Improving learning outcomes through information provision: Evidence from Indian villages

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Abstract

We study whether information provision improves students' academic performance in a setting where parents have incomplete information about their child's cognitive skills and there exist competing public and private providers of education. Contiguous village councils in the north Indian state of Rajasthan were randomly assigned to either a control or one of four treatment groups in which schools and/or parents were provided information through report cards on either intra or both intra and inter school performance of students in curriculum based tests. We find significant improvement in test scores of private school students by 0.31 standard deviations when information on both absolute and relative school quality is provided to households and schools but no impact when information on intra-school performance and to schools alone is provided. Close examination of the results suggest that these impacts were due to choice of better quality schools by private school students in the new academic year. Public school parents did respond by exercising school choice and lowering student absenteeism but saw no improvements in learning outcomes possibly because of constrained school choice set. Overall, our results suggest that information can be a cheap and effective tool for improving learning outcomes and accountability of service providers when households can exercise school choice.

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1. Introduction

Lack of accountability is often cited as a reason for the poor quality of public service provision in low income countries. This deficiency in public accountability is usually accompanied by poor awareness of entitlements by intended beneficiaries. In such a context, where insufficient accountability and awareness co-exist in the provision of education, learning outcomes of children in public schools is often inadequate. This inadequacy extends to private providers of education as well, exemplified by the large variation in private school quality in developing countries. In this paper we conduct a randomized control experiment in rural India, to assess whether and in what form reducing the information gap between the demand (parents) and supply (schools) side can lead to an improvement in students' learning outcomes in a market in which both public and private providers of education co-exist. Our research design allows us to study which side of the market is more responsive to information provision - households or schools - and the nature of information that can be effective in improving learning outcomes – absolute or relative school quality. Unlike most existing information interventions, we do not induce community dialogue or mobilization. This allows us to test whether private information alone can be an instrument for improving schooling outcomes.

Poor learning outcomes and low quality of teaching in public schools in India are widely acknowledged (Pratham, 2009).[1] Not surprisingly, private schools have mushroomed, reflected in a decline in enrolment in government schools in rural areas by almost 10 percentage points in 2014 (Pratham, 2014; Desai et al. 2009). While average learning outcomes in private schools are better than in public schools, there is considerable variation in the quality of these schools (Pratham (2009); Wadhwa (2009)). An often cited reason for this

[1] These schools have been found to have high teacher absenteeism with around 25% of teachers being found absent without leave on an average school day in a nation-wide survey of rural schools (Muralidharan and Kremer, 2006).

dismal scenario in the provision of education (both public and private) is that schools are not held accountable for their services because parents cannot correctly assess the quality of education being provided to their children (World Development Report (2004)).

We conduct a randomized control experiment in rural Rajasthan in which we randomly assigned villages to either a control group in which no attempt was made to bridge existing information gaps in the education market or one of four treatment groups. In each treatment either households or schools or both were provided a report card on the performance of students in curriculum based tests designed and administered by us. In the first treatment, only parents received a report card in which their child's absolute score in the tests, her rank in her grade and the average performance of her grade were given. In the second and third treatments, in addition to the parent report card, we provided schools with report cards as well. In the second treatment, we gave report cards to schools on the absolute performance of their students. We reported scores of all schools in the village council (a collection of 3-4 villages) in the school report card in the third treatment. In the fourth treatment, schools continued to get the report card with their absolute and relative performance in the village council but we added the schools' relative performance and the child's rank across all schools in the village council to the parental report card. Our intervention, unlike previous studies (Banerjee et al., 2010 and Andrabi et al., 2016) provided the report cards privately to both sides of the market, with no facilitation of discussions by the researchers.

Accountability programs that evaluate schools on the basis of student performance have a long history, originating mainly in the U.S., U.K. and Latin America (Figlio and Loeb,

2011).[2] The rationale behind school accountability programs is asymmetric information or the standard principal-agent problem - if the principal, i.e. the stakeholders in education (i.e. parents) are unable to assess the quality of education being provided by the agent (i.e. the schools) then educational outcomes may be poor because the agent's interests are not aligned with those of the stakeholder's. However, evidence on the effectiveness of school accountability programs on students' learning outcomes is mixed.

A review of the evidence on such programs in the U.S. by Figlio and Loeb (2011) concludes that '*although there is a positive association between school accountability and student achievement, it is far from universal*'. While some studies, primarily in the U.S. have found positive effects of these initiatives on students' learning outcomes (Wong et al. 2009; Jacob 2005; Ladd 1999) others suggest that perverse incentives can arise due to school accountability programs.[3] For instance, Figlio and Getzler (2006) find that the No Child Left Behind program led to schools in one state of the U.S. to classify low-performing students and those from poor socio-economic background as 'disabled' and transferred to special education programs. Similarly, Jacob and Levitt (2003) show that teachers in Chicago public schools responded to accountability pressures by fraudulently completing student examinations in an attempt to improve student outcomes. Thus, accountability programs could lead school

[2] Almost all states in the U.S. have instituted programs over the last couple of decades or more that reward or punish schools by linking teacher salaries, school autonomy and federal or state grants to students' performance in annual state-wide standardized exams (Figlio and Loeb, 2011).

[3] Wong, Cook and Steiner (2009) find positive effects of the No Child Left Behind program in the U.S. on student achievement in the fourth and eighth grades. Jacob (2005) finds positive trends in both math and reading scores following accountability reforms in Chicago. Ladd (1999) finds greater increases in pass rates in Dallas district after the district implemented accountability compared to other Texas districts. Other studies that have found a positive relationship between school accountability and student achievement are Figlio and Rouse (2006), Chiang (2007) and Rockoff and Turner (2008). The success of these programs are qualified by concerns related to 'teaching to the test' (eg: Koretz and Barron 1998). In general, the concern is that the focus of teachers shifts from long-term learning outcomes to short term performance on standardized tests.

managements to behave strategically in order to cross the learning thresholds set by these programs.[4]

While the literature on school accountability has until recently focused on the developed countries, new research in developing countries highlights the role of initiatives that fill the information gap between education providers and households. Providing information on schools' performance on standardized tests to local stakeholders can be expected to improve student learning outcomes through three accountability channels: *choice, participation and voice* (World Bank, 2004). Experimental evidence on such initiatives from developing countries has, however, been inconclusive. In a recent and well-known study, Andrabi et al. (2016) conduct a randomized experiment, spanning two academic years, in which parents and teachers in the treated villages in Pakistan receive report cards on students' performance in three commonly taught subjects in the middle of an academic year while no information was provided in the control group of villages.[5] Average test scores were higher in poorly performing schools with a larger increment in learning outcomes in private schools due to the treatment. In contrast, an experiment in Jaunpur district of the state of Uttar Pradesh in India in which the community was informed of the average village-level test scores in math and reading of students enrolled in public primary schools showed no evidence of improvement in learning outcomes (Banerjee et al., 2010). No improvements in reading levels was reported from a

[4] School accountability programs can reward or punish schools either explicitly (eg: by affecting teacher salaries) or implicitly (eg: affecting the market for education).

[5] Parents received two report cards. The first card included the child's individual score in each subject, his or her quintile rank in the village, and the average scores and rank for the child's school and for his or her village. The second card included the average scores for each school in the village, its quintile rank, and the number of students tested. Teachers received an additional card that included a disaggregation of the scores across subtopics—for example, word recognition and sentence building in English. The cards were delivered through discussion groups where it was explained how to interpret the cards. Schools and households were also explicitly informed that report cards will be distributed and discussed again a year later.

randomized study in Liberia where some communities were informed about average reading achievement using school report cards (Piper and Korda, 2011).

The findings of this limited research suggests that sanctions imposed by local communities on poorly performing schools, in the absence of explicit and credible punishments for low learning outcomes, do not always have a significant impact on school inputs. Moreover, the channels through which information provision improves student outcomes remain unclear. While Andrabi et al. (2016) find an increase in test scores of students' in private schools, there was no impact of the intervention on school choice or parental time allocation on children's education. However, schools raised investments, particularly in the more competitive markets, through hiring more qualified teachers and increased instruction time. Banerjee et al. (2010) find that providing information on the performance of local public schools did not have any impact on parental participation in community management of schools.[6] If parents cannot fully assess the quality of education in schools, then providing information may enable parents to choose a better school given their budget constraint. Evidence of this, too, is conflicting. For instance, Hastings and Weinstein (2008) provide evidence that low-income households in one public school district in the U.S. chose better schools for their children when school rankings were reported. On the other hand, Mizala and Urquiola (2013) find no impact on school enrolment when parents are informed about the gains in average school-level test scores in Chile's program of identifying effective schools, suggesting no impact on the school market. Andrabi et al. (2016) do not find any impact on school choice although private schools reduce tuition by 17 percent and increase primary enrollment by 4.5 percent.

[6] In contrast, Bjorkman and Svensson (2010) argue that health provider report cards led to a sharp decline in infant mortality due to an increase in provider e□ort in Uganda.

Our results provide strong evidence of a positive impact on learning outcomes even in the absence of any overt attempt to facilitate discussions, when information on both intra and inter-school performance is provided to both stakeholders – households and schools. But this holds only for students enrolled in private schools at baseline – there is no improvement in learning outcomes of public school students in any of the treatments. The finding suggests that providing information to the demand side of the market may be more relevant for improving outcomes. The improvement in learning outcomes was driven by treatment impacts in the more competitive markets, which suggests that school choice could be an important mechanism for improved learning outcomes. We collected information on students' choice of school a year from our intervention for a randomly chosen sub-sample through household surveys. Indeed, we find that private school students chose higher ranked schools in the fourth treatment. We do not see this effect in the other treatments. Households of public school students exercise school choice and lower student absenteeism in response to the intervention in the year following the intervention but they or the public schools or both are either resource constrained or do not have the incentives to improve learning outcomes in public schools. Interestingly, school mobility both within a year and over three academic years since the intervention, is significant in the more competitive education markets for all schools which suggests that markets can be leveraged to improve learning outcomes.

Our paper extends the emerging literature on policy measures for improving the learning outcomes in developing countries. First, our results suggest that providing information on relative school quality and to the demand side of the market could be integral for improving student learning outcomes. Second, while our results complement the findings of Andrabi et al. (2016), they also suggest that public schools' incentives should be redesigned to align them

with those of the households (Banerjee et al. 2008) - encouraging competition amongst public providers of education, by facilitating school choice, can potentially lead to better public school accountability in the long run. Finally, our experiment suggests that even in the absence of community pressures created through explicit dialogues between the service providers and households, information itself can be a powerful instrument for raising service quality.

The remainder of the paper is organised as follows. Section 2 provides the background, including the context and design of the intervention. Section 3 discusses the data and methodology. The results are analysed in Section 4. Section 5 concludes with policy recommendations.

2. Background

2.1 The context

Our study was conducted in the rural areas of Ajmer district in Rajasthan. Although the district is well connected with urban centers (62% of villages in the district have access to paved roads (Census 2011), it is quite poor. In 2009 daily rural wages in Ajmer were only Rs. 54 compared to the state average of around Rs. 70.[7] Moreover, the average literacy rate in this district was 59% in 2011, lower than the state average of 62% (Census, 2011). Inspite of the low levels of literacy and extant poverty, the population is aspirational - the growth of private school enrolment in this state has accompanied rapid urbanisation in Ajmer district. To elaborate, between 2006 and 2014, the percentage of children aged 6 to 14 enrolled in rural private schools increased from 25% to 42% (ASER, 2014). But issues of school quality abound – while

[7] World Food Program (2009) Report on Food Security in Rural Rajasthan. $1= Rs. 48 (approximately) in 2009.

65% of children enrolled in grade 5 in private schools could read a text meant for grade 2, the figure for public schools was 35% (Pratham, 2014).

Our sample consists of all villages in Srinagar panchayat samiti, a collection of village councils or panchayats, approximately the size of a census block, in Ajmer district of Rajasthan (see Figure A1).[8] In addition, 23 villages of the adjoining panchayat samiti, Kishangarh, which bordered Srinagar and were potentially a part of the education market of Srinagar, were also included, giving a total sample of 72 villages.[9] All public and private primary schools in each of the 72 villages were included in our study – a total of 159 schools (excluding schools which did not have any students enrolled in primary grades). The average number of primary schools -public or private- in a village was 2.2, suggesting the presence of a market for education. Every village had at least one or more public school with primary grades (grades 1 to 5) and more than half of our sampled villages had at least one private school. This is not accounting for the fact that children often enroll in schools outside their villages and there is rapid turnover in the market for private schooling (Kremer and Muralidharan, 2008).[10] Thus there were considerable schooling options for households.

[8] A cluster of village councils with close socio-economic ties form a panchayat samiti which forms a link between village councils and the state development authority. The panchayat samiti is responsible for implementation of development works including investments in primary education.

[9] Instead of randomly choosing villages, we covered all of them because of our expectation that information could expand the potential choice set to schools outside the village. We first confirmed that this is a possibility by a village survey in which we asked local o□cials to list all schools that children at the primary level attended. We found that at least some students in about 30% of villages attended primary schools outside the village but seldom outside the panchayat. The village list was obtained from the o□cial in charge of measuring land and demarcating boundaries (or patwari). 5 villages from Srinagar panchayat samite were excluded from our baseline because there were no students enrolled in our grades of interest (4 and 5) in these villages' public primary schools.

[10] The average age of a private school in our sample was 9.8 years as opposed to 39.4 years for public schools.

2.2 Study Design

Sample

The study was conducted in three rounds. Since the academic year begins in June, the baseline survey was conducted in August-September, 2011. We administered curriculum based language (Hindi and English) and Math tests to students enrolled in grades 4 and 5 in the 159 schools on the day of visit within school hours.[11]

We purposively focused on grades 4 and 5 for three reasons. First, these are the highest grades of primary education. Parents are at the point when they have to decide if a child should continue education to higher levels or not.[12] Therefore, they may be more sensitive to the quality of education and respond to new information on it. Second, these students would soon transition to secondary education and are therefore on the cusp of choosing a school. Studying these grades would allow us to analyse how households make school choices. Furthermore, we felt that these students were old enough to understand instructions and be able to take our tests in a classroom environment.[13]

We conducted a survey of households' economic status and parental perception of students' learning achievements for a sub-sample of 5 randomly selected students from each tested grade of all schools. Our household sample has a total of 1499 students. We also collected baseline information on observable village and school characteristics, such as pupil teacher ratio and teacher qualification.

[11] On average, we were able to test 83% of all students enrolled in a class on the day of the test. The curriculum taught in both types of schools are similar and most private schools use textbooks designed by the state education board.

[12] A study by the Ministry of Human Resource Development using a sample of public primary schools from 21 states found that while dropout rates are around 1% from grades 1 to 3, this figure increases to 3% and 7% for grades 4 and 5 respectively.

[13] We concluded this from the large-scale tests that ASER conducts for students of grade 3. These are administered at home and the test takes more the form of a personal interview between the student and the investigator.

We revisited all schools in 2014, three years since our baseline, to record whether each sampled child (at baseline) continued to be enrolled in the same school in 2011 or not. We were successful in tracking 85% of the students.

Test Instruments

Our curriculum based tests were designed by an NGO, Bodh Shikshan Samiti, based in Jaipur (the state's capital), which has worked extensively in the field of education in Rajasthan. The questions we use in our tests are from the NGOs question bank of assessment tests which were based on the curriculum of public schools in Rajasthan and tested for relevance to grades 4 and 5.

The instruments were designed to test proficiency in language (English and Hindi) and Math. Each test instrument consisted of 3 sections – Hindi, English and Math – in the order in which they appeared in the test booklet. The Hindi and Math questions were based on the curriculum of grades 1 to 3 while the English questions were from grades 1 and 2 curriculum. Since English is not the native language, we kept the threshold low for this language skill. Each question was designed to measure basic skills such as word construction, sentence construction and mathematical operations. For each skill being tested, questions asked were of increasing difficulty level. For instance, to test addition skill, we first included 1-digit addition, then 2 – digits (level to be acquired by grade 1 and grade 2 respectively) and finally 3-digit addition, with carry over. Each section began with the easiest question, i.e. questions that a student who has completed grade 1 should be able to solve, and moved on to the more difficult ones.
The test booklets for grades 4 and 5 differed, with questions appropriate for grade 3 forming a

relatively higher proportion of the total score for grade 5.[14] Students were allowed 30 minutes to complete each section of the test.

Unannounced visits to schools were made to administer the tests and all schools in a village were covered on the same day. All students present in a grade were given a booklet which had separate Hindi, Math and English sections. The field assistants would explain how to answer each question in their native language, Hindi, in a given section from solved examples in the booklet. To control for any instructor biases, a script of the instructions for the students was prepared and strictly followed by each instructor. The same script was followed in each round.[15]

Subsequent to the baseline tests, two more rounds of post-intervention tests were conducted in February-March, 2012 (same academic year, midline) and September-October, 2012 (in new academic year, endline).[16] Neither schools nor households were informed beforehand about the revisits. The timeline of the study and the sample sizes are described in Table 1. At midline and endline the test booklets contained the same questions as in the baseline but an additional question for each cognitive skill was added in the test booklets.[17] The

[14] Each question carried a score equal to its level, i.e. questions of level 2 carried a score of 2 marks. This was done to enable us to evaluate the quality of answers rather than the answers being correct or incorrect, particularly in language test. For example- in Hindi sentence construction the maximum score was 2 (since a child is expected to be able to write a simple sentence by grade 2). The child got the full score if she wrote a grammatically correct sentence using the word given. If the child wrote a sentence using the word correctly but it was grammatically incorrect overall, the child scored 1 point.

[15] Some students were tested at their homes during the post-intervention visits, it is possible that the performance of these students may be affected by change in test environment. We tried to follow the same protocol as in schools. An instructor would visit the student's home and request for permission to test the student. Students were tested alone and parents and family members were requested to not assist them in any way. Our results are unchanged when we include a dummy for 'tested at home' in our analyses.

[16] We do not expect schools to teach to the test because they were not intimated about the revisits neither were students provided answers to the test questions in any of the rounds (unlike Andrabi et al., 2016).

[17] Since there were additional questions in the follow-up rounds, we gave students 45 minutes to complete each section in the mid and endline.

weightage given to level 3 questions for each subject was marginally higher in the mid-line and end-line tests compared to the baseline. The test scores in each section were scaled over 100 to make it easier for parents to interpret the results.

Report Cards

Report cards on student performance were given to the households of the randomly selected 1499 students from the sampled schools and each of the 159 schools, following the baseline tests in October-November, 2011. We chose panchayats as the unit of randomization to control for spillover of information. Furthermore, we had established that students were more likely to attend schools inside their panchayats. Randomization at this level helped us to limit the possibility of contamination of treatments due to switching of students between treatment groups.

Table 2 describes the nature of the report cards and the sample size for each treatment. Parental report cards were of two types – (1) P1 reported the student's absolute performance in Hindi, English and Math as well as her relative performance by ranking her in her grade on the basis of her combined score in all three subjects. (2) P2 showed the relative performance of the student as in P1 and the relative performance of all students and schools in the panchayat based on combined scores, for the relevant grade. We plotted bars in ascending order of scores of all students in the panchayat and highlighted the child's position in the graph. Students of the same school were marked in identical colors which allowed parents to understand the ranking of every school in the panchayat. Thus, while the first report card allowed parents to assess their ward's performance within her school, the second helped them evaluate her learning levels relative to other students within and across schools.

School report cards were designed similarly. S1 reported the average, subject specific score for each grade in the school and the proportion of students at different levels of competence in reading, writing and numeracy in each grade at the school level. S2 showed the grade-averaged score in each subject of all schools in the panchayat. See Figures A2-A5 in the Appendix for details.

Our treatments were of 4 types in which we provided different combinations of parental and school report cards, with each treatment providing incrementally more information. In the control group no report cards were provided to either households or schools. In treatment T1, only parental report card P1 was given. In T2, parents received P1 while schools were provided S1 report cards. In T3, schools were informed of their absolute and relative performance in the panchayats through S1 and S2 while parents continued to receive information on their child's intra-school performance in P1. In T4, both parents and schools had information on intra and inter-school performance – P1 and P2 was given to parents while S1 and S2 were provided to the schools.

The difference between the post-intervention learning outcomes of the control group and T1 would inform us about the response of parents to receiving report cards on own effort and/or exerting greater pressure on their child's schools to deliver. The impact of T2, relative to the control group, would indicate whether parents respond in terms of own effort, pressure schools and/or whether schools respond by raising effort/selection of students if the report is unexpected. If we don't see any difference between the T1 and T2 it may suggest that schools do not respond to intra-school performance measures. This would be reasonable if the report cards do not provide school authorities with new information. The difference in learning outcomes between T3 and the control group would indicate the response of parents in terms of

own effort, pressure on schools and perhaps schools' response by raising effort/selection of students in response to the perceived performance of other schools in the market. If we find no difference between in the average test scores between T2 and T3 it would imply that schools do not respond to relative measures or that schools do not receive new information.

Finally, T4 would indicate the response of parents in terms of own effort, pressure on schools and also in terms of relative performance of students in other schools. So the expectation is that both parental and school response to inter school performance should be high since in this treatment there would be maximal information provided both in absolute and relative terms to the demand and supply sides of the market. If we find a difference in average student performance between T3 and T4 it would imply that parents respond to relative quality of schools by or exert pressure on schools to deliver or both.

Note that the household report cards were delivered to 5 randomly selected students' homes (the 1499 randomly selected households) by our surveyors who would discuss the report card in detail with parents or guardians, even though our report cards were designed for ease of self-comprehension. The report card was discussed in the presence of another educated adult family member often the elder brother or uncle if the parents were illiterate. The school report cards were handed over to the school principals.[18] Parents were informed if schools had received a report card or not but the details of the report card were not revealed to them. Similarly, we informed schools that some randomly selected students' parents had received

[18] Parents were informed if schools had received a report card or not but the details of this report card was not revealed to them. Similarly, although we informed schools that some parents received report cards, we did not identify them. However, parents could have shared their report cards with schools and other parents. This meant that even though we were targeting only some households, those parents who did not receive student report cards could easily use these to find out the average school performance. Similarly, teachers could ask students to show their report cards. Schools may even choose to disclose their report cards to parents. Field reports suggested that most schools knew what type of report cards were provided to parents but not vice-versa.

report cards without identifying them. We cannot discount the possibility that parents shared their report cards with schools and/or other parents and vice versa. Unlike previous work on school accountability where community discussions were organized by the researchers around the report cards, our intervention was private and minimal.[19] Any significant effects we find could, therefore, suggest that even in the absence of explicit community mobilization, information can lead households, schools or both to respond.

3 Data and Methodology

3.1 Data

Table 3 reports the individual, student level characteristics from the school and household data. In column 1 we show the average characteristics of the control group, while columns 2-5 show the difference between the control and each of the four treatment groups. The top panel reports characteristics from the school based sample of 5157 students. The panel below reports data from the random sub-sample of 1499 students whose household survey data were also collected.

The first four rows in panel 1 show that there are no significant differences in the raw baseline scores on standardized tests between the control and treatment groups. About half of our sample was male, in grade 4 and enrolled in a private school. However, T2 has significantly more male students than in the control group. In the bottom panel we find some significant differences in gender and age of children between T2 and T3 and the control groups. Eyeballing the figures, however, suggests that the students' individual and household

[19] Field reports suggested that most schools knew what type of report cards were provided to parents but not vice-versa.

characteristics are largely comparable across the groups. We reach similar conclusions when we compare the village and school characteristics in Table A1 in the Appendix, suggesting that the randomization was largely successful. Any significant differences indicate that the treatment group(s) was socio-economically weaker than the control group which would potentially bias the treatment effects downwards. In our empirical analysis, however, we control for observable differences at the individual, school and village level.

Private and public schools did not differ markedly on inputs in our study, yet diverge in terms of effectiveness. Table A2 in the Appendix shows that private and public schools were comparable in terms of size (school enrolment), infrastructure, training of teachers and pupil-teacher ratios. However, public schools were more likely to have a school management committee (SMC) consisting of parents and teachers, a larger share of non-local teachers and almost 10 times higher salary of teachers. Apart from being free, public schools are required to enroll every student who seeks admission. Yet accountability is potentially lower because households which had students enrolled in public schools were significantly less educated, financially more constrained, less aspirational and more likely to be non-participants in school affairs as suggested by Table A3.[20]

At the baseline, we also elicited parental perceptions of the children's learning levels in our study sample. Parents were asked if they thought that their child could perform a specific scholastic task or not. We then compared their perceptions of learning levels with the actual performance of their child on standardized tests administered by us at the baseline. Table A4 shows that parental perceptions, in both public and private schools, were significantly different

[20] Public school teachers tend to be well-trained but teacher absenteeism is notorious in the public schooling system. On the other hand, private schools can select students and charge tuition. Yet, their operating costs may be low because of lower teacher salaries (Kingdon (1996), (Muralidharan and Kremer, 2006)). Teachers in these schools are almost always contractual and more likely to be locally appointed.

from actual learning levels of their children but the gap between expectations and actual performance was larger for parents whose ward was in a public school. Parents whose children were enrolled in public schools also had lower expectations across all tasks than those in private schools. This suggests significant gaps in households' information about existing educational attainment.[21]

3.2 Methodology

Since our study design uses randomized allocation of treatments, we can infer treatment effects by comparing the post-treatment average test score between control and treatment groups. The outcome variable of interest for us is students' overall test score post-treatment. To enable us to compare scores across grades and rounds, we use normalized test scores. We normalize baseline scores to the population mean and standard deviation for each subject and grade. For instance, baseline grade 4 scores in Hindi are normalised with respect to grade 4 mean and standard deviation for Hindi. To normalise the combined score, we use the population mean and standard deviation of the raw combined score. In the post-intervention rounds, we normalise with respect to the mean and standard deviation of the control group since we do not expect the distribution of this group to alter due to our treatments.

Our main estimating equation is given by,

$$Y_{isp} = \alpha + \sum \beta_k T(k)_p + \varphi Y^0_{isp} + \mathbf{Z}_{isp} + \varepsilon_{isp} \qquad (1)$$

[21] While both types of schools claim to provide some information on their child's academic performance. Public schools do not provide 'report cards'. Instead they are expected to hold annual/bi-annual meetings where the student's performance is to be discussed with parents. However, household participation in these meetings is often dismal. Private schools, on the other hand, provide some form of report cards but there is no standardization. But a typical report card contains information on the score of the child in various subjects, with almost no information on child's ranking within her grade. Some are in English, making it hard for parents whose children are first generation school goers difficult to comprehend.

Here Y_{isp} is the score of student *i* in school *s* in panchayat *p* at the endline. T_p takes value 1 if school *s* in panchayat *p* is in treatment group *k*=1,2,3,4. The control group forms the reference. Following Todd and Wolpin (2003) and Andrabi et al. (2011), we include Y^0_{isp} or the baseline score of student *i* as a control variable. Gains in test scores are determined by not only educational inputs in that period but also the entire history of inputs that provided the basic knowledge. Having the baseline score as an independent variable accounts for the achievement that the student already has. ε_{isp} is the idiosyncratic error term. The causal effect of the treatment, relative to the control group, is given the coefficients of $T(k)_p$. While the coefficients of each treatment variable would indicate the impact of the treatment compared to the control group, we can estimate the value-added by the additional information in each treatment as well by comparing the coefficients between treatments.

Since we see some differences in baseline characteristics between the control and treatment groups we analyse equation (1) with controls for student, school and village characteristics or vector $\mathbf{Z}_{isp}$. It includes the gender and grade of the student, school characteristics - baseline pupil-teacher ratio, school's total enrollment in primary grades, school type (highest grade level), village characteristics - female literacy rate, distance to town and proportion of SC (scheduled caste) population and a dummy for village development block. Standard errors are clustered at panchayat level. Throughout, we conduct our analysis separately for private and public schools. In each round, we restrict our sample to students present at the baseline and endline across159 schools sampled at baseline.

Of the random sub-sample of 1499 students who were purposively tracked, 1404 were retested and their households re-interviewed. But our main concern is with high levels of student attrition in the school based sample. The proportion of students we are able to re-

administer the test to from the baseline was 58%, resulting in a 42% attrition rate. The probability of a student dropping out of the sample was systematically correlated with her observable characteristics. In particular, students with lower baseline scores were more likely to attrit, raising concerns about upward biased estimates (see Table A5 in the Appendix). We discuss and address attrition concerns in our sensitivity analyses in later sections.

4. Results

4.1 Learning

We first report the mean, difference-in-difference estimate of the impact of each treatment on the learning outcomes at endline in Table 4. The top panel reports the single difference in the mean total, z-score between each treatment group and the control group at baseline (column 1) and endline (column 2) for the private schools. Column 3 reports the mean difference-in-difference estimate. The bottom panel reports the same mean estimates for the public schools. Column 3 suggests that while there was no improvement in the learning outcomes of children enrolled in public schools in any of the four treatments, there was a significant improvement in the learning outcomes of students in private schools between the baseline and endline, compared to the control group of children.

In Table 5, we control for individual, school and village characteristics and estimate equation (1). Column 1 shows the results for private schools while column 2 for public schools. In the bottom panel, we report the F-stats of tests of significance. The sample includes the students who were present both at baseline and endline. Looking at the results for private schools in column 1, we find that test scores improved by 0.308 SD in T4. We do not find any impact of the other treatments. Our treatment variables are, however, jointly significantly different from zero in the bottom panel (p value=0.001). Looking at the p-values

of the incremental impacts in the bottom panel, we see that the point estimate on T4 is significantly different from T3. None of the treatments, however, had a significant impact in public schools, individually or jointly. These results are in line with our observation in Table 4 above.[22]

We calculate the Hirschman-Herfindahl Index (HHI) of concentration of student enrolments in primary grades within a panchayat and classify schools into those that operate in more (greater than median value of HHI) and less (lower than median value of HHI) competitive markets in Table 6. The improvement in learning outcomes due to the intervention is significant in the more competitive education market for private schools as shown by the coefficient on T4 in column 2. We do not find any significant effects of T4 by market competition for public schools, although the point estimates are significantly different between columns 3 and 4.[23]These findings suggest that learning outcomes improved in markets where parents had more school choice.

4.2 Mechanisms - school choice and attendance

We use the household sub-sample of 1499 students who were purposively tracked to study the direct impact of report cards on school choice in the new academic year or at the endline in

[22] None of the treatment coefficients are significant for public and private schools at midline. This is expected since only 2 to 4 months would have lapsed between report card distribution and midline test, with a month of winter vacations in between. See analysis of balanced panel between midline and endline in Table A6 in the Appendix.

[23] We do not find heterogeneity in outcomes by language or math when we break up the aggregate effect into performance in each of the three subjects in Table A7. Although the point estimates are not significantly different from each other, the coefficient on T4 is the largest and statistically more significant than for English and Math. We also do not find any significant heterogeneity in the response to the intervention when we classify either students or schools into below and above median performers at the baseline. Table A8 in the Appendix shows no significant difference in the impact of T4 on student performance between low and better performing students or schools, although we do find a marginally significant effect of T2 on above median performers in public schools.

2012. Since our sample is small and all treatment groups received some form of a report card, we look at both the combined effect of all treatments and the effect of T, specifically, on school choice. We define school choice either at the individual level - 1 if the child is enrolled in a school different from the one at baseline and 0 if the school is unchanged from the baseline – or at the school-grade level. The dependent variable in the latter case is the proportion of children in a school grade at baseline who changed schools at endline. This includes students who may have switched to schools in our sample as well as those who may have chosen urban schools not included in our sample. Since students in grade 5 of primary-only schools would have changed schools even without our treatments, we exclude these grades from our analysis.

The results, using equation (1), but with the dependent variable representing school choice measures, is reported in Table 7. Columns 1-2 and 5-6 report individual level analysis while columns 3-4 and 7-8 report the results from the school-grade analysis. We conduct the analysis separately for private and public schools, as previously. In column 1 (5), when we control for student level characteristics, we find that a child in private (public) school is 6.8 (4) percentage points more likely to change schools due to the treatments but this effect becomes insignificant when we include the full set of controls in column 2 (6). The point estimates are larger and more significant at the school-grade level. In these analyses either the separate effect of T4 is insignificant or only marginally significant at 10% level. More interestingly, we find that the probability that a child shifted to a higher ranked school (measured by school's performance at baseline), increase by 7 percentage points in a private school due to T4 while there was no effect on public school students (columns 5 and 9). Our results, thus, suggest that while private school students were more likely to exercise *better* school choice due to the intervention, even public school students responded but due to income constraints their choice

set may have been restricted to public schools alone.

In the 2014 academic year – 3 years after our initial intervention in 2011- we tracked the enrolment status of all students in the baseline through the records of the schools they were enrolled in in 2011. We find strong effects on school mobility in the more competitive markets – both in 2012 (in the short run) and in 2014 (in the long run) as shown in Table 8. Columns 1-4 show the results for all schools in 2012 (columns 1-2) and 2014 (columns 3-4). The probability that a child switched schools due to the treatment is significant in panchayats with higher than median HHI in 2012 as shown in column 2. Ironically, this seems to be driven by public schools (column 10). But when we tracked all baseline students in 2014, we find that the impact of T4 on mobility was significant for private school children in high HHI panchayats, although the overall impact of treatment is also significant for public schools (Table 9, column 4). Thus the short-run treatment effects on school choice remarkably persisted in the long-run.[24]

Next, we analyse the response of households to the treatment through student absenteeism in Table 10. We define a child having lower absenteeism (=1) if the child was absent at midline but present at endline. The comparison group is students who were absent both at mid and endline (=0). Interestingly, we find an 8.54 percentage points reduction in absenteeism from the midline to the endline among public school students but no impact in private schools. This was expected, given that public school absenteeism rates are higher, but it also suggests that better informed households responded to their perceptions being higher than actual skills of their wards by ensuring more regular school attendance.

We do not find evidence of an overall response by schools to our interventions on dimensions such as school infrastructure or teacher recruitment or effort as perceived by

[24] We obtained reliable information on whether the student continued to be enrolled in the same school in 2014 as in 2011 or not through teacher interview. Our dependent variable, hence is different from the 2012 tracked sample.

households. However, in the more competitive education markets household expenditure on schooling for the sampled child increased due to T4 in private schools while parental effort increased due to T4 for public school students (results available on request). This, together with our finding on school choice suggests that the main mechanism that led to improved outcomes was greater household responsiveness and the shift to better quality schools by private school students in response to the treatment. Although public school students did respond by exercising school choice and lowering absenteeism it did not translate into better learning outcomes probably because their school set was restricted due to constrained budgets.

Overall, our results suggest that learning outcomes improved significantly when information on relative school quality and to both sides of the market was provided. The absence of any significant effects of other treatments suggests that information on how a child is performing relative to other students *within* the same school may not be sufficient for improving learning outcomes. This may be because the full information set – performance of children in the entire market for education – is missing. It also points, potentially, to the necessity of providing this information to the demand side of the market. Schools alone may either not have the incentives or the resources to respond to new information. The results on school choice suggest that households can leverage the market to create pressure on service providers to improve delivery in the long run.

4.3 Sensitivity analyses

Our estimates from equation (1) are likely to be biased as we have non-random attrition. We use two methods to address this concern. First, we use inverse probability weights suggested by Moffit et al. (1999) and Baulch and Quisumbing (2010) to correct for the attrition determined

by observables. Intuitively, this method gives more weightage to students who are similar on baseline observables to attriters than to students who stay in the sample.[25] The results are reported in Table 11. Our overall finding of significant effect for private schools and no impact on the learning outcomes of public school students is not only upheld, the results are much stronger. The coefficients on all treatments is significant but largest for T4. This suggests that our estimates from equation (1) in Table 5 were downward biased.

However, inverse probability weights would only correct for attrition determined by observable characteristics. If there is selection on unobservables, this method would be inadequate. As a second robustness check, therefore, we estimate a method proposed by Lee (2009) to estimate lower and upper bounds on treatment effects by trimming the sample to a common support across all treatments. This ensures that treatment groups are comparable on observables. The results are reported in the bottom panel in in Table 11. The Lee bounds give us an interval of lower bound and upper bound estimates. The interval of T4 shows that the both the lower and upper bound estimates are statistically significant. Moreover, our estimate from equation (1) of 0.308 standard deviations falls within this interval.

To address concerns that high intra-cluster correlation coupled with small clusters in our study would lead to low power we use the method proposed by Cameron, Gelbach and Miller (2008) (henceforth, CGM). The usual solution for within cluster correlations has been calculating cluster-robust standard errors. However, the presumption that these standard errors is correct is based on having a large number of clusters. CGM (2008) propose cluster bootstrap procedures for calculating correct standard errors with small clusters, between 5 to 30. We report results of CGM bootstrap method in Table 12. Our results are remarkably

[25] We use the built-in STATA command 'teffects ipw' along with our full set of control variables to implement this method.

similar to those reported in Table 5.

5 Conclusions

In this study, we investigate whether the quality of education can be improved by providing information on student performance to parents and schools in the market for schooling. We varied report cards by recipient (parents or schools) and whether information on intra and inter school quality was bundled or not. We then analysed the response of recipients by studying the performance of students in subsequent academic year and school choice in the long run.

We find starkly different impacts on learning levels of children enrolled in private and public schools and by type of information. Test scores improved significantly when we informed parents of the position of their child relative to all others students in the panchayat as well the relative effectiveness of every school. Schools received information both on their own students' performance and the average school performance relative to others in the panchayat. We do not find any impacts when only intra-school performance or information to schools alone is provided.

What factors could potentially explain our results? First, making the relative performance of every school explicit to parents may increase pressure on schools to improve quality. Since parents may share their report cards with schools, we can make the assumption that schools knew the kind of report cards being given to parents. In a scenario where there are ample schooling options and public schools are free, this would put pressure on poorly ranked private schools to improve quality. However, we do not find any evidence of improved school inputs. Second, parents may increase their own and their child's effort towards learning. This could take the form of better monitoring as well as reallocating household inputs to a child's

education such as private tuitions. In this study, we observe that there was an increase in the regularity of school participation of students as a result of our report cards. Third, there is some evidence to indicate that parents chose higher ranked schools which could lead to better outcomes. Overall, the weight of our results on school choice supports this mechanism as an explanation of the observed improvement in learning outcomes in private schools.

The absence of any significant improvements in test scores where schools alone are informed of their relative positions in the panchayat is not surprising. Panchayats on average had 5 schools while the average rank of private schools was 1.8. Given their high rank in a panchayat, these schools may choose to compete on margins other than quality. This may offset the positive impact of the parental report cards. Our results are similar to Andrabi et al. (2014) who show that private schools with high academic scores respond by increasing fees in response to an information campaign in Pakistan. Another possible explanation would be that there was no new information for service providers - schools already have a fair idea about their relative rankings in the panchayat and we did not add to their information set. The interpretation of this result would also depend on the latent competitiveness in the school market. We find that the overall learning effects were driven by students' performance in more competitive education markets. A significantly higher proportion of students changed schools when parents had more school choice or when the market was more competitive, and these effects persisted in the long-run. However, we do not see any significant improvements in the rank of the new schools chosen by public school students. Although it may seem that parents were not choosing better schools, we can argue that this is because students in public schools face hard budget constraints.

We see no significant improvement in test scores of public school students. This

finding echoes Banerjee et al. (2010) who find no effect of community level information campaigns on public school learning outcomes. Apart from lack of market pressures, the ability of public schools to improve services may be limited as public school have little control on the choice of teachers and reallocation of schools resources. However, our results suggest that leveraging the market, either by creating competition within the public school system or across school types (viz. through vouchers) could be an effective policy instrument in the long run.

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Table 1: Timeline of study

Date	Round	Data	Sample
Jul, Aug, Sept, 2011	Baseline	72 villages Village survey School survey Household survey Student test scores	159 schools 1499 households 5157 students
Oct, Nov 2011	***Report card intervention***		1499 households 159 schools
Feb, Mar 2012	Midline	Student test scores	4000 baseline students
Aug, Sep, Oct 2012	Endline	School survey Household survey Student test scores	159 baseline schools 1404 baseline households 2983 baseline students

Table 2: Description of report cards

	Control	T1	T2	T3	T4
Report card recipient			**Type of report card**		
Household	None	P1	P1	P1	P1 and P2
School	None	None	S1	S1 and S2	S1 and S2
Number of schools	35	29	37	28	30
Public	18	16	26	16	20
Private	17	13	11	12	10
Number of students	1064	860	1319	918	996
Public	523	499	858	486	599
Private	541	361	461	432	397

P: parental report card; S: school report card
P1: (i) Child's score by subject (ii) Child's total score relative to all students in her class. (iii) Graph showing total score of all students in class.
P2: (i) Child's total score relative to all students in the panchayat (ii) Graph showing total scores of all students in the panchayat with each school marked out.
S1: (i) Average score by subject and grade (ii) Percentage of students correctly answering each question by grade.
S2: (i) Average score of schools in the panchayat in Hindi, Math and English, by grade.

Table 3: Child characteristics at baseline

		Treatment - Control			
	Control	**T1**	**T2**	**T3**	**T4**
	(1)	(2)	(3)	(4)	(5)
Individual characteristics	(N=1064)	(N=859)	(N=1319)	(N=918)	(N=995)
Overall raw test score	64.72	-8.66*	-5.23	-5.58	-2.64
	(2.422)	(4.527)	(4.430)	(5.910)	(2.802)
Hindi raw test score	27.77	-3.73*	-2.38	-3.06	-1.78
	(1.070)	(1.871)	(2.089)	(2.645)	(1.266)
Math raw test score	18.71	-1.96	-0.68	-0.99	-0.25
	(0.720)	(1.269)	(1.096)	(1.552)	(0.812)
English raw test score+	17.84	-2.87*	-2.10	-1.59	0.73
	(0.901)	(1.557)	(1.484)	(1.798)	(0.100)
Enrolled in private school	0.51	-0.09	-0.16	-0.04	-0.11
	(0.059)	(0.085)	(0.102)	(0.132)	(0.079)
Male child	0.54	0.10***	0.06*	0.05	0.00
	(0.024)	(0.036)	(0.034)	(0.041)	(0.035)
Child enrolled in grade 4	0.53	-0.03	-0.01	-0.02	-0.01
	(0.018)	(0.026)	(0.032)	(0.023)	(0.036)
Individual and household characteristics					
	(N=327)	(N=273)	(N=346)	(N=263)	(N=291)
Male child	0.50	0.07*	0.06**	0.04	0.01
	(0.022)	(0.040)	(0.027)	(0.044)	(0.100)
Age of child	10.71	-0.11	-0.11	-0.42**	-0.24
	(0.108)	(0.170)	(0.124)	(0.150)	(0.162)
Child enrolled in grade 4	0.50	0.01	0.02	-0.01	0.01
	(0.010)	(0.015)	(0.014)	(0.013)	(0.013)
Household head's education	1.94	-0.15	-0.07	-0.05	0.08
	(0.168)	(0.209)	(0.225)	(0.240)	(0.246)
Household head daily wage worker	0.47	-0.04	0.00	0.05	0.01
	(0.044)	(0.065)	(0.054)	(0.069)	(0.064)
Household's wealth index	4.89	0.14	-0.06	-0.07	-0.24
	(0.145)	(0.218)	(0.162)	(0.213)	(0.267)
Household's education expenditure	1874.02	-0.365.55	-458.90	-482.76	-294.48
	(224.113)	(247.665)	(268.303)	(295.825)	(469.348)

Note: Column 1 shows the means for the control group while columns 2 to 5 show the difference of the treatments from the control. The top panel reports data from the entire sample of children. The lower panel reports characteristics from the subsample of 1499 children whose households were surveyed. Household head's education is a continuous variable with the following codes: 0= Illiterate, 1 =Literate but no formal schooling, 2 = Grades 1-5, 3= Grades 6-12, 4= Graduate or Professional degree. The wealth index is a score out of 10 for the following household assets: draft animal, cattle, four wheeler, fridge, telephone/mobile, TV, productive assets, *pucca* house, electricity and tap water. The English test score excludes level 3 which was not administered to grade 4 students. Standard errors clustered at panchayat level in parenthesis. Significant at *** 1% **5% *10%.

Table 4: Difference-in-difference impact of report cards on standardized test scores

Treatment	Treatment - Control		Difference
	Baseline	Endline	
	(1)	(2)	(1) – (2)
	Private Schools		(N=1338)
T 1	-0.040	0.081	0.122*
			(0.063)
T 2	-0.088	0.051	0.139**
			(0.061)
T 3	-0.171	-0.190	-0.019
			(0.059)
T 4	0.178	0.279	0.101*
			(0.059)
	Public Schools		(N=1658)
T 1	-0.319	-0.355	-0.036
			(0.089)
T 2	0.040	-0.046	-0.085
			(0.077)
T 3	-0.114	-0.247	-0.133
			(0.086)
T 4	0.065	0.032	-0.033
			(0.085)

Note: Standard errors in parentheses. Significant at *** 1% **5% *10%.

Table 5: Impact of report cards on standardized test scores in the new academic year

	Private	Public
	(1)	(2)
T 1	0.129	-0.100
	(0.133)	(0.162)
T 2	0.111	0.009
	(0.147)	(0.167)
T 3	-0.020	-0.038
	(0.100)	(0.139)
T 4	0.308***	-0.047
	(0.108)	(0.104)
Baseline z - score	0.584***	0.598***
	(0.046)	(0.048)
Constant	-0.809**	-0.157
	(0.335)	(0.566)
Joint Significance	6.148	0.197
	[0.001]	[0.938]
T1=T2	0.038	0.522
	[0.848]	[0.476]
T2=T3	1.585	0.069
	[0.218]	[0.795]
T3=T4	23.69	0.004
	[0.000]	[0.953]
Controls	Yes	Yes
N	1338	1658
R^2	0.368	0.280

Note: Standard errors, clustered at panchayat level, in parentheses. P-values of F-stats in square brackets. Controls include child's grade and gender, school characteristics- pupil-teacher ratio, highest grade taught, total enrolment, village characteristics - female literacy rate, distance to town, proportion of SC population and a dummy for census block. Significant at *** 1% **5% *10%.

Table 6: Impact of report cards on standardized test scores in the new academic year by school competition within panchayat

	Private		Public	
	Below median competition	**Above median competition**	**Below median competition**	**Above median competition**
	(1)	(2)	(3)	(4)
T 1	0.246	0.232	-0.407**	0.0647
	(0.163)	(0.143)	(0.164)	(0.125)
T 2	0.135	0.214	-0.160	0.0586
	(0.192)	(0.161)	(0.177)	(0.194)
T 3	0.167*	0.0287	-0.357**	0.103
	(0.0913)	(0.0726)	(0.141)	(0.328)
T 4	0.0426	0.399***	-0.293	0.101
	(0.192)	(0.0848)	(0.168)	(0.116)
Baseline score	0.636***	0.510***	0.574***	0.664***
	(0.0709)	(0.0489)	(0.0765)	(0.0594)
Constant	0.272	-0.381	1.236***	0.688
	(0.337)	(0.321)	(0.312)	(0.588)
t test of equality of coefficient on T4				
Below median = Above median	-0.356*		-0.395**	
	(0.203)		(0.198)	
Controls	Yes	Yes	Yes	Yes
N	635	703	836	822
R^2	0.436	0.296	0.298	0.321

Note: School competition is measured by calculating the Hirschman-Herfindahl Index of concentration of student enrolment in primary grades. Standard errors clustered at panchayat-level are in parenthesis. P-values of F-stats in brackets. Significance *** 1% **5% *10%.

Table 7: Impact of report cards on standardized test scores in the new academic year report cards on school choice

	Private					Public				
	Student level		School-grade level		School rank	Student level		School-grade level		School rank
	(1)	(2)	(3)	(4)		(5)	(6)	(7)	(8)	
Treatment	0.068*	0.024	0.100**	0.047		0.040*	0.036	0.069***	0.065*	
	(0.033)	(0.032)	(0.045)	(0.038)		(0.021)	(0.025)	(0.024)	(0.035)	
T1-T3					0.023					-0.017
					(0.042)					(0.027)
T4					0.070*					0.036
					(0.040)					(0.038)
Constant	0.116***	0.183	0.072**	0.101	0.069	0.014	0.009	-0.000	-0.0485	0.0041
	(0.038)	(0.110)	(0.030)	(0.128)	(0.121)	(0.020)	(0.068)	(0.019)	(0.119)	(0.064)
Student level controls	Yes	Yes	-	-	Yes	Yes	Yes	-	-	Yes
School and village	No	Yes	No	Yes	Yes	No	Yes	No	Yes	Yes
N	525	525	111	111	525	747	747	161	161	747
R^2	0.018	0.078	0.033	0.249	0.056	0.011	0.028	0.040	0.097	0.033

Note: Treatment is a dummy variable that equals 1 if the unit was in T1, T2, T3 or T4 and 0 if it was in the control group. The dependent variable is dichotomous and equals 1 if the child has changed school between baseline and endline and 0 if there was no change or the child dropped out in columns 1-2 and 5-6. The dependent variable is the proportion of students who changed schools at endline in a grade in a school in columns 3-4 and 7-8. The dependent variable in columns 5-9 equals 1 if the rank of the student's school, based on performance in the standardized test at baseline, was higher than school chosen at baseline, and 0 otherwise. The sample is restricted to tracked students. Full set of controls included. OLS regressions. Standard errors clustered at panchayat-level in parenthesis. Significance *** 1% **5% *10%.

Table 8: Impact of report cards on standardized test scores in the new academic year on school choice by school competition within panchayat

	All schools				Private				Public			
	2012		2014		2012		2014		2012		2014	
	Below median	Above median	Below median	Above median	Below median	Above median	Below median	Above median	Below median	Above median	Below median	Above median
	(1)	(2)			(3)	(4)			(5)	(6)		
Treatment	-0.003	0.119***	-0.074	0.140***	-0.001	0.081	-0.054	0.286*	-0.014	0.116***	-0.052	0.080**
	(0.038)	(0.036)	(0.054)	(0.040)	(0.050)	(0.059)	(0.067)	(0.154)	(0.044)	(0.030)	(0.071)	(0.031)
Constant	0.111*	-0.075	-0.618***	-0.895***	0.226*	-0.005	0.020	-1.163**	0.079	-0.170	-0.761***	-0.860***
	(0.058)	(0.099)	(0.109)	(0.115)	(0.113)	(0.162)	(0.498)	(0.472)	(0.060)	(0.112)	(0.140)	(0.140)
All controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	542	730	1890	2397	222	303	860	933	320	427	1030	1464
R^2	0.0115	0.0812	0.0273	0.0301	0.0319	0.138	0.0794	0.0446	0.0255	0.0738	0.0181	0.0215

Note: The dependent variable is dichotomous and equals 1 if the child has changed school between baseline and endline and 0 if there was no change or the child dropped out. The student sample is restricted to tracked students in 2012. The dependent variable is dichotomous and equals 0 if the child is in the same school between baseline and endline and 1 if the child is not in the same school in 2014.School competition is measured by calculating the Hirschman-Herfindahl Index of concentration of student enrolment in primary grades. Standard errors clustered at panchayat-level in parenthesis. Significance *** 1% **5% *10%.

Table 9: Impact of report cards on standardized test scores in the new academic year report cards on change in enrolment status by school competition within panchayat (2014)

	All schools		Private		Public	
	Below median	**Above median**	**Below median**	**Above median**	**Below median**	**Above median**
	(1)	(2)	(3)	(4)	(5)	(6)
T1	-0.0445	0.0965**	0.133*	0.0684	-0.168**	0.0822**
	(0.0447)	(0.0419)	(0.0659)	(0.189)	(0.0740)	(0.0379)
T2	-0.190***	0.121**	-0.228**	0.317	-0.0713	0.0837*
	(0.0580)	(0.0435)	(0.101)	(0.186)	(0.0919)	(0.0452)
T3	0.0661	0.0892	0.0964**	0.0502	0.0126	0.0853**
	(0.0602)	(0.0522)	(0.0424)	(0.109)	(0.0726)	(0.0379)
T4	-0.293***	0.197***	-0.754***	0.288**	-0.0518	0.0709
	(0.0718)	(0.0451)	(0.123)	(0.113)	(0.0808)	(0.0628)
Constant	-0.669***	-0.901***	-0.874**	-0.912**	-0.729***	-0.855***
	(0.120)	(0.108)	(0.370)	(0.382)	(0.164)	(0.147)
All controls	Yes	Yes	Yes	Yes	Yes	Yes
N	1890	2397	860	933	1030	1464
R^2	0.069	0.036	0.190	0.0761	0.027	0.022

Note: The dependent variable is dichotomous and equals 0 if the child is in the same school between baseline and endline and 1 if the child is not in the same school in 2014. School competition is measured by calculating the Hirschman-Herfindahl Index of concentration of student enrolment in primary grades. Standard errors clustered at panchayat-level in parenthesis. Significance *** 1% **5% *10%.

Table 10: Impact of of report cards on student absenteeism in the new academic year

	Private	**Public**
	(1)	(2)
Treatment	-0.0690	0.0854**
	(0.0676)	(0.0401)
Baseline score	0.116***	0.0113
	(0.0330)	(0.0250)
Constant	0.598***	0.179
	(0.200)	(0.138)
All Controls	Yes	Yes
N	367	784
R^2	0.141	0.045

Note: The dependent variable takes value 1 if the child was absent at midline but present at endline. The comparison group is students who were absent at mid and endline. Standard errors clustered at panchayat-level in parenthesis. Significance *** 1% **5% *10%.

Table 11: Impact of report cards on standardized test scores using Inverse Probability Weights and Lee bounds

	Private				**Public**			
	Inverse Probability Weights							
	N=1338				N=1658			
	T1	T2	T3	T4	T1	T2	T3	T4
	0.420	0.329	0.241	0.487	-0.062	-0.054	-0.135	-0.095
	(0.115)	(0.107)	(0.111)	(0.118)	(0.301)	(0.077)	(0.109)	(0.093)
	Lee bounds							
Lower bound	-0.0125	-0.0743	-0.349***	0.163**	-0.529***	-0.118	-0.395***	-0.143
	(0.080)	(0.123)	(0.097)	(0.068)	(0.144)	(0.109)	(0.134)	(0.135)
Upper bound	0.266***	0.0935	0.132	0.486***	-0.232*	0.0635	0.0116	0.149
	(0.087)	(0.086)	(0.109)	(0.060)	(0.127)	(0.127)	(0.154)	(0.117)
N	902	1002	973	938	1022	1381	1009	1122

Table 12: Impact of report cards on standardized test scores in the new academic year (CGM correction of S.E.)

	Private	Public
	(1)	(2)
T 1	0.120	-0.115
	(0.169)	(0.203)
T 2	0.098	0.012
	(0.192)	(0.321)
T 3	-0.029	-0.035
	(0.105)	(0.137)
T 4	0.310**	-0.052
	(0.155)	(0.114)
Baseline z - score	0.584***	0.608***
	(0.000)	(0.000)
Constant	-0.160	0.325
	(0.317)	(0.333)
Controls	Yes	Yes
N	1338	1658
R^2	0.368	0.277

Notes: Controls, as elucidated in Table 5. Bootstrapped, clustered standard errors reported in parentheses. Significant at *** 1% **5% *10%.

Appendix

Table A1: Village and school characteristics at baseline

		Treatment - Control			
	Control	**T1**	**T2**	**T3**	**T4**
	(1)	(2)	(3)	(4)	(5)
Village characteristics	(N=15)	(N=13)	(N=16)	(N=13)	(N=15)
Number of households	354	-47.92	-47.00	-44.08	-94.80
	(78.364)	(82.169)	(87.366)	(85.682)	(88.443)
Female literacy rate	0.30	-0.07	-0.01	0.02	-0.08*
	(0.036)	(0.049)	(0.077)	(0.048)	(0.042)
Distance to town	12.47	0.92	4.03	2.23	2.87
	(1.979)	(4.036)	(3.660)	(4.387)	(2.410)
Proportion of SC population	0.12	-0.03	-0.02	-0.02	0.02
	(0.019)	(0.025)	(0.029)	(0.024)	(0.025)
Number of private schools	1.13	-0.13	-0.51	-0.29	-0.47
	(0.357)	(0.439)	(0.393)	(0.441)	(0.426)
School characteristics	(N=35)	(N=29)	(N=37)	(N=28)	(N=30)
Private school	0.49	-0.04	-0.19**	-0.06	-0.15
	(0.068)	(0.095)	(0.090)	(0.137)	(0.103)
Monthly teacher salary (Rs.)	19261.09	-4549.67	-4228.60	-5510.87	-4219.19
	(6741.121)	(6850.155)	(6996.064)	(7152.688)	(6928.337)
Annual school tuition (Rs.)	755.09	-271.50	-184.64	-249.74	-19.88
	(158.356)	(194.637)	(249.061)	(202.536)	(280.305)
Proportion of graduate teachers	0.83	-0.08	-0.12**	-0.02	-0.07
	(0.033)	(0.072)	(0.053)	(0.051)	(0.062)
Proportion of local teachers	0.25	-0.05	-0.01	-0.08	0.01
	(0.066)	(0.092)	(0.082)	(0.085)	(0.086)
Total enrolment in school	204.63	-19.25	-2.14	-9.13	1.44
	(14.495)	(22.532)	(20.679)	(34.441)	(30.219)
Pupil-teacher ratio	28.24	2.02	6.47***	3.18	3.07
	(1.055)	(3.045)	(1.658)	(2.200)	(2.380)
Presence of SMC in school	0.89	-0.14	-0.07	-0.14	-0.10
	(0.037)	(0.096)	(0.068)	(0.097)	(0.072)
Grade level	2.03	-0.20	-0.35**	-0.24	-0.03
	(0.154)	(0.192)	(0.167)	(0.169)	(0.182)
School infrastructure index	3.69	-0.41**	-0.50***	-0.47**	-0.45***
	(0.094)	(0.160)	(0.135)	(0.220)	(0.142)

Notes: This table shows the balance of baseline characteristics of 72 villages and 159 schools. Column 1 shows the means for the control group while columns 2 to 5 show the difference of the treatments from the control. SMC – school management committee. Grade level is a continuous variable – (1) grades 1-5 (2) grades 1-8 (3) grades 1-10 (4) grades 1-12. School infrastructure index is the school's score on having a pucca school building, drinking water facility, functional toilets and electricity connection, with a maximum possible score of 5. Standard errors clustered at panchayat level in parenthesis. Significant at *** 1% **5% *10%

Table A2: Differences between private and public schools at baseline

	School resources				School accountability		
	Primary grade enrolment	**Infrastructure index**	**Prop. Graduate teachers**	**Pupil – teacher ratio**	**SMC exists**	**Prop. local teachers**	**Monthly teacher salary (Rs.)**
Public	188.04	3.25	0.770	32.63	0.95	0.151	23792.8
[N=96]	(13.370)	(0.074)	(0.029)	(1.280)	(0.024)	(0.033)	(2476.687)
Private	216.41	3.44	0.768	29.14	0.58	0.350	2825.658
[N=63]	(13.008)	(0.108)	(0.030)	(1.423)	(0.063)	(0.040)	(197.792)
Difference	-28.371	-0.194	0.001	3.487*	0.366***	-0.199***	20967.12***
	(19.587)	(0.126)	(0.044)	(1.957)	(0.059)	(0.052)	(3137.245)

Notes: Standard errors in parentheses. Significant at *** 1% **5% *10%

Table A3: Differences between private and public households at baseline

	Education of household head	Daily wage worker	Wealth index	Education expenditure (Rs.)	Desired level of schooling for child	Know of presence or absence of SMC
Public [N=897]	1.64	0.55	4.56	520.76	8.57	0.34
	(0.047)	(0.017)	(0.046)	(16.514)	(0.091)	(0.016)
Private [N=602]	2.30	0.38	5.26	3108.43	9.25	0.44
	(0.054)	(0.020)	(0.056)	(77.069)	(0.082)	(0.020)
Difference	-0.661***	0.169***	-0.698***	-2587.66***	-0.677***	-0.096***
	(0.072)	(0.026)	(0.072)	(66.267)	(0.130)	(0.025)

Notes: Desired level of schooling is response to question "How much education do you wish (sampled) child to complete?" 0= none, 1= less than primary, 2= primary, 3=grades 6-9, 4= grade 10, 5= grade 12, 6= graduate, 7=post graduate, 8=professional degree 9= diploma 10= as much as child wishes. Standard errors in parentheses. Significant at *** 1% **5% *10%

Table A4: Parental expectation and student performance at baseline

Scholastic skill	Public Schools			Private Schools		
	Parental perception	Student performance	Difference	Parental perception	Student performance	Difference
	(1)	(2)	(2)-(1)	(3)	(4)	(4)-(3)
Hindi						
Alphabet recognition	0.98	0.71	0.267***	0.99	0.91	0.087***
			(0.019)			(0.014)
Word construction	0.93	0.81	0.117***	0.99	0.96	0.027***
			(0.017)			(0.010)
Sentence construction	0.64	0.49	0.149***	0.89	0.87	0.018
			(0.022)			(0.018)
Math						
Count	0.98	0.87	0.115***	0.99	0.97	0.029***
			(0.014)			(0.009)
2-digit operation without carry over	0.85	0.87	-0.016	0.98	0.97	0.004
			(0.018)			(0.011)
3-digit operation without carry over	0.58	0.26	0.323***	0.87	0.60	0.269***
			(0.025)			(0.026)
English						
Alphabet recognition	0.93	0.67	0.264***	0.99	0.91	0.082***
			(0.020)			(0.014)
Word construction	0.51	0.74	-0.236***	0.80	0.95	-0.153***
			(0.024)			(0.021)

Notes: Parental responses and test scores of 1093 students and households, conditional on parental response to all questions on perceptions, separately for public and private schools. Parental expectation is measured as the proportion of parents who responded "Yes" when asked if their child could perform a specific scholastic task. Student performance is measured as the proportion of students who scored at least 50 percent marks in the questions for each specific skill in the tests administered at the baseline. Standard errors in parentheses. Significant at *** 1% **5% *10%.

Table A5: Sample attrition between baseline and endline

	All	Public	Private
	(1)	(2)	(3)
Baseline score	-0.061***	-0.055***	-0.078***
	(0.016)	(0.019)	(0.019)
T 1	-0.034	-0.007	-0.050
	(0.046)	(0.069)	(0.054)
T 2	-0.057	-0.053	-0.020
	(0.045)	(0.066)	(0.060)
T 3	-0.113**	-0.113*	-0.133**
	(0.047)	(0.056)	(0.062)
T 4	-0.044	0.026	-0.160***
	(0.050)	(0.062)	(0.053)
Male	-0.015	-0.046**	0.029
	(0.016)	(0.018)	(0.026)
Grade 4	-0.035	-0.014	-0.065*
	(0.023)	(0.028)	(0.033)
Pupil-teacher ratio	0.003*	0.003	0.001
	(0.002)	(0.002)	(0.003)
Grade level	-0.055***	-0.082***	-0.024
	(0.018)	(0.023)	(0.034)
Total enrolment	0.001***	0.001***	0.001**
	(0.000)	(0.000)	(0.001)
Female literacy rate	-0.101	-0.051	-0.124
	(0.132)	(0.157)	(0.199)
Distance to town	-0.002	-0.006**	0.001
	(0.003)	(0.003)	(0.004)
Prop. of SC population	0.019	-0.180	0.160
	(0.188)	(0.222)	(0.266)
Block dummy	0.029	0.014	0.115
	(0.045)	(0.038)	(0.071)
Private school	0.029		
	(0.029)		
Constant	0.381***	0.524***	0.257**
	(0.087)	(0.103)	(0.097)
N	5151	2959	2192
R^2	0.0545	0.0593	0.0816

Notes: The dependent variable equals 1 if the student was present at baseline but absent at endline and 0 if the student was present both at baseline and endline. Standard errors clustered at panchayat-level are in parenthesis. Significance *** 1% **5% *10%.

Table A6: Impact of report cards on standardized test scores with balanced panel

	Midline		Endline	
	Public	**Private**	**Public**	**Private**
	(1)	(2)	(3)	(4)
T 1	-0.028	-0.097	-0.046	0.087
	(0.140)	(0.111)	(0.148)	(0.137)
T 2	-0.096	0.008	-0.025	0.077
	(0.159)	(0.138)	(0.154)	(0.146)
T 3	-0.152	-0.108	-0.065	-0.070
	(0.177)	(0.104)	(0.123)	(0.096)
T 4	-0.106	-0.079	-0.037	0.246*
	(0.151)	(0.080)	(0.093)	(0.107)
Baseline score	0.739***	0.726***	0.599***	0.574**
	(0.045)	(0.040)	(0.046)	(0.051)
Constant	1.147**	0.627**	-0.260	-
	(0.502)	(0.277)	(0.528)	(0.329)
Joint Significance	0.285	0.632	0.0953	6.018
	[0.885]	[0.644]	[0.983]	[0.001]
T1=T2	0.307	1.277	0.024	0.010
	[0.584]	[0.268]	[0.878]	[0.922]
T2=T3	0.153	0.928	0.0582	1.957
	[0.699]	[0.343]	[0.811]	[0.172]
T3=T4	0.081	0.089	0.048	23.59
	[0.778]	[0.767]	[0.828]	[0.000]
Controls	Yes	Yes	Yes	Yes
N	1428	1208	1428	1208
R^2	0.415	0.499	0.287	0.364

Notes: The sample is restricted to 2636 students present in all three rounds. Standard errors clustered at panchayat-level are in parenthesis. P-values of F-stats in brackets. Controls as elucidated in Table 5. Significance *** 1% **5% *10%.

Table A7: Impact of report cards on standardized test scores in the new academic year by subject

	Private			Public		
	Hindi	**English**	**Math**	**Hindi**	**English**	**Math**
T 1	-0.001	0.0840	0.303	-0.234	0.017	-0.091
	(0.112)	(0.111)	(0.188)	(0.156)	(0.171)	(0.166)
T 2	-0.009	0.169	0.191	-0.031	-0.029	0.062
	(0.128)	(0.107)	(0.189)	(0.131)	(0.172)	(0.149)
T 3	-0.047	-0.037	0.008	-0.120	-0.003	-0.009
	(0.087)	(0.083)	(0.141)	(0.106)	(0.132)	(0.190)
T 4	0.315***	0.260**	0.281*	-0.057	-0.090	0.074
	(0.089)	(0.096)	(0.150)	(0.080)	(0.135)	(0.133)
Baseline score	0.556***	0.445***	0.415***	0.499***	0.486***	0.309***
	(0.037)	(0.045)	(0.032)	(0.047)	(0.045)	(0.051)
Constant	-0.377	-0.896***	-1.033**	0.243	-0.541	-0.093
	(0.297)	(0.312)	(0.440)	(0.469)	(0.523)	(0.608)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
N	1338	1338	1338	1658	1658	1658
R^2	0.309	0.246	0.237	0.258	0.202	0.113

Notes: Standard errors clustered at panchayat-level are in parenthesis. Controls as elucidated in Table 5 above. Significant at *** 1% **5% *10%.

Table A8: Impact on endline standardized test scores by baseline scores

	Private				Public			
	Individual		School		Individual		School	
	Below median	Above median	Below median	Above median	Below median	Above median	Below median	Above median
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
T 1	0.121	0.099	0.203	-0.0601	-0.218	0.010	0.0570	-0.147
	(0.264)	(0.103)	(0.147)	(0.113)	(0.194)	(0.120)	(0.184)	(0.246)
T 2	0.040	0.100	0.344*	-0.238*	-0.139	0.219*	0.264	-0.0502
	(0.254)	(0.109)	(0.172)	(0.119)	(0.191)	(0.125)	(0.181)	(0.191)
T 3	-0.114	-0.012	0.0782	-0.151	-0.159	0.090	-0.281	0.279
	(0.203)	(0.081)	(0.115)	(0.126)	(0.197)	(0.126)	(0.184)	(0.182)
T 4	0.435*	0.237***	0.358**	0.222**	0.021	-0.140	0.345	-0.288*
	(0.217)	(0.085)	(0.155)	(0.0873)	(0.183)	(0.138)	(0.206)	(0.148)
Baseline score	0.529***	0.538***	0.614***	0.517***	0.565***	0.474***	0.676***	0.553***
	(0.086)	(0.057)	(0.0601)	(0.0696)	(0.079)	(0.059)	(0.0561)	(0.0697)
Constant	-1.107*	-0.548*	-0.296	0.283	-0.438	0.114	-0.0986	1.275***
	(0.577)	(0.315)	(0.289)	(0.171)	(0.774)	(0.596)	(0.449)	(0.273)
t test of equality of coefficient on T4								
Below median = Above median	0.198		0.135		0.161		0.632**	
	(0.184)		(0.181)		(0.268)		(0.294)	
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	323	1015	670	668	1012	646	791	867
R^2	0.342	0.205	0.390	0.257	0.132	0.216	0.286	0.281

Note: Columns 1-2 and 5-6 classify individual student performance at baseline into below and above median. Columns 3-4 and 7-8 classify schools into above median and below median performers at baseline. Standard errors clustered at panchayat-level are in parenthesis. P-values of F-stats in brackets.
Significance *** 1% **5% *10%.

Figure A1: Map of Ajmer district with study area demarcated in red

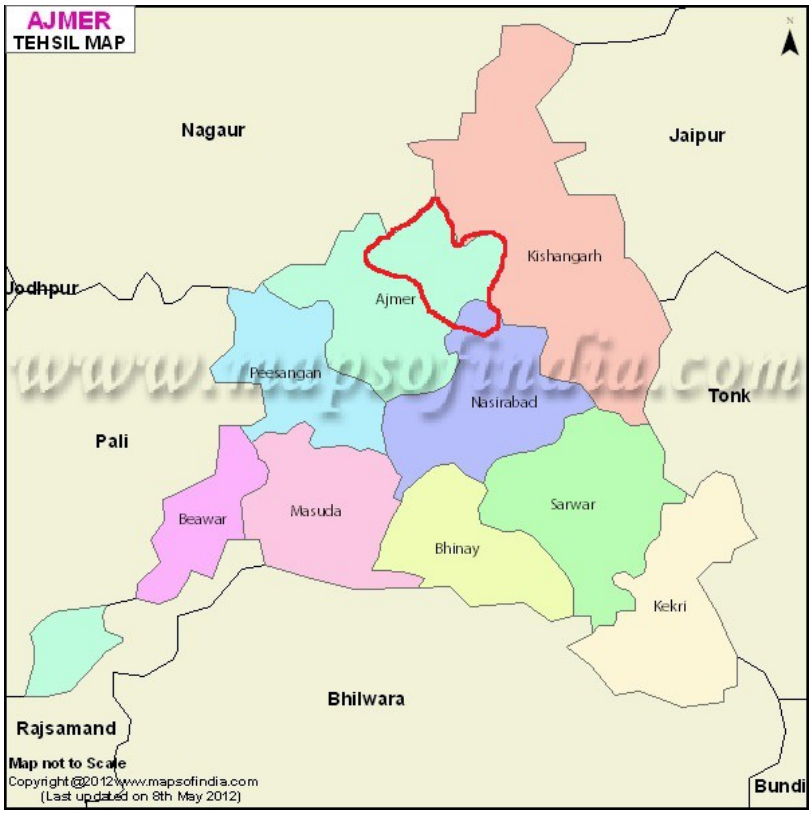
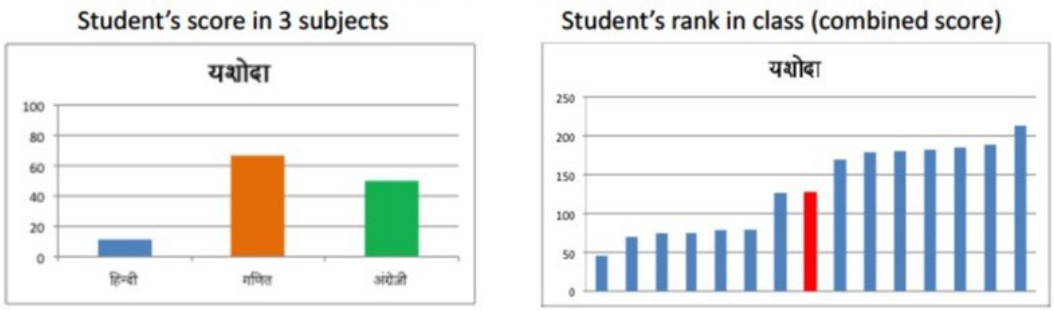
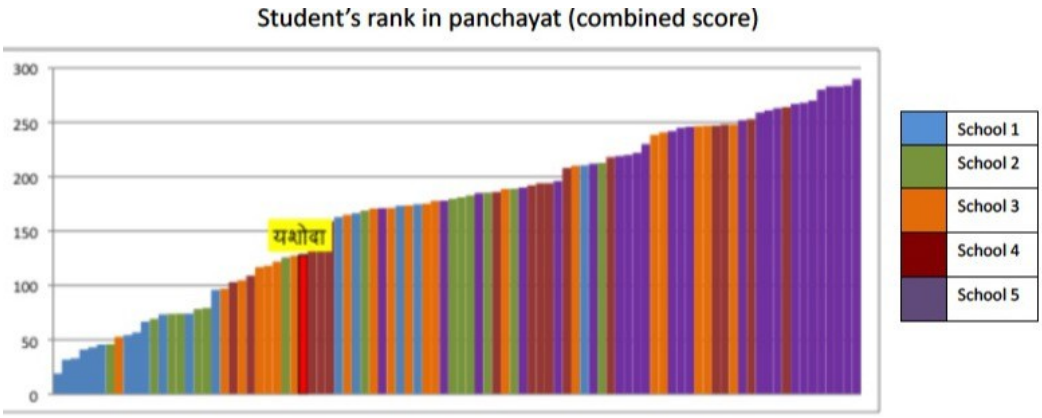


Figure A2: Parental Report Card P1



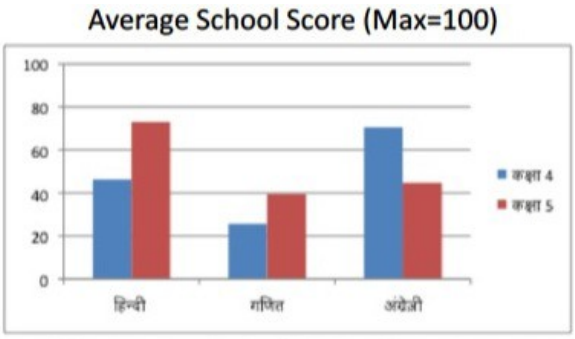
Notes: The graph to the left shows a student's score out of 100 in each subject. The blue bar shows her score in Hindi, the orange bar for Math and the green bar for English. The graph on the right shows the combined scores (out of 300) of all students in her class with the student's score highlighted by the red bar.

Figure A3: Parental Report Card P2



Notes: This graph shows the combined scores (out of 300) of all students of the same grade in the panchayat. Each bar shows the score of one student. Students of the same schools are depicted by bars of the same color. The target student name is mentioned and her score is highlighted in red.

Figure A4: School Report Card S1



Number of student achieving proficiency

हिन्दी	कक्षा 4	कक्षा 5	गणित	कक्षा 4	कक्षा 5	अन्ग्रेज़ी	कक्षा 4	कक्षा 5
वर्णमाला लिखना और शब्दों का पेहचान	10	20	गिनती			वर्णमाला लिखना और शब्दों का पेहचान		
शब्द और वाक्य लिखना	8	7	जोड़ i) 1-अंक ii) 2- अंक iii) 3- अंक			शब्द लिखना		
सरल कहानी समझना	10	4	घटाव i) 1-अंक ii) 2- अंक iii) 3- अंक			सरल कहानी समझना		
कठिन कहानी समझना	9	4	गुणा i) 2-अंक X 1-अंक ii) 2- अंक X2- अंक					
अनुच्छेद लिखना	7	6	मापना- तौलना					
			ज्यामिति					
Total	10	28	वाक्य पढ़कर हल करना					

Notes: The graph on top shows the average scores in each subject of grade 4 (in blue) and grade 5 (in red) of a school. The table below reports the number of students who have achieved a particular competency such as reading a sentence etc. for each grade.

Figure A5: School Report Card S2

Average School Score in Three Subjects (Max=100)

Class 4	School Name		Hindi	Math	English
1	RAJKIYA MADHYAMIK VIDHALYA,SAIDARIYA	Saidriya	26	24	18
2	RAJKIYA PRATHMIK VIDHALYA,RAIL KI BAADIYA	Saidriya	45	50	57
3	RAJKIYA UCCH PRATHMIK VIDHALYA,BARGAON	Badgaon	38	35	29
5	SATYANAND PUBLIC SCHOOL,BADGAV	Badgaon	77	81	85
6	SRI NAMDEV VIDYA MANDIR, BADGAON	Badgaon	68	61	74

Class 5	School Name		Hindi	Math	English
1	RAJKIYA MADHYAMIK VIDHALYA,SAIDARIYA	Saidriya	27	34	28
2	RAJKIYA PRATHMIK VIDHALYA,RAIL KI BAADIYA	Saidriya	69	70	78
3	RAJKIYA UCCH PRATHMIK VIDHALYA,BARGAON	Badgaon	54	55	63
5	SATYANAND PUBLIC SCHOOL,BADGAV	Badgaon	85	92	87
6	SRI NAMDEV VIDYA MANDIR BADGAO	Badgaon	73	73	75

Notes: This table reports the average score in each subject of all schools in panchayat.