immediately obvious whether a particular regressor leads to the examination outcome or is actually itself caused by it. More able students would lead to better results. However, a school with better results may attract high-ability students. So, a positive coefficient on relevant variables (proxies for student ability) may reflect either effect. In rural areas, such sorting by students (or teachers) is likely to be less

due to less school choice but in urban areas the scope for such activity may be greater. Does good school governance lead to better examination performance or does better examination performance engender superior school governance, and then, does the induced superior school governance lead to even better results? This positive spiral can potentially exist. So long as school governance leads to higher educational attainment, it doesn't matter where the process might have begun in any school. A school specific fixed effect (as described earlier) can be accounted for using panel data as also partially the effects of reverse causation and endogeneity. An appropriate instrument for school governance would also be adequate. Therefore, while the regression coefficients are partial correlations, the causality attributed to results obtained with the cross-sectional data here has to be more carefully assessed. Nevertheless, we would argue that even understanding conditional correlations is illuminating.

## 4 Data

Education data in India are collected by three government agencies: (a) The annual school census by the Ministry of Human Resource Development which collects basic data (e.g., enrollment) on schools; (b) The census of schools every 7-8 years by the National Council of Educational Research and Training (NCERT) and (c) the annual District Information System for Education (DISE) by the National University of Educational Planning and Administration (NUEPA, erstwhile NIEPA). Most of these data capture only recognized schools and are available at some aggregated level such as the state or the district and not at the school level. Educational attainment indicators (number of students passing in grade examination) are few. Lack of disaggregated data and performance data has hampered broad-based analysis of education in India.

Education data from households are available from the National Sample Surveys (NSS) on employment and education. The NSS data provide location – state, district; household demographics, age, gender; parental education, employment; children – type of educational institution, among other variables. Also, a non-governmental (civil society) organization, PRATHAM, has conducted three annual surveys called the Annual Status of Education (ASER - reports available for 2005 and 2006) with data on enrollment; indicators for learning levels – reading, arithmetic, comprehension, writing (science missing); mother’s educational level, and school type. However, both these datasets are stand-alone and cannot be combined with schools’ data except at an aggregated (state or district) level.

Schools are affiliated to different examination boards where curricula, examinations and therefore achievement indicators differ by examination board. There are few comparable measures of learning achievement across schools based on common exams such as at the grade X (secondary) and grade XII (senior secondary) level board examinations. At the upper primary level, in some states, a common examination is conducted.

There has been some improvement in the educational database in India, thanks to the recent DISE data that is available at the state and the district level aggregates as well as the school level.

#### **4.1 DISE Dataset**

The dataset for this study comes from the DISE or the annual District Information System for Education developed as an management information system (MIS) tool for the Sarva Shiksha Abhiyan (SSA). The DISE data is a near-census of recognized schools in India. Nation-wide, it covers a million schools. It also attempts to capture data from unrecognized schools. The DISE data

covers teacher characteristics - education, training, age, gender and caste; student characteristics - age, gender and caste; and school characteristics - type of school, level of schooling, school infrastructure, enrollment by grade up to the upper primary level (grade VII or VIII depending upon the states of India), in-service training to teachers (at the block resource center (BRC), at the cluster resource center (CRC) or by the District Institute of Education and Training (DIET)), incentives or scholarships (textbooks, uniforms, attendance, stationery) to students, grants received by schools. Unlike other school-based datasets that provide data on schooling inputs, DISE also provides examination results - number of students passing at the primary level (grade IV or V) and at the upper primary (grade VII or VIII) as well as the number of students securing marks above 60 percent (or "first class"). Thus, analyses beyond evaluating sufficiency of school inputs can be conducted; the two indicators of examination results can be used to evaluate schooling performance.

## 4.2 Data Limitations

The DISE dataset is rich in that it includes a host of teacher and school variables. However, unobservables such as teacher motivation and school governance are difficult to capture. Variables regarding students are age, gender, and social group. Family background, especially parental education and income/consumption are not available. Hence, proxy variables for unobserved student ability are few. These omitted variables are also related to issues of endogeneity and reverse causality that were discussed in the methodology section.

Measurement issues arise, in particular, for enrollments. Since the number of and budget allocations for teaching positions sanctioned are pegged to student enrollments, there is a tendency by government/public schools to over-report enrollments. Hence, using enrollments data would lead to measurement bias or

attenuation bias. There are no data on student attendance that could be used instead.

Data on school performance in terms of examination result are available only for primary (grade IV or V) and upper primary (grade VII or VIII) levels depending upon the prescribed grade as the terminal grade for the primary and upper primary levels in the states of India. A problem arises in that the examination at these levels is not uniform. Hence, the examination outcomes across schools are not for the same test and thus not comparable. However, in some states of India, there is a common examination/test at the upper primary level across school boards. Andhra Pradesh is one of these states and its data are used here.

This study uses the DISE data for the year 2005-06 (data as of September 1, 2006 for the previous academic year) in the state of Andhra Pradesh. The study dataset excludes schools with no students or those with no teachers or observations that have data errors. This leads to dropping of about 4000 school-observations of a total of 15102 schools classified as rural government schools. Summary statistics of key variables across schools under study for the state of Andhra Pradesh are provided in table I. The number of schools is 10809.

## 5 Results

We begin by estimating a detailed specification with variables for regular teachers - academic qualification; professional training; age, experience, and tenure; demographics - scheduled castes (SC), scheduled tribes (ST), other backward castes (OB); and in-service training; total student strength in grade 7, classrooms for the entire school, school infrastructure and facilities; students'

incentives or scholarships; and, student demographics - ratio of enrollments of specific social groups (female, scheduled castes, scheduled tribes, other backward castes) to total student enrollments in the upper primary class. This specification is presented in table 7.

A parsimonious specification based on variables found significant for Andhra Pradesh data for the year 2005-06 forms the basic model and is presented in Table 3. The dependent variable is boys who passed grade 7 examination as percentage of the total number of students in grade 7. The null hypothesis is that para teachers do not have any positive impact on educational attainment and are not effective. Before we investigate the issue of para teachers, let us discuss the correlation of other variables with pupil achievement first. To begin with, table 3 has regressors (except dummy variables) in terms of percentages. Also included is the student strength of grade VII to capture scale effects, if any. The coefficient for this regressor is significant. Thus, scale does appear to matter.

Indicative findings from the basic model of control variables for boys (table 3) suggest several positive indicators for the number of students passing the upper primary level: teacher experience at the current school is positively associated with educational attainment. Basic school infrastructure - availability of power - also has a positive association. Student incentives or scholarships - for textbooks - are also positively related to educational attainment. So, clearly, experienced teachers, better school infrastructure supported by incentives-based policies (for students) are associated with better educational outcomes.

There are important “insignificant” and some negative indications: neither teacher academic qualifications nor professional training coefficients -for Senior Basic Training (S.B.T.), Bachelor of Education (B.Ed.) and Master of Educa-

tion (M.Ed.) - have any associated impact on educational attainment, coefficients are insignificant. However, age has a negative association. Further, of the three in-service teacher training types (by policy) - block resource centre (BRC), cluster resource centre (CRC), and District Institute of Education and Training (DIET) - training at the level of BRC is negative (table 3). It may be the case that training of teachers results in improved teaching with some lag and that the contemporaneous effect is negative - this association must be investigated appropriately (e.g., using multiple observations per school or panel data) and the in-service training policy be rigorously evaluated. Third, peer effects from having weaker sections' students (SC, ST, OB) are negative. Fourth, the variable in the DISE data is the distance of the school from block headquarters and it is difficult to relate this to distance of the school from the student's home/habitation. The "distance" variable is insignificant.

## 5.1 Use of Contract or Para Teachers

The effects of para teachers are presented in table 4. The para-teacher variables are added in column (1) - "Para teachers, if any," in column (2) - "Para teachers' number" and in column (3) - para teacher attributes. The first is a dummy variable that takes a value equal to one if there are any para teachers. The dummy variable for the presence of para teachers is negative. So, if there are any para teachers, then the effect on educational attainment is negative. Recall that para teachers are to be appointed in schools where regular or permanent teachers are in short supply. The negative effect of the para teachers' dummy captures this teacher shortage. The table below shows the average pupil-teacher ratio (PTR-regular) at the upper primary and total school levels for schools where para teachers are present versus those where they

are not.

|                                   | No Para Teachers | Para Teachers exist |
|-----------------------------------|------------------|---------------------|
| PTR-regular, school (all grades)  | 32               | 50                  |
| PTR-regular, upper primary grades | 13               | 24                  |

Clearly, the schools with para teachers have a much higher number of students per regular teacher or that regular teachers are in relatively short supply. So, it would make sense to augment teaching time by alternate means, such as, hiring para teachers. Given a shortage of regular teachers and the use of para teachers to increase teaching time, what is the effect of the number of para teachers? We attempt to gauge this in column (2) of table 4. It is not significant. Hence, there is no clear evidence that para teachers have a positive influence on educational attainment. What does this imply?

Do para teachers impact educational attainment through other attributes - are para teachers special in some way, that is, are their qualifications, training, experience/tenure, demographics, or in-service training associated with educational attainment in a manner distinct from that of regular teachers. This is investigated by including para teacher attributes as regressors in column (3) of table 4. Most para teacher attributes are found to be insignificant but para teacher experience has a negative coefficient.

Other than para teacher experience, there may well be another reason for the negative association - there is something special about the schools with para teachers. Schools with para teachers that also have lesser regular teacher availability may have been worse off without the para teachers. This effect - are the schools with para teachers poor or are the para teachers poorer teachers than regular teachers - can be properly addressed with observations for these schools before these hired contract/para teachers. This is an important issue that needs to be addressed in further research and examining it with panel data

on schools would be useful. With the cross-sectional data we have, however, we can still attempt to disentangle the effect of para teachers from correlated variables such as poor schools.

Para teacher schools might be located in villages where people have less political voice. This weak voice affects governance of services such as education and so the village people may be unable to secure regular teachers for their schools. With the national policy of allowing para teachers and hiring local youth as such, these villages instead opt for para teachers. The less voice in these villages may be related to other attributes (less parental education; majority of special groups such as SC, ST, OB which have had a weak voice historically; remoteness of the village) of the community. Then the effect of the para teacher variable will be confounded by the effect of these other characteristics with which it is correlated. To capture community effects, we use fixed effects at the district (table 5) and block (table 6) levels. In both tables, column (1) is the basic model, column (2) adds the “Para teachers, if any” variable and column (3) adds “Para teachers’ number.” With both district and block fixed effects, the coefficients for both “Para teachers, if any” and “Para teachers’ number” are negative. This indicates that despite controlling for community effects, para teachers are negatively associated with educational attainment. It could be that the community effects extend beyond the village to the block and district, that is, some districts have, on average, weaker voice and so poor schools and others have better schools.

In order to explain these community effects further, we attempt to use community variables at the district level from other data sources. Note that aggregation to the district level could well mask any discernible effect of these community variables. Nonetheless, if a variable does matter at the district level, it is likely to be quite important. We use education levels in the district from

the National Sample Survey (NSS), these are found to be insignificant. The proportions of SC and ST populations in the district from the Primary Census Abstract (PCA) data are also insignificant. Next, we use the census Village Amenities (VA) data to identify remoteness of the village. We use land under forest cover, the coefficient significance is not robust. We also use distance from nearest town. The distance coefficients are significant.

The Census Village Amenities data covers all villages and provides a variable - distance from nearest town - for each village. In order to characterize the district, we calculate the number of villages in the district that have distance from nearest town of less than three kilometre, between three and sixteen kilometres, and so on. We include it in the fixed effects regressions by interacting distance categories in the district with “Para teachers’ number.” In table 5A column (2) and table 6, column (4), the interaction with closer distance is associated negatively with educational attainment while that with larger distance is positively associated. The “Para teachers’ number” coefficient remains significant. Nonetheless, this suggests that the presence of para teachers is correlated with remoteness of the school (village) and distance from the nearest town or remoteness of the village might be driving the result on “Para teachers’ number.” It also underscores the point that disentangling the two effects - para teachers and schools (and/or community) effect - is quite important.

## 6 Concluding remarks

Overall, there is evidence that several aspects of school governance - both provision of basic school resources and the use of some incentives - are important but the evidence also raises concerns about specific interventions. Is teacher in-service training proving to be ineffective in terms of student performance? If so, how can it be restructured? Should in-service training be scrapped and

the resources be deployed where there is effectiveness? Student incentives or scholarships are positively associated with performance, especially text-books. Should resources for these be augmented? Similarly, basic school resources have a positive bearing on student performance, in particular, the availability of electricity. Should resources for these be enhanced instead?

On para teachers, their presence reflects shortage of regular (permanent) teachers. There is some evidence that hiring para teachers' to increase teaching time is not improving educational achievement of students; however, it is not clear whether this evidence can be attributed to para-teachers or the schools that hire para-teachers. To establish that para teachers are either not or less effective relative to regular teachers, the effect (condition) of those schools' hiring para teachers needs to be separated from the effect of para teachers. The schools might have been worse off without para teachers. Even beyond that, it is unclear if the policy has the incentives for para teachers in place - the underlying incentive for para teachers seems to be the prospect of regularization but the policy is silent on this aspect. Can the para teachers be absorbed as regular teachers? For regular teachers, what incentive mechanisms are required to keep effectiveness high? Therefore, the effect of a change in incentives via the type of contract for teachers alone is difficult to ascribe.

While existing policies must be evaluated, given the pressing need to expand quality education for all, enrolling and retaining students, there is also a need for experimenting with new ideas/solutions. The use of para teachers came about as a solution to the twin problems of teacher shortage and budgetary constraints. While fixed-term contracts are not new, their use in education service delivery at a systemic level in India is new. So, the means of expanding budgetary resources for education and ideas on making the best use of these funds are both desirable. Experimenting with old or new ideas must be accompanied

with impact evaluations so that lessons learnt can be suitably acted upon. An impact evaluation of existing policies as these continue to expand would aid discussion and further direction of policy.

## 6.1 Study limitations

The analyses here use schools' level data for the entire state of Andhra Pradesh. While the dataset is an improvement on data in other studies - either aggregated data for districts/state or small sample surveys of schools, it falls short of (i) having panel data on schools that will allow modelling school effects, and (ii) having student-teacher matches by subject that will allow accounting for unobserved student ability and teacher motivation explicitly. Also, characteristics of individual student background are not available, so it is difficult to account for factors such as parental education.

So, within the ambit of DISE data, panel data would help as would explicitly modeling the choice of engaging para or contract teachers. Also, developing sample datasets by student-teacher matches would be useful. Finally, further research should consider modelling student background by linking household data with schools' data.

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**Table 1: Summary Statistics**  
**Rural Government Schools - Andhra Pradesh**

| <b>Variable</b>  | <b>No. of school-observations</b> | <b>Mean</b> | <b>Std. Dev.</b> | <b>Min</b> | <b>Max</b> |
|--|-----------------------------------|-------------|------------------|------------|------------|
| Percent of boys passing grade 7  | 10809                             | 46.6        | 19.9             | 0          | 100        |
| No. of boys enrolled in grade 7  | 10809                             | 39.2        | 36.9             | 1          | 910        |
| No. of teachers teaching upper primary grades  | 10809                             | 4.1         | 2.8              | 1          | 33         |
| Percent of teachers - regular  | 10809                             | 64.9        | 26.0             | 8          | 100        |
| Percent of teachers - para   | 10809                             | 15.3        | 24.9             | 0          | 88         |
| <b><u>Regular teachers</u></b>   |                                   |             |                  |            |            |
| Percent of teachers - Graduate degree  | 10809                             | 39.4        | 31.7             | 0          | 100        |
| Percent of teachers - Post-graduate degree   | 10809                             | 21.0        | 25.8             | 0          | 100        |
| Percent of teachers - M.Phil. Or Ph.D. degree  | 10809                             | 0.2         | 2.7              | 0          | 100        |
| Percent of teachers - Senior Basic Training (S.B.T.) trained   | 10809                             | 7.1         | 19.1             | 0          | 100        |
| Percent of teachers - Bachelor of Education (B.Ed.) trained  | 10809                             | 51.2        | 30.0             | 0          | 100        |
| Percent of teachers - Master of Education (M.Ed.) trained  | 10809                             | 5.7         | 14.6             | 0          | 100        |
| Teacher age - median   | 10809                             | 41.0        | 7.5              | 21         | 90         |
| Teacher age squared - median   | 10809                             | 1748.8      | 634.6            | 441        | 8100       |
| Teacher experience - median  | 10809                             | 6.8         | 5.0              | 0          | 37         |
| Teacher experience squared - median  | 10809                             | 76.9        | 128.8            | 0          | 1369       |
| Teacher tenure - median  | 10809                             | 4.1         | 2.0              | 0          | 31         |
| Teacher tenure squared - median  | 10809                             | 21.9        | 34.0             | 0          | 961        |
| Percent of teachers - female   | 10809                             | 18.3        | 25.7             | 0          | 100        |
| Percent of scheduled castes (SC) teachers  | 10809                             | 7.0         | 16.7             | 0          | 100        |
| Percent of scheduled tribes (ST) teachers  | 10809                             | 3.2         | 13.4             | 0          | 100        |
| Percent of other backward castes (OB) teachers   | 10809                             | 25.8        | 27.5             | 0          | 100        |
| In-service training, if any  | 10809                             | 0.7         | 0.4              | 0          | 1          |
| Percent of teachers with in-service Block Resource Centre (BRC) teacher training                         | 10809                             | 32.2        | 35.6             | 0          | 100        |
| Percent of teachers with in-service Cluster Resource Centre (CRC) teacher training                       | 10809                             | 35.3        | 38.1             | 0          | 100        |
| Percent of teachers with in-service District Institute of Education and Training (DIET) teacher training | 10809                             | 8.1         | 17.8             | 0          | 100        |

**Para teachers (schools where para teachers exist)**

|  |      |       |       |     |      |
|--|------|-------|-------|-----|------|
| Percent of teachers - Graduate degree  | 3520 | 26.5  | 20.6  | 0   | 86   |
| Percent of teachers - Post-graduate degree   | 3520 | 2.5   | 8.2   | 0   | 67   |
| Percent of teachers - M.Phil. Or Ph.D. degree  | 3520 | 0.0   | 0.9   | 0   | 36   |
| Percent of teachers - Senior Basic Training (S.B.T.) trained   | 3520 | 7.6   | 15.0  | 0   | 83   |
| Percent of teachers - Bachelor of Education (B.Ed.) trained  | 3520 | 20.1  | 24.3  | 0   | 88   |
| Percent of teachers - Master of Education (M.Ed.) trained  | 3520 | 0.7   | 4.6   | 0   | 67   |
| Teacher age - median   | 3520 | 27.9  | 4.8   | 19  | 60   |
| Teacher age squared - median   | 3520 | 807.6 | 300.0 | 361 | 3600 |
| Teacher experience - median  | 3520 | 0.5   | 1.3   | 0   | 34   |
| Teacher experience squared - median  | 3520 | 2.0   | 22.8  | 0   | 1156 |
| Teacher tenure - median  | 3520 | 0.4   | 1.1   | 0   | 21   |
| Teacher tenure squared - median  | 3520 | 1.4   | 10.2  | 0   | 441  |
| Percent of teachers - female   | 3520 | 21.9  | 23.5  | 0   | 88   |
| Percent of scheduled castes (SC) teachers  | 3520 | 13.2  | 19.9  | 0   | 80   |
| Percent of scheduled tribes (ST) teachers  | 3520 | 2.7   | 10.1  | 0   | 83   |
| Percent of other backward castes (OB) teachers   | 3520 | 18.0  | 20.7  | 0   | 86   |
| In-service training, if any  | 3520 | 0.2   | 0.4   | 0   | 1    |
| Percent of teachers with in-service Block Resource Centre (BRC) teacher training                         | 3520 | 4.5   | 13.1  | 0   | 83   |
| Percent of teachers with in-service Cluster Resource Centre (CRC) teacher training                       | 3520 | 3.4   | 11.7  | 0   | 80   |
| Percent of teachers with in-service District Institute of Education and Training (DIET) teacher training | 3520 | 0.6   | 4.9   | 0   | 67   |

**Students in grade 7**

|  |       |      |      |   |     |
|--|-------|------|------|---|-----|
| No. of sections or classrooms                      | 10809 | 0.8  | 1.3  | 0 | 62  |
| Student incentive, if any                          | 10809 | 1.0  | 0.0  | 1 | 1   |
| Student incentives: Percent textbooks to SC boys   | 10809 | 11.4 | 11.9 | 0 | 100 |
| Student incentives: Percent textbooks to ST boys   | 10809 | 4.6  | 13.5 | 0 | 100 |
| Student incentives: Percent text-books to OB boys  | 10809 | 27.1 | 15.9 | 0 | 100 |
| Student incentives: Percent textbooks to SC girls  | 10809 | 11.0 | 11.3 | 0 | 100 |
| Student incentives: Percent textbooks to ST girls  | 10809 | 3.8  | 10.6 | 0 | 100 |
| Student incentives: Percent text-books to OB girls | 10809 | 28.8 | 15.5 | 0 | 100 |

|   |       |      |      |   |     |
|---|-------|------|------|---|-----|
| Percent of SC students to total students in grade 7               | 10809 | 20.4 | 19.1 | 0 | 100 |
| Percent of ST students to total students in grade 7               | 10809 | 8.1  | 19.8 | 0 | 100 |
| Percent of OB students to total students in grade 7               | 10809 | 54.3 | 25.7 | 0 | 100 |
| Percent of general category students to total students in grade 7 | 10809 | 17.2 | 19.7 | 0 | 100 |
| Percent of girl students to total students in grade 7             | 10809 | 50.3 | 19.9 | 0 | 100 |
| Percent of SC boys to total students in grade 7                   | 10809 | 10.7 | 12.4 | 0 | 100 |
| Percent of ST boys to total students in grade 7                   | 10809 | 4.5  | 13.8 | 0 | 100 |
| Percent of OB boys to total students in grade 7                   | 10809 | 26.1 | 16.9 | 0 | 100 |
| Percent of general category boys to total students in grade 7     | 10809 | 8.5  | 11.5 | 0 | 92  |
| Percent of SC girls to total students in grade 7                  | 10809 | 9.7  | 11.7 | 0 | 100 |
| Percent of ST girls to total students in grade 7                  | 10809 | 3.6  | 11.0 | 0 | 100 |
| Percent of OB girls to total students in grade 7                  | 10809 | 28.2 | 17.5 | 0 | 100 |
| Percent of general category girls to total students in grade 7    | 10809 | 8.7  | 11.6 | 0 | 100 |

### **School characteristics**

|  |       |      |      |   |     |
|--|-------|------|------|---|-----|
| Pupil-teacher ratio                        | 10809 | 23.4 | 10.0 | 4 | 228 |
| School: No. of classrooms (n)              | 10809 | 0.2  | 0.2  | 0 | 7   |
| School: No. of blackboards (n)             | 10792 | 0.3  | 0.4  | 0 | 22  |
| School: No. of computers (n)               | 10691 | 0.0  | 0.7  | 0 | 42  |
| School: No. of books in the library (n)    | 10797 | 12.9 | 20.5 | 0 | 857 |
| Facility - common toilet (yes=1)           | 10809 | 0.7  | 0.5  | 0 | 1   |
| Facility - girls toilet (yes=1)            | 10809 | 1.0  | 0.0  | 1 | 1   |
| Facility - boundary wall (yes=1)           | 10809 | 0.7  | 0.5  | 0 | 1   |
| Facility - bookbank (yes=1)                | 10809 | 0.6  | 0.5  | 0 | 1   |
| Facility - playground (yes=1)              | 10809 | 0.6  | 0.5  | 0 | 1   |
| Facility - drinking water (yes=1)          | 10809 | 0.9  | 0.3  | 0 | 1   |
| Facility - medical check-up (yes=1)        | 10809 | 0.7  | 0.5  | 0 | 1   |
| Facility - ramps for disabled (yes=1)      | 10809 | 0.1  | 0.3  | 0 | 1   |
| Facility - furniture for teachers (yes=1)  | 10809 | 1.0  | 0.2  | 0 | 1   |
| Facility - furniture for students (yes=1)  | 10809 | 0.5  | 0.5  | 0 | 1   |
| Facility - kitchen shed (yes=1)            | 10809 | 1.0  | 0.0  | 1 | 1   |
| Facility - electricity available (yes=1)   | 10809 | 0.5  | 0.5  | 0 | 1   |
| Distance of school from block headquarters | 10809 | 9.3  | 8.5  | 0 | 254 |

|   |       |        |        |   |       |
|---|-------|--------|--------|---|-------|
| No. of villages in the district with distance less than 3km*Percent para teachers | 10809 | 157.6  | 302.7  | 0 | 2143  |
| No. of villages in the district with distance of 3-16 km*Percent para teachers    | 10809 | 3042.5 | 5274.2 | 0 | 26914 |
| No. of villages in the district with distance of 16-30 km*Percent para teachers   | 10809 | 4794.7 | 8205.6 | 0 | 42080 |
| No. of villages in the district with distance of 30-52 km*Percent para teachers   | 10809 | 4715.7 | 8433.8 | 0 | 50500 |

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**(n) variable divided or normalized by the no. of students enrolled in grade 7**

**Table 2: Comparison of Schools  
Rural Government Schools - Andhra Pradesh**

| <b>Variable</b>   | <b>All-Mean</b> | <b>NO para<br/>teacher<br/>schools<br/>Mean</b> | <b>Para<br/>teacher<br/>schools<br/>Mean</b> |
|---|-----------------|---|--|
| No. of observations   | 10809           | 7214  | 3520   |
| Percent of boys passing grade 7                                   | 46.6            | 48.2  | 43.3   |
| No. of boys enrolled in grade 7                                   | 39.2            | 32.3  | 53.5   |
| No. of teachers teaching upper primary grades                     | 4.1             | 3.4   | 5.6  |
| Percent of teachers – regular                                     | 64.9            | 75.0  | 44.1   |
| Percent of teachers – para  | 15.3            | 0.0   | 46.9   |
| <b><u>Students in grade 7</u></b>                                 |                 |   |  |
| No. of sections or classrooms                                     | 0.8             | 0.7   | 0.9  |
| Student incentive, if any   | 1.0             | 1.0   | 1.0  |
| Student incentives: Percent textbooks to SC boys                  | 11.4            | 11.7  | 10.7   |
| Student incentives: Percent textbooks to ST boys                  | 4.6             | 4.2   | 5.4  |
| Student incentives: Percent text-books to OB boys                 | 27.1            | 28.5  | 24.3   |
| Student incentives: Percent textbooks to SC girls                 | 11.0            | 10.3  | 12.5   |
| Student incentives: Percent textbooks to ST girls                 | 3.8             | 3.3   | 4.8  |
| Student incentives: Percent text-books to OB girls                | 28.8            | 28.8  | 28.8   |
| Percent of SC students to total students in grade 7               | 20.4            | 20.2  | 20.9   |
| Percent of ST students to total students in grade 7               | 8.1             | 7.3   | 9.9  |
| Percent of OB students to total students in grade 7               | 54.3            | 54.7  | 53.4   |
| Percent of general category students to total students in grade 7 | 17.2            | 17.8  | 15.9   |
| Percent of girl students to total students in grade 7             | 50.3            | 48.3  | 54.4   |
| Percent of SC boys to total students in grade 7                   | 10.7            | 11.0  | 10.1   |
| Percent of ST boys to total students in grade 7                   | 4.5             | 4.1   | 5.3  |
| Percent of OB boys to total students in grade 7                   | 26.1            | 27.3  | 23.6   |
| Percent of general category boys to total students in grade 7     | 8.5             | 9.3   | 6.7  |
| Percent of SC girls to total students in grade 7                  | 9.7             | 9.2   | 10.8   |
| Percent of ST girls to total students in grade 7                  | 3.6             | 3.2   | 4.6  |
| Percent of OB girls to total students in grade 7                  | 28.2            | 27.4  | 29.8   |
| Percent of general category girls to total students in grade 7    | 8.7             | 8.5   | 9.1  |
| <b><u>School characteristics</u></b>                              |                 |   |  |
| Pupil-teacher ratio   | 23.4            | 24.1  | 21.9   |
| School: No. of classrooms (n)                                     | 0.2             | 0.2   | 0.2  |
| School: No. of blackboards (n)                                    | 0.3             | 0.3   | 0.2  |
| School: No. of computers (n)                                      | 0.0             | 0.0   | 0.0  |
| School: No. of books in the library (n)                           | 12.9            | 13.2  | 12.4   |

|   |        |     |         |
|---|--------|-----|---------|
| Facility - common toilet (yes=1)  | 0.7    | 0.7 | 0.6     |
| Facility - girls toilet (yes=1)   | 1.0    | 1.0 | 1.0     |
| Facility - boundary wall (yes=1)  | 0.7    | 0.7 | 0.6     |
| Facility - bookbank (yes=1)   | 0.6    | 0.7 | 0.6     |
| Facility - playground (yes=1)   | 0.6    | 0.6 | 0.7     |
| Facility - drinking water (yes=1)   | 0.9    | 0.9 | 0.9     |
| Facility - medical check-up (yes=1)   | 0.7    | 0.7 | 0.6     |
| Facility - ramps for disabled (yes=1)   | 0.1    | 0.1 | 0.2     |
| Facility - furniture for teachers (yes=1)   | 1.0    | 1.0 | 1.0     |
| Facility - furniture for students (yes=1)   | 0.5    | 0.5 | 0.6     |
| Facility - kitchen shed (yes=1)   | 1.0    | 1.0 | 1.0     |
| Facility - electricity available (yes=1)  | 0.5    | 0.4 | 0.6     |
| Distance of school from block headquarters  | 9.3    | 9.9 | 7.9     |
| No. of villages in the district with distance less than 3km*Percent para teachers | 157.6  | na  | 483.9   |
| No. of villages in the district with distance of 3-16 km*Percent para teachers    | 3042.5 | na  | 9342.8  |
| No. of villages in the district with distance of 16-30 km*Percent para teachers   | 4794.7 | na  | 14723.2 |
| No. of villages in the district with distance of 30-52 km*Percent para teachers   | 4715.7 | na  | 14480.6 |

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**(n) variable divided or normalized by the no. of students enrolled in grade 7**

**Table 3: Achievement Equation - Rural Government schools: Boys  
Basic Model**

|   | <b>Percent of boys passing grade7</b> |
|---|---------------------------------------|
| <b>Regular teacher age – median</b>   | <b>-0.869</b>                         |
|   | <b>(5.44)***</b>                      |
| <b>Regular teacher age squared – median</b>   | <b>0.011</b>                          |
|   | <b>(5.98)***</b>                      |
| <b>Regular teacher experience – median</b>  | <b>0.208</b>                          |
|   | <b>(2.10)**</b>                       |
| <b>Regular teacher experience squared – median</b>                                      | <b>-0.008</b>                         |
|   | <b>(2.07)**</b>                       |
| <b>Percent of teachers with in-service Block Resource Centre (BRC) teacher training</b> | <b>-0.009</b>                         |
|   | <b>(2.13)**</b>                       |
| <b>No. of boys enrolled in grade 7</b>  | <b>-0.079</b>                         |
|   | <b>(17.21)***</b>                     |
| <b>Student incentives: Percent textbooks to SC boys</b>                                 | <b>0.747</b>                          |
|   | <b>(21.81)***</b>                     |
| <b>Student incentives: Percent textbooks to ST boys</b>                                 | <b>0.755</b>                          |
|   | <b>(15.42)***</b>                     |
| <b>Student incentives: Percent textbooks to OB boys</b>                                 | <b>0.747</b>                          |
|   | <b>(32.92)***</b>                     |
| <b>Facility - electricity available (yes=1)</b>   | <b>1.526</b>                          |
|   | <b>(4.93)***</b>                      |
| <b>Percent of SC boys to total students in grade 7</b>                                  | <b>-0.215</b>                         |
|   | <b>(6.88)***</b>                      |
| <b>Percent of ST boys to total students in grade 7</b>                                  | <b>-0.153</b>                         |
|   | <b>(3.26)***</b>                      |
| <b>Percent of OB boys to total students in grade 7</b>                                  | <b>-0.200</b>                         |
|   | <b>(9.51)***</b>                      |
| <b>Percent of SC girls to total students in grade 7</b>                                 | <b>-0.247</b>                         |
|   | <b>(15.94)***</b>                     |
| <b>Percent of ST girls to total students in grade 7</b>                                 | <b>-0.239</b>                         |
|   | <b>(14.27)***</b>                     |
| <b>Percent of OB girls to total students in grade 7</b>                                 | <b>-0.210</b>                         |
|   | <b>(19.04)***</b>                     |
| <b>Constant</b>   | <b>49.422</b>                         |
|   | <b>(14.41)***</b>                     |
| <b>Observations</b>   | <b>10809</b>                          |
| <b>Adjusted R-squared</b>   | <b>0.544</b>                          |

Robust t statistics in parentheses

\* significant at 10%; \*\* significant at 5%; \*\*\* significant at 1%

**Table 4: Achievement Equation – Rural Government schools: Boys  
Para Teachers**

|   | (1)                            | (2)                            | (3)                            |
|---|--------------------------------|--------------------------------|--------------------------------|
|   | Percent of boys passing grade7 | Percent of boys passing grade7 | Percent of boys passing grade7 |
| <b>Regular teacher age – median</b>   | <b>-0.870</b>                  | <b>-0.887</b>                  | <b>-0.871</b>                  |
|   | <b>(5.45)***</b>               | <b>(5.52)***</b>               | <b>(5.46)***</b>               |
| <b>Regular teacher age squared – median</b>   | <b>0.011</b>                   | <b>0.011</b>                   | <b>0.011</b>                   |
|   | <b>(5.98)***</b>               | <b>(6.04)***</b>               | <b>(5.98)***</b>               |
| <b>Regular teacher experience – median</b>  | <b>0.210</b>                   | <b>0.221</b>                   | <b>0.218</b>                   |
|   | <b>(2.10)**</b>                | <b>(2.22)**</b>                | <b>(2.20)**</b>                |
| <b>Regular teacher experience squared – median</b>                                      | <b>-0.008</b>                  | <b>-0.008</b>                  | <b>-0.008</b>                  |
|   | <b>(2.07)**</b>                | <b>(2.14)**</b>                | <b>(2.15)**</b>                |
| <b>Percent of teachers with in-service Block Resource Centre (BRC) teacher training</b> | <b>-0.009</b>                  | <b>-0.010</b>                  | <b>-0.010</b>                  |
|   | <b>(2.14)**</b>                | <b>(2.33)**</b>                | <b>(2.25)**</b>                |
| <b>No. of boys enrolled in grade 7</b>  | <b>-0.079</b>                  | <b>-0.078</b>                  | <b>-0.078</b>                  |
|   | <b>(16.83)***</b>              | <b>(16.48)***</b>              | <b>(16.69)***</b>              |
| <b>Student incentives: Percent textbooks to SC boys</b>                                 | <b>0.747</b>                   | <b>0.745</b>                   | <b>0.745</b>                   |
|   | <b>(21.77)***</b>              | <b>(21.71)***</b>              | <b>(21.78)***</b>              |
| <b>Student incentives: Percent textbooks to ST boys</b>                                 | <b>0.755</b>                   | <b>0.754</b>                   | <b>0.755</b>                   |
|   | <b>(15.42)***</b>              | <b>(15.39)***</b>              | <b>(15.38)***</b>              |
| <b>Student incentives: Percent textbooks to OB boys</b>                                 | <b>0.747</b>                   | <b>0.745</b>                   | <b>0.745</b>                   |
|   | <b>(32.83)***</b>              | <b>(32.55)***</b>              | <b>(32.78)***</b>              |
| <b>Facility - electricity available (yes=1)</b>   | <b>1.526</b>                   | <b>1.521</b>                   | <b>1.515</b>                   |
|   | <b>(4.93)***</b>               | <b>(4.92)***</b>               | <b>(4.90)***</b>               |
| <b>Percent of SC boys to total students in grade 7</b>                                  | <b>-0.215</b>                  | <b>-0.214</b>                  | <b>-0.214</b>                  |
|   | <b>(6.86)***</b>               | <b>(6.85)***</b>               | <b>(6.86)***</b>               |
| <b>Percent of ST boys to total students in grade 7</b>                                  | <b>-0.153</b>                  | <b>-0.151</b>                  | <b>-0.152</b>                  |
|   | <b>(3.25)***</b>               | <b>(3.23)***</b>               | <b>(3.24)***</b>               |
| <b>Percent of OB boys to total students in grade 7</b>                                  | <b>-0.199</b>                  | <b>-0.199</b>                  | <b>-0.199</b>                  |
|   | <b>(9.48)***</b>               | <b>(9.45)***</b>               | <b>(9.48)***</b>               |
| <b>Percent of SC girls to total students in grade 7</b>                                 | <b>-0.246</b>                  | <b>-0.246</b>                  | <b>-0.245</b>                  |
|   | <b>(15.90)***</b>              | <b>(15.86)***</b>              | <b>(15.80)***</b>              |
| <b>Percent of ST girls to total students in grade 7</b>                                 | <b>-0.239</b>                  | <b>-0.238</b>                  | <b>-0.238</b>                  |
|   | <b>(14.25)***</b>              | <b>(14.23)***</b>              | <b>(14.18)***</b>              |
| <b>Percent of OB girls to total students in grade 7</b>                                 | <b>-0.210</b>                  | <b>-0.208</b>                  | <b>-0.207</b>                  |
|   | <b>(18.99)***</b>              | <b>(18.66)***</b>              | <b>(18.69)***</b>              |
| <b>Para (contract) teachers, if any</b>   | <b>-0.064</b>                  |                                |                                |

|   |                   |                   |                   |
|---|-------------------|-------------------|-------------------|
|   | <b>(0.20)</b>     |                   |                   |
| <b>Percent of teachers – para</b>               |                   | <b>-0.007</b>     |                   |
|   |                   | <b>(1.20)</b>     |                   |
| <b>Para teacher experience – median</b>         |                   |                   | <b>-0.849</b>     |
|   |                   |                   | <b>(2.94)***</b>  |
| <b>Para teacher experience squared – median</b> |                   |                   | <b>0.039</b>      |
|   |                   |                   | <b>(2.68)***</b>  |
| <b>Constant</b>                                 | <b>49.476</b>     | <b>49.949</b>     | <b>49.544</b>     |
|   | <b>(14.41)***</b> | <b>(14.42)***</b> | <b>(14.47)***</b> |
| <b>Observations</b>                             | <b>10809</b>      | <b>10809</b>      | <b>10809</b>      |
| <b>Adjusted R-squared</b>                       | <b>0.544</b>      | <b>0.544</b>      | <b>0.544</b>      |

**Robust t statistics in parentheses**

**\* significant at 10%; \*\* significant at 5%; \*\*\* significant at 1%**

**Table 5: Achievement Equation – Rural Government schools: Boys  
Para Teachers  
(with district fixed effects)**

|   | (1)                            | (2)                            | (3)                            |
|---|--------------------------------|--------------------------------|--------------------------------|
|   | Percent of boys passing grade7 | Percent of boys passing grade7 | Percent of boys passing grade7 |
| <b>Regular teacher age - median</b>   | <b>-0.935</b>                  | <b>-0.951</b>                  | <b>-0.973</b>                  |
|   | <b>(6.13)***</b>               | <b>(6.24)***</b>               | <b>(6.35)***</b>               |
| <b>Regular teacher age squared – median</b>   | <b>0.013</b>                   | <b>0.013</b>                   | <b>0.013</b>                   |
|   | <b>(6.93)***</b>               | <b>(6.99)***</b>               | <b>(7.09)***</b>               |
| <b>Regular teacher experience – median</b>  | <b>0.283</b>                   | <b>0.305</b>                   | <b>0.310</b>                   |
|   | <b>(3.29)***</b>               | <b>(3.52)***</b>               | <b>(3.58)***</b>               |
| <b>Regular teacher experience squared – median</b>                                      | <b>-0.012</b>                  | <b>-0.013</b>                  | <b>-0.013</b>                  |
|   | <b>(3.71)***</b>               | <b>(3.88)***</b>               | <b>(3.90)***</b>               |
| <b>Percent of teachers with in-service Block Resource Centre (BRC) teacher training</b> | <b>-0.017</b>                  | <b>-0.019</b>                  | <b>-0.019</b>                  |
|   | <b>(4.07)***</b>               | <b>(4.38)***</b>               | <b>(4.44)***</b>               |
| <b>No. of boys enrolled in grade 7</b>  | <b>-0.073</b>                  | <b>-0.071</b>                  | <b>-0.071</b>                  |
|   | <b>(17.15)***</b>              | <b>(16.63)***</b>              | <b>(16.40)***</b>              |
| <b>Student incentives: Percent textbooks to SC boys</b>                                 | <b>0.744</b>                   | <b>0.743</b>                   | <b>0.742</b>                   |
|   | <b>(37.26)***</b>              | <b>(37.17)***</b>              | <b>(37.10)***</b>              |
| <b>Student incentives: Percent textbooks to ST boys</b>                                 | <b>0.749</b>                   | <b>0.748</b>                   | <b>0.746</b>                   |
|   | <b>(26.95)***</b>              | <b>(26.92)***</b>              | <b>(26.84)***</b>              |
| <b>Student incentives: Percent textbooks to OB boys</b>                                 | <b>0.740</b>                   | <b>0.738</b>                   | <b>0.736</b>                   |
|   | <b>(49.52)***</b>              | <b>(49.34)***</b>              | <b>(49.06)***</b>              |
| <b>Facility - electricity available (yes=1)</b>   | <b>1.021</b>                   | <b>0.999</b>                   | <b>0.994</b>                   |
|   | <b>(3.28)***</b>               | <b>(3.21)***</b>               | <b>(3.19)***</b>               |
| <b>Percent of SC boys to total students in grade 7</b>                                  | <b>-0.236</b>                  | <b>-0.236</b>                  | <b>-0.235</b>                  |
|   | <b>(12.39)***</b>              | <b>(12.35)***</b>              | <b>(12.32)***</b>              |
| <b>Percent of ST boys to total students in grade 7</b>                                  | <b>-0.188</b>                  | <b>-0.187</b>                  | <b>-0.186</b>                  |
|   | <b>(6.87)***</b>               | <b>(6.83)***</b>               | <b>(6.78)***</b>               |
| <b>Percent of OB boys to total students in grade 7</b>                                  | <b>-0.234</b>                  | <b>-0.233</b>                  | <b>-0.233</b>                  |
|   | <b>(16.19)***</b>              | <b>(16.15)***</b>              | <b>(16.11)***</b>              |
| <b>Percent of SC girls to total students in grade 7</b>                                 | <b>-0.270</b>                  | <b>-0.269</b>                  | <b>-0.268</b>                  |
|   | <b>(19.77)***</b>              | <b>(19.73)***</b>              | <b>(19.65)***</b>              |
| <b>Percent of ST girls to total students in grade 7</b>                                 | <b>-0.272</b>                  | <b>-0.272</b>                  | <b>-0.271</b>                  |
|   | <b>(19.06)***</b>              | <b>(19.04)***</b>              | <b>(19.03)***</b>              |
| <b>Percent of OB girls to total students in grade 7</b>                                 | <b>-0.227</b>                  | <b>-0.225</b>                  | <b>-0.224</b>                  |
|   | <b>(22.53)***</b>              | <b>(22.34)***</b>              | <b>(22.10)***</b>              |
| <b>Para (contract) teachers, if any</b>   |                                | <b>-0.637</b>                  |                                |

|                                   |                      |                      |                      |
|-----------------------------------|----------------------|----------------------|----------------------|
|                                   |                      | (2.08)**             |                      |
| <b>Percent of teachers – para</b> |                      |                      | <b>-0.014</b>        |
|                                   |                      |                      | (2.42)**             |
| <b>Constant</b>                   | <b>52.401</b>        | <b>52.989</b>        | <b>53.459</b>        |
|                                   | (16.33)***           | (16.45)***           | (16.51)***           |
| <b>Observations</b>               | <b>10809</b>         | <b>10809</b>         | <b>10809</b>         |
| <b>Number of districts</b>        | <b>21</b>            | <b>21</b>            | <b>21</b>            |
| <b>Adjusted R-squared</b>         | <b>0.513</b>         | <b>0.513</b>         | <b>0.513</b>         |
|                                   |                      |                      |                      |
| <b>F for u_i=0 (p-value)</b>      | <b>10.59 (0.000)</b> | <b>10.80 (0.000)</b> | <b>10.80 (0.000)</b> |
|                                   |                      |                      |                      |

**Absolute value of t statistics in parentheses**

**\* significant at 10%; \*\* significant at 5%; \*\*\* significant at 1%**

**Table 5A: Achievement Equation – Rural Government schools: Boys  
Para Teachers  
(with district fixed effects)**

|  | (1)                            | (2)                            |
|--|--------------------------------|--------------------------------|
|  | Percent of boys passing grade7 | Percent of boys passing grade7 |
| <b>Regular teacher age – median</b>  | <b>-0.973</b>                  | <b>-1.816</b>                  |
|  | (6.35)***                      | (10.82)***                     |
| <b>Regular teacher age squared – median</b>  | <b>0.013</b>                   | <b>0.024</b>                   |
|  | (7.09)***                      | (12.00)***                     |
| <b>Regular teacher experience – median</b>   | <b>0.310</b>                   | <b>0.691</b>                   |
|  | (3.58)***                      | (7.26)***                      |
| <b>Regular teacher experience squared – median</b>                                       | <b>-0.013</b>                  | <b>-0.028</b>                  |
|  | (3.90)***                      | (7.62)***                      |
| <b>Percent of teachers with in-service Block Resource Centre (BRC) teacher training</b>  | <b>-0.019</b>                  | <b>-0.031</b>                  |
|  | (4.44)***                      | (6.62)***                      |
| <b>No. of boys enrolled in grade 7</b>   | <b>-0.071</b>                  | <b>-0.070</b>                  |
|  | (16.40)***                     | (14.41)***                     |
| <b>Student incentives: Percent textbooks to SC boys</b>                                  | <b>0.742</b>                   | <b>0.565</b>                   |
|  | (37.10)***                     | (26.04)***                     |
| <b>Student incentives: Percent textbooks to ST boys</b>                                  | <b>0.746</b>                   | <b>0.520</b>                   |
|  | (26.84)***                     | (17.18)***                     |
| <b>Student incentives: Percent textbooks to OB boys</b>                                  | <b>0.736</b>                   |                                |
|  | (49.06)***                     |                                |
| <b>Facility - electricity available (yes=1)</b>  | <b>0.994</b>                   | <b>1.828</b>                   |
|  | (3.19)***                      | (5.32)***                      |
| <b>Percent of SC boys to total students in grade 7</b>                                   | <b>-0.235</b>                  | <b>-0.085</b>                  |
|  | (12.32)***                     | (4.10)***                      |
| <b>Percent of ST boys to total students in grade 7</b>                                   | <b>-0.186</b>                  | <b>-0.044</b>                  |
|  | (6.78)***                      | (1.47)                         |
| <b>Percent of OB boys to total students in grade 7</b>                                   | <b>-0.233</b>                  | <b>0.254</b>                   |
|  | (16.11)***                     | (22.04)***                     |
| <b>Percent of SC girls to total students in grade 7</b>                                  | <b>-0.268</b>                  | <b>-0.351</b>                  |
|  | (19.65)***                     | (23.38)***                     |
| <b>Percent of ST girls to total students in grade 7</b>                                  | <b>-0.271</b>                  | <b>-0.319</b>                  |
|  | (19.03)***                     | (20.31)***                     |
| <b>Percent of OB girls to total students in grade 7</b>                                  | <b>-0.224</b>                  | <b>-0.184</b>                  |
|  | (22.10)***                     | (16.34)***                     |
| <b>Percent of teachers – para</b>  | <b>-0.014</b>                  | <b>-0.084</b>                  |
|  | (2.42)**                       | (3.64)***                      |
| <b>No. of villages in the district with distance less than 3km*Percent para teachers</b> |                                | <b>0.013</b>                   |
|  |                                | (7.19)***                      |
| <b>No. of villages in the district with distance of 3-16 km*Percent para teachers</b>    |                                | <b>-0.001</b>                  |
|  |                                | (6.38)***                      |
| <b>No. of villages in the district with distance of 16-30 km*Percent para teachers</b>   |                                | <b>0.001</b>                   |

|  |                      |                      |
|--|----------------------|----------------------|
|  |                      | (5.92)***            |
| <b>No. of villages in the district with distance of 30-52 km*Percent para teachers</b> |                      | <b>-0.000</b>        |
|  |                      | (4.29)***            |
| <b>Constant</b>  | <b>53.459</b>        | <b>75.811</b>        |
|  | (16.51)***           | (21.45)***           |
| <b>Observations</b>  | <b>10809</b>         | <b>10809</b>         |
| <b>Number of districts</b>   | <b>21</b>            | <b>21</b>            |
| <b>Adjusted R-squared</b>  | <b>0.513</b>         | <b>0.408</b>         |
|  |                      |                      |
| <b>F for <math>u_i=0</math> (p-value)</b>  | <b>10.80 (0.000)</b> | <b>12.52 (0.000)</b> |

Absolute value of t statistics in parentheses

\* significant at 10%; \*\* significant at 5%; \*\*\* significant at 1%

**Table 6: Achievement Equation – Rural Government schools: Boys  
Para Teachers  
(with block fixed effects)**

|   | (1)                            | (2)                            | (3)                            | (4)                            |
|---|--------------------------------|--------------------------------|--------------------------------|--------------------------------|
|   | Percent of boys passing grade7 | Percent of boys passing grade7 | Percent of boys passing grade7 | Percent of boys passing grade7 |
| <b>Regular teacher age – median</b>   | <b>-0.907</b>                  | <b>-0.930</b>                  | <b>-0.961</b>                  | <b>-0.969</b>                  |
|   | (5.70)***                      | (5.83)***                      | (6.01)***                      | (6.06)***                      |
| <b>Regular teacher age squared – median</b>   | <b>0.013</b>                   | <b>0.013</b>                   | <b>0.013</b>                   | <b>0.013</b>                   |
|   | (6.71)***                      | (6.79)***                      | (6.94)***                      | (6.95)***                      |
| <b>Regular teacher experience – median</b>  | <b>0.380</b>                   | <b>0.412</b>                   | <b>0.421</b>                   | <b>0.416</b>                   |
|   | (4.19)***                      | (4.51)***                      | (4.60)***                      | (4.55)***                      |
| <b>Regular teacher experience squared – median</b>                                      | <b>-0.015</b>                  | <b>-0.016</b>                  | <b>-0.016</b>                  | <b>-0.015</b>                  |
|   | (4.35)***                      | (4.58)***                      | (4.63)***                      | (4.51)***                      |
| <b>Percent of teachers with in-service Block Resource Centre (BRC) teacher training</b> | <b>-0.019</b>                  | <b>-0.022</b>                  | <b>-0.022</b>                  | <b>-0.021</b>                  |
|   | (4.38)***                      | (4.83)***                      | (4.92)***                      | (4.74)***                      |
| <b>No. of boys enrolled in grade 7</b>  | <b>-0.073</b>                  | <b>-0.071</b>                  | <b>-0.070</b>                  | <b>-0.066</b>                  |
|   | (16.47)***                     | (15.80)***                     | (15.49)***                     | (14.16)***                     |
| <b>Student incentives: Percent textbooks to SC boys</b>                                 | <b>0.761</b>                   | <b>0.758</b>                   | <b>0.757</b>                   | <b>0.754</b>                   |
|   | (36.12)***                     | (35.97)***                     | (35.89)***                     | (35.75)***                     |
| <b>Student incentives: Percent textbooks to ST boys</b>                                 | <b>0.749</b>                   | <b>0.747</b>                   | <b>0.745</b>                   | <b>0.742</b>                   |
|   | (25.62)***                     | (25.56)***                     | (25.47)***                     | (25.40)***                     |
| <b>Student incentives: Percent textbooks to OB boys</b>                                 | <b>0.749</b>                   | <b>0.746</b>                   | <b>0.743</b>                   | <b>0.737</b>                   |
|   | (47.83)***                     | (47.60)***                     | (47.26)***                     | (46.57)***                     |
| <b>Facility - electricity available (yes=1)</b>   | <b>1.159</b>                   | <b>1.127</b>                   | <b>1.121</b>                   | <b>1.173</b>                   |
|   | (3.49)***                      | (3.39)***                      | (3.38)***                      | (3.53)***                      |
| <b>Percent of SC boys to total students in grade 7</b>                                  | <b>-0.249</b>                  | <b>-0.247</b>                  | <b>-0.246</b>                  | <b>-0.242</b>                  |
|   | (12.33)***                     | (12.24)***                     | (12.18)***                     | (11.99)***                     |
| <b>Percent of ST boys to total students in grade 7</b>                                  | <b>-0.181</b>                  | <b>-0.180</b>                  | <b>-0.177</b>                  | <b>-0.173</b>                  |
|   | (6.31)***                      | (6.26)***                      | (6.18)***                      | (6.04)***                      |
| <b>Percent of OB boys to total students in grade 7</b>                                  | <b>-0.249</b>                  | <b>-0.248</b>                  | <b>-0.247</b>                  | <b>-0.244</b>                  |
|   | (16.13)***                     | (16.09)***                     | (16.02)***                     | (15.80)***                     |
| <b>Percent of SC girls to total students in grade 7</b>                                 | <b>-0.262</b>                  | <b>-0.260</b>                  | <b>-0.259</b>                  | <b>-0.252</b>                  |
|   | (17.89)***                     | (17.79)***                     | (17.65)***                     | (17.11)***                     |
| <b>Percent of ST girls to total students in grade 7</b>                                 | <b>-0.261</b>                  | <b>-0.260</b>                  | <b>-0.260</b>                  | <b>-0.256</b>                  |
|   | (16.12)***                     | (16.09)***                     | (16.06)***                     | (15.81)***                     |
| <b>Percent of OB girls to total</b>   | <b>-0.218</b>                  | <b>-0.216</b>                  | <b>-0.214</b>                  | <b>-0.207</b>                  |

|  |                     |                     |                     |                     |
|--|---------------------|---------------------|---------------------|---------------------|
| students in grade 7  |                     |                     |                     |                     |
|  | <b>(20.05)***</b>   | <b>(19.77)***</b>   | <b>(19.44)***</b>   | <b>(18.64)***</b>   |
| Para (contract) teachers, if any   |                     | <b>-0.908</b>       |                     |                     |
|  |                     | <b>(2.81)***</b>    |                     |                     |
| Percent of teachers – para   |                     |                     | <b>-0.021</b>       | <b>-0.033</b>       |
|  |                     |                     | <b>(3.34)***</b>    | <b>(1.50)</b>       |
| No. of villages in the district with distance less than 3 km*Percent para teachers |                     |                     |                     | <b>0.006</b>        |
|  |                     |                     |                     | <b>(3.42)***</b>    |
| No. of villages in the district with distance of 3-16 km*Percent para teachers     |                     |                     |                     | <b>-0.001</b>       |
|  |                     |                     |                     | <b>(2.82)***</b>    |
| No. of villages in the district with distance of 16-30 km*Percent para teachers    |                     |                     |                     | <b>0.000</b>        |
|  |                     |                     |                     | <b>(2.93)***</b>    |
| No. of villages in the district with distance of 30-52 km*Percent para teachers    |                     |                     |                     | <b>-0.000</b>       |
|  |                     |                     |                     | <b>(2.69)***</b>    |
| Constant   | <b>50.368</b>       | <b>51.158</b>       | <b>51.817</b>       | <b>51.753</b>       |
|  | <b>(14.80)***</b>   | <b>(14.99)***</b>   | <b>(15.12)***</b>   | <b>(15.11)***</b>   |
| Observations   | <b>10809</b>        | <b>10809</b>        | <b>10809</b>        | <b>10809</b>        |
| Number of blocks   | <b>1002</b>         | <b>1002</b>         | <b>1002</b>         | <b>1002</b>         |
| Adjusted R-squared   | <b>0.472</b>        | <b>0.472</b>        | <b>0.472</b>        | <b>0.473</b>        |
|  |                     |                     |                     |                     |
| F for $u_i=0$ (p-value)  | <b>1.63 (0.000)</b> | <b>1.64 (0.000)</b> | <b>1.64 (0.000)</b> | <b>1.64 (0.000)</b> |

Absolute value of t statistics in parentheses

\* significant at 10%; \*\* significant at 5%; \*\*\* significant at 1%

**Table 7: Achievement Equation – Rural Government schools: Boys  
Detailed Specification**

|   | <b>Percent of boys passing grade7</b> |
|---|---------------------------------------|
| <b>Percent of teachers – regular - Graduate degree</b>  | <b>-0.006</b>                         |
|   | <b>(0.50)</b>                         |
| <b>Percent of teachers – regular – Post-graduate degree</b>   | <b>0.001</b>                          |
|   | <b>(0.09)</b>                         |
| <b>Percent of teachers – regular – M.Phil. Or Ph.D. degree</b>  | <b>0.063</b>                          |
|   | <b>(0.92)</b>                         |
| <b>Percent of teachers – regular - Senior Basic Training (S.B.T.) trained</b>   | <b>-0.018</b>                         |
|   | <b>(1.53)</b>                         |
| <b>Percent of teachers – regular – Bachelor of Education (B.Ed.) trained</b>  | <b>0.004</b>                          |
|   | <b>(0.28)</b>                         |
| <b>Percent of teachers – regular – Master of Education (M.Ed.) trained</b>  | <b>0.018</b>                          |
|   | <b>(1.09)</b>                         |
| <b>Regular teacher age – median</b>   | <b>-0.904</b>                         |
|   | <b>(5.25)***</b>                      |
| <b>Regular teacher age squared – median</b>   | <b>0.012</b>                          |
|   | <b>(5.65)***</b>                      |
| <b>Regular teacher experience – median</b>  | <b>0.158</b>                          |
|   | <b>(1.44)</b>                         |
| <b>Regular teacher experience squared – median</b>  | <b>-0.006</b>                         |
|   | <b>(1.43)</b>                         |
| <b>Regular teacher tenure – median</b>  | <b>0.424</b>                          |
|   | <b>(2.07)**</b>                       |
| <b>Regular teacher tenure squared – median</b>  | <b>-0.016</b>                         |
|   | <b>(1.13)</b>                         |
| <b>Percent of scheduled castes (SC) teachers - regular</b>  | <b>0.001</b>                          |
|   | <b>(0.16)</b>                         |
| <b>Percent of scheduled tribes (ST) teachers – regular</b>  | <b>0.026</b>                          |
|   | <b>(1.93)*</b>                        |
| <b>Percent of other backward castes (OB) teachers - regular</b>   | <b>0.015</b>                          |
|   | <b>(2.53)**</b>                       |
| <b>Percent of regular teachers with in-service Block Resource Centre (BRC) teacher training</b>                         | <b>-0.016</b>                         |
|   | <b>(3.15)***</b>                      |
| <b>Percent of regular teachers with in-service Cluster Resource Centre (CRC) teacher training</b>                       | <b>0.007</b>                          |
|   | <b>(1.45)</b>                         |
| <b>Percent of regular teachers with in-service District Institute of Education and Training (DIET) teacher training</b> | <b>-0.014</b>                         |
|   | <b>(1.61)</b>                         |
| <b>No. of boys enrolled in grade 7, divided by 10</b>   | <b>-0.831</b>                         |
|   | <b>(8.84)***</b>                      |
| <b>No. of boys enrolled in grade 7 (divided by 10), squared</b>   | <b>0.001</b>                          |
|   | <b>(0.79)</b>                         |
| <b>School: classrooms (n)</b>   | <b>-3.289</b>                         |
|   | <b>(1.36)</b>                         |
| <b>Student incentives: Percent textbooks to SC boys</b>   | <b>0.734</b>                          |
|   | <b>(21.05)***</b>                     |
| <b>Student incentives: Percent textbooks to ST boys</b>   | <b>0.754</b>                          |
|   | <b>(15.07)***</b>                     |

|   |                   |
|---|-------------------|
| <b>Student incentives: Percent textbooks to OB boys</b> | <b>0.740</b>      |
|   | <b>(31.20)***</b> |
| <b>School: blackboards (n)</b>                          | <b>0.086</b>      |
|   | <b>(0.11)</b>     |
| <b>School: books in the library (n)</b>                 | <b>0.007</b>      |
|   | <b>(0.51)</b>     |
| <b>School: computers (n)</b>                            | <b>0.133</b>      |
|   | <b>(0.49)</b>     |
| <b>Facility – common toilet (yes=1)</b>                 | <b>0.531</b>      |
|   | <b>(1.68)*</b>    |
| <b>Facility - girls toilet (yes=1)</b>                  | <b>0.000</b>      |
|   | <b>(.)</b>        |
| <b>Facility - boundary wall (yes=1)</b>                 | <b>-0.596</b>     |
|   | <b>(1.92)*</b>    |
| <b>Facility – book-bank (yes=1)</b>                     | <b>0.284</b>      |
|   | <b>(0.94)</b>     |
| <b>Facility - playground (yes=1)</b>                    | <b>-0.601</b>     |
|   | <b>(1.93)*</b>    |
| <b>Facility - drinking water (yes=1)</b>                | <b>-0.176</b>     |
|   | <b>(0.37)</b>     |
| <b>Facility - medical check-up (yes=1)</b>              | <b>-0.482</b>     |
|   | <b>(1.54)</b>     |
| <b>Facility – ramps for disabled (yes=1)</b>            | <b>-1.045</b>     |
|   | <b>(2.08)**</b>   |
| <b>Facility - furniture for teachers (yes=1)</b>        | <b>-1.281</b>     |
|   | <b>(1.70)*</b>    |
| <b>Facility - furniture for students (yes=1)</b>        | <b>0.719</b>      |
|   | <b>(2.44)**</b>   |
| <b>Facility - kitchen shed (yes=1)</b>                  | <b>0.000</b>      |
|   | <b>(.)</b>        |
| <b>Facility - electricity available (yes=1)</b>         | <b>1.507</b>      |
|   | <b>(4.50)***</b>  |
| <b>Distance of school from block headquarters</b>       | <b>0.003</b>      |
|   | <b>(0.17)</b>     |
| <b>Percent of SC boys to total students in grade 7</b>  | <b>-0.206</b>     |
|   | <b>(6.51)***</b>  |
| <b>Percent of ST boys to total students in grade 7</b>  | <b>-0.153</b>     |
|   | <b>(3.23)***</b>  |
| <b>Percent of OB boys to total students in grade 7</b>  | <b>-0.201</b>     |
|   | <b>(9.30)***</b>  |
| <b>Percent of SC girls to total students in grade 7</b> | <b>-0.242</b>     |
|   | <b>(15.06)***</b> |
| <b>Percent of ST girls to total students in grade 7</b> | <b>-0.228</b>     |
|   | <b>(12.82)***</b> |
| <b>Percent of OB girls to total students in grade 7</b> | <b>-0.206</b>     |
|   | <b>(17.75)***</b> |
| <b>Constant</b>   | <b>51.154</b>     |
|   | <b>(13.49)***</b> |
| <b>Observations</b>                                     | <b>10667</b>      |
| <b>Adjusted R-squared</b>                               | <b>0.548</b>      |

**Robust t statistics in parentheses**

**\* significant at 10%; \*\* significant at 5%; \*\*\* significant at 1%**