Why Complain?
The Accountability of Public and Private Schools in India

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Why Complain?

The Accountability of Public and Private Schools in India

The accountability of schools in developing countries has captured the attention of researchers. Concurrently, a body of literature has devoted itself to studying the effect of information on accountability in the schooling system, and in other domains of public service. A subset of the studies considering the effect of information proposes that information leads service recipients to complain, which in turn improves outcomes. In this thesis, I ask whether households in India are able to raise the test scores of their children by complaining at schools in a context where households do not have accurate information on their children's competencies, and where teachers might not find the threat of complaints credible. I find no evidence that complaints raise test scores. However, I find evidence that complaints lead households to perceive improvements in their children's competencies, even when the improvements did not occur. I conclude that information symmetry and credible threats are both necessary, if not sufficient, for complaints to cause improvements in outcomes.

I thank the subjects of this thesis, and offer my gratitude to all who helped me write it.

Contents

I. Introduction

The accountability of schooling systems in developing countries plays a prominent role in recent debates surrounding education policy. Experiments provide evidence that if contractual obligations hold teachers accountable, they work harder, and their students learn more. In Kenya, Duflo et al. (2015) found that teachers with temporary, annually renewable contracts had higher attendance compared to that of regular teachers, and their students had higher test scores. Similarly, in the Indian state of Rajasthan, tying primary school teachers' salaries to their attendance increased it, and in turn, the test scores of their students increased. (Duflo et al. 2012) Kingdon and Muzammil (2013) also found that, in the Indian state of Uttar Pradesh, the geographical subject of analysis in this thesis, primary school students taught by temporary teachers on annually renewable contracts had higher test scores, despite these teachers receiving one-sixth the pay of regular teachers, and having lower educational qualifications.

Various authors have evaluated several means of improving accountability in education, or in other domains of public service. Gertler et al. (2012) have considered whether financing parent associations in Mexico improves educational outcomes. Mbiti (2016) has contemplated the role of private schools in injecting accountability in the education system through competition. Similarly, another body of literature considers empowering households through information. Pandey et al. (2009) have evaluated an intervention in India designed to inform villages about the role of local institutional channels for collective action, as well as to allow households to assess the competencies of their children. In India, Banerjee et al. (2010), whose data I use for my analysis in this thesis, have also considered the role of information about local educational authorities on educational outcomes. A majority of the literature finds evidence that information on its own can produce positive educational outcomes.

Within the literature on the effects of information, a few studies propose that information works by increasing complaints. This thesis belongs amongst these studies. In Uganda, Reinikka and Svensson (2011) have studied how publishing information on funds available for public schools in newspapers affected the amount received by the schools. The authors found that about half of the schools which did not receive their due complained. In their randomized experiment, Banerjee et al. (2015), provide evidence that information about eligibility for subsidized rice in Indonesia led to a rise in complaints by those who did not receive the subsidized rice. They conclude, "The evidence points to a mechanism through which information increased citizens' bargaining power vis-à-vis village officials." In Pakistan Andrabi et al. (2017) used a randomized experiment to measure the effect of information on test scores, enrollment, and private school fees[1]. The authors supplied households and schools with information that allowed them to compare the test scores of each child with the average test score of all children, as well as to compare the performance of each school in the village with that of another. In evaluating their information campaign, Andrabi et al.

[1] In the villages where the researchers distributed information, children's test scores improved by about eleven percent of standard deviation relative to villages where they did not distribute such information. In addition, the price of private schooling dropped by seventeen percent, and enrollment increased by three percentage points, possibly due to lower schooling prices. (Andrabi et al. 2017)

(2017) take inspiration from Banerjee et al. (2015) and theorize how a mechanism of complaints would underlie the workings of the information. The authors use households' engagement with schools to measure complaints. While Reinikka and Svensson (2011), Banerjee et al. (2015), and Andrabi et al. (2017) find evidence that their interventions caused an increase in complaints, as well as improvements in their respective outcomes of interest, they make no attempts to study the correlations between complaints and their outcomes of interest. In the absence of evidence that complaints were correlated with their outcomes, the authors are unable to argue convincingly that information leads to improvements in outcomes via complaints.

In this thesis, my goal is to estimate the extent to which households are able to improve the literacy and numeracy of their children by complaining at their schools as individual units in a context where information on children's competencies is not symmetric between teachers and households, and where teachers might not find the threat of complaints credible. I construct a simple theoretical model, and hypothesize that households' complaints lead to improvements in learning. Given the difference in the incentives of public and private school teachers, I also hypothesize that complaints are more effective at improving the learning of private school children compared to that of public school children. After controlling for the effect of various child and household characteristics— observed as well as unobserved— on children's competencies in reading, arithmetic, and writing, I find no evidence to support my hypotheses. Motivated by the information asymmetry, I then turn to asking whether complaints influence households' perceptions of their children's competencies, if not the actual competencies. Once again, I estimate the effect of complaints on households' perceptions of the competencies of their children. After eliminating the effect of various child and household characteristics— observed or unobserved— I find evidence that complaints inflate perceived competency. I conclude that complaints can improve test scores, if at all, in the presence of information symmetry as well as enforcement mechanisms which make the threat of complaints credible.

I have organized the remainder of this thesis as follows. Section II details the state of the education system in Uttar Pradesh while also discussing some literature on accountability. Section III theorizes how complaints would improve learning, and motivates my hypotheses. The section also discusses the conditions of credible threat and information symmetry which I propose are necessary, if not sufficient, for complaints to improve test scores. Section IV defines key variables, and outlines an empirical strategy to evaluate whether or not the evidence favors my hypotheses. Section V discusses socioeconomic characteristics which determine private school attendance, Section VI studies those which determine the probability of complaining, and Section VII assesses which characteristics determine competency in reading, writing, and arithmetic. Section VIII evaluates whether or not the evidence favors the hypotheses. Section IX estimates the effect of complaints on households' perceptions of their children's competencies. Finally, Section X discusses the analysis, and concludes the thesis.

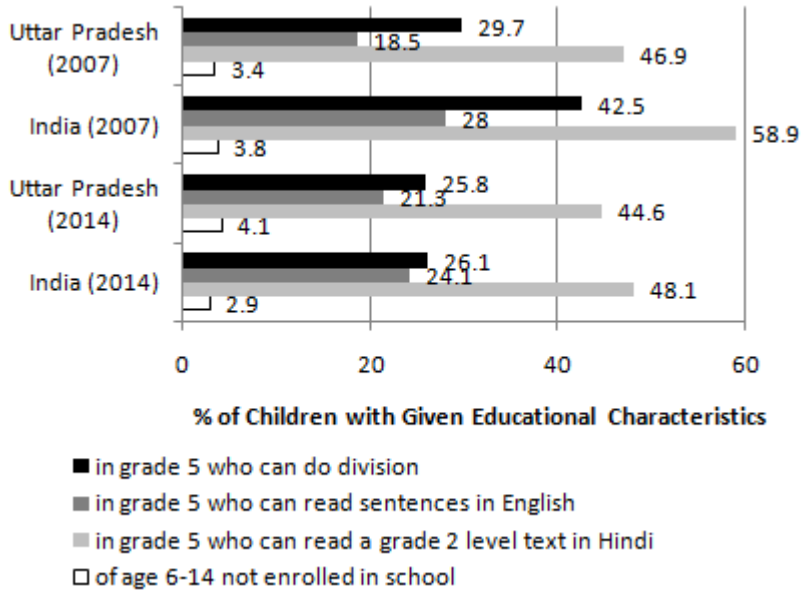
II. Background

This section paints a picture of the state of education in Uttar Pradesh. It describes some features of the education system which are symptomatic of poor accountability and weak local institutions, once again with the focus on Uttar Pradesh. It reflects on the existing literature on participatory school governance, particularly in the Indian context. Finally, it characterizes the demography, and the state of education of Jaunpur district— the geographical origin of the data I use for my main analyses.

II.A The State of Education in Uttar Pradesh

Over the past decade, India's performance along most metrics of primary and secondary education, except enrolment, has deteriorated, and Uttar Pradesh has consistently performed worse than the national average. Figure 1 below shows that, in India (Uttar Pradesh), roughly 42 (30) percent of students in grade five could perform division in 2007, about 28 (18) percent could read a sentence in English, and about 59 (47) percent could read a grade two level text in Hindi. In 2014, the figures were respectively about 26 (26) percent, about 24 (21) percent, and about 48 (45) percent. The gap between Uttar Pradesh and India as a whole dropped from roughly ten percentage points across these three metrics in 2007, to three or fewer percentage points in 2014. However, this fall in disparity comes at the cost of an overall fall in performance, both in Uttar Pradesh, and India as a whole.

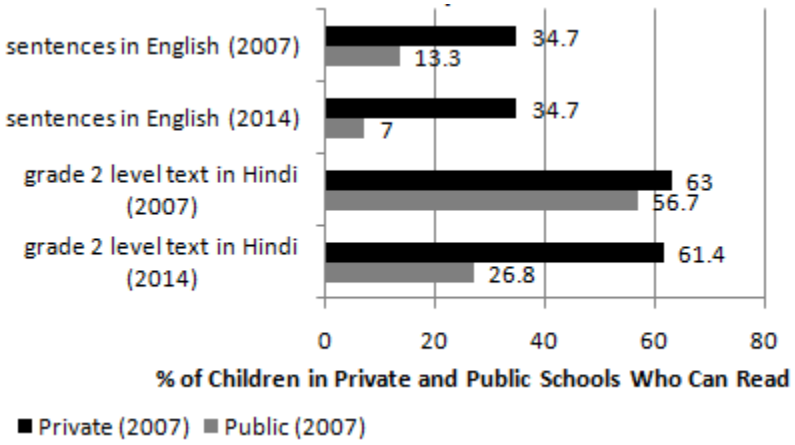
Figure 1: Reading and Enrolment in Uttar Pradesh Compared to the Whole of India (2007 and 2014)



Data source: ASER Centre (2015)

Within Uttar Pradesh, as Figure 2 below shows, children who attended private schools learned more than those who attended public schools. The gap has widened considerably. Consider fifth grade children in the state. In 2007, about thirteen percent among those of them who attended public schools could read sentences in English while in 2014, the proportion almost halved. Among their counterparts in private schools, a little over a third could perform the task in 2007; the proportion remained unchanged in 2014. So, the proportion of children who could perform the task in private schools was a little over twice the same proportion in public schools in 2007, but the gap had increased to five times as much in 2014. Similarly, in 2007, about 57 percent of those in public schools could read a grade two level text in Hindi. In 2014, the proportion decreased to less than half its value in 2007. In private schools, on the other hand, the proportion was 63 percent in 2007. It had decreased by less than two percentage points in 2014. So, in 2007, the proportion of children in public schools who could read the Hindi text was about the same as the proportion of children in private schools who could perform the task. However, by 2014, the proportion had decreased to less than half. The gap has widened, it appears, due to the deteriorating performance of public schools rather than improvements in the learning of private school students.

Figure 2: Reading Levels of Fifth Grade Children in Uttar Pradesh (2007 and 2014)



Data source: ASER Centre (2015)

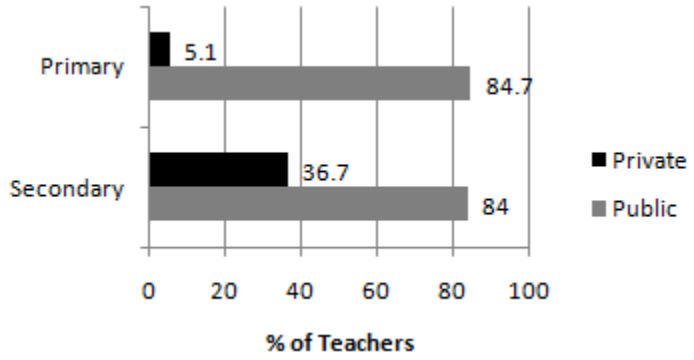
Various studies in developing countries have shown that children who attend private schools learn more than those who attend public schools. (Angrist et al. 2002; Cox and Jimenez 1991; Azam et al. 2016; Singh and Sarkar 2015) Private schools are also cheaper. In Pakistan, private schools charge fees amounting to about 2.5 percent of the country's gross national income, whereas in the United States, the fees are about nine percent of gross national income. (Das et al. 2006) Private schools appear to have provided a viable alternative to public schools despite the seemingly inferior quality of teachers they hire. In the Indian state of Andhra Pradesh, private school teachers have less education, and are also less likely to have training in pedagogy. Private schools pay their teachers less— as low as a sixth of what is paid to public school teachers. (Muralidharan and Sundararaman 2015) In fact, Singh and Sarkar (2015) found that, in Andhra Pradesh, neither teachers' experience, gender, educational qualifications, nor their knowledge of content influenced the learning outcomes of their students, whether in private or public schools. Whatever the reason, private schools have increasingly gained popularity in Uttar Pradesh. The seven year period between 2007 and 2014

saw substantial increases in the proportion of boys and girls enrolled in private schools. In 2007 (2014), about a quarter (46 percent) of girls and almost a third (56 percent) of the boys of ages six to fourteen in the state were enrolled in private schools. (ASER Centre 2015) The popularity of private schools is raising important questions about the relevance of public schools.

II.B Teacher Accountability and Participatory Public School Governance

The environment of public school governance in India, and particularly Uttar Pradesh, makes it difficult to hold public school teachers accountable. Kingdon and Muzammil (2013) have provided anecdotal evidence from various sources arguing that, collectively, public school teachers in Uttar Pradesh are able to undermine the authority of school principals and district level education authorities through political means. They claim that high degree of politicization and unionization of teachers has allowed them to influence school governance. In their 2008 survey of 570 teachers from five districts in Utter Pradesh, they found that just below two fifths of private school teachers at the secondary level and about five percent in the primary level held union memberships. By contrast, over four fifths of public school teachers held union membership, both in primary and secondary levels. These statistics, presented in Figure 3 below, become important when we consider what the authors discovered: students who were taught by unionized teachers had lower scores, though unionization seemed to have no effect on teacher attendance. Likewise, Kingdon and Teal (2010), based on data from 186 schools from sixteen states in India, also showed that secondary school students taught by unionized teachers received lower marks in examinations.

Figure 3 Unionization of Teachers in Uttar Pradesh (2008)

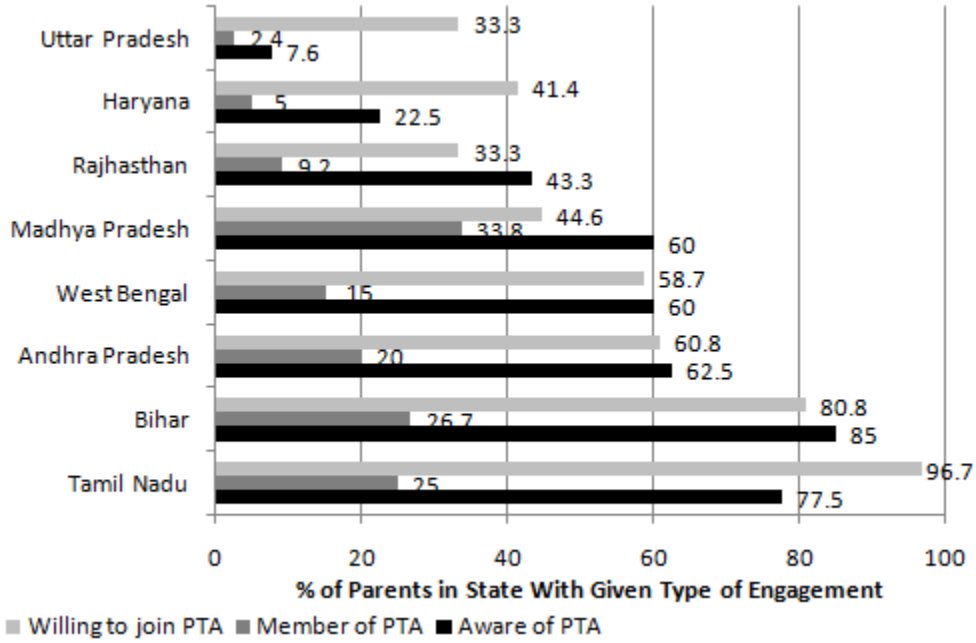


Data Source: Kingdon and Muzammil (2013)

Various governments have tried to decentralize school governance by creating community level organizations with authority over school management, as well as the ability to facilitate negotiations between households and teachers. In India, Parent Teacher Associations as well as School Development and Monitoring Committees are mandatory in each school while Village Education Committees are mandatory in each cluster of villages (*Gram Panchayat*). (Pandey et al. 2009) These bodies, however, have not been successful channels of participatory school governance. As Figure 4 below shows, only about eight percent of households in Uttar Pradesh were aware of Parent Teacher Associations, about two percent were members of the associations,

and about eighteen percent were willing to become members. In fact, participatory school governance along these metrics were the worst in Uttar Pradesh among all the states— some of which are not shown in the figure— where India's Planning Commission (2010) performed their evaluation.

Figure 4: Households' Engagement with Parent Teacher Associations (PTA) by State



Data Source: Planning Commission (2010)

Researchers have tried to assess whether rejuvenating these local level forums through information campaigns improves educational outcomes. In rural Mexico, Gertler et al. (2012) found that a program which financed parent associations and encouraged parental involvement in the management of primary school funds reduced grade repetition by over five percent, and grade failure by over seven percent in first through third grades; though the program had no effect in the poorest regions. Similarly, Pandey et al. (2009) conducted a randomized experiment involving 610 villages from three Indian states— Madhya Pradesh, Uttar Pradesh, and Karnataka. They held eight or nine village meetings in treatment villages where they shared information on these local institutions through film, posters, and other methods. They also provided households with booklets to help assess whether or not their children had acquired the reading and math knowledge expected of a child in their grade. In Uttar Pradesh, the campaign increased the number of Village Education Committee meetings in treatment villages by a quarter. Teacher attendance in treatment villages also increased by seven percentage points. In the remaining two states, the authors detected no impact on teacher attendance. The authors argue that the interventions also led to modest improvements in learning among children of certain grades. Banerjee et al. (2010), whose data I use for the substantial analysis in this thesis, carried out another randomized experiment in 280 villages in Jaunpur district of Uttar Pradesh. They aimed at evaluating the effect of three interventions on educational outcomes. Their interventions were similar to those of Pandey et al. (2009) in that they sought to inform households about local institutions, as well as about the state

of literacy in the communities. It is worth taking note of the nature of the interventions of Banerjee et al. (2010) because I refer to them further in this thesis. Under the first intervention, the researchers held village meetings informing households about the function of local Village Education Committees. The second intervention combined these meetings with another component. In addition to the meetings, the researchers trained volunteers to administer a reading test to children in their villages so as to assess the aggregate competency of the village children. Their findings were presented at the village meetings. The third intervention contained yet another component. In addition to holding the village meetings, and the child assessment trainings, the researchers trained at least one volunteer per village in pedagogical techniques. The techniques enabled the volunteers to teach basic reading. The volunteers then held daily classes outside of school for two to three months. The third intervention improved learning for children who attended the volunteers' classes. Attendees who could not recognize letters at baseline were about 60 percentage points more likely to be able to recognize letters at endline. Nevertheless, none of the interventions had any impact on community participation in school governance, teacher attendance, children's attendance, or in-school learning. Though the interventions in the two experiments were different in their design and intensity, the findings of Banerjee et al. (2010) contradict those of Pandey et al. (2009) to some degree.

II.C Jaunpur District

I base my empirical analysis on the two-year panel data which Banerjee et al. (2010) collected as part of their randomized experiment in Jaunpur district in Uttar Pradesh. The authors collected baseline data in March and April of 2005, and endline twelve months later. They administered tests and recorded a few child characteristics at thirty randomly chosen households in each of the 280 villages selected for the study. They included in the study only those households which had children between the ages of seven and fourteen. The average household in the dataset has more than two children in the age range at baseline, which means there are roughly 18,000 children in— what I will henceforth call— the full sample. However, the researchers administered detailed household surveys to only ten or so households out of the roughly thirty in each village. I base the substantial portion of my arguments on this subset of roughly 2,800 households, which have about 5,800 children of ages seven to fourteen at baseline.

Table 1 A Description of the Children and Households of Jaunpur in 2005

Child Characteristics

Variable	Mean	Std. Dev.	N
Female	0.48	0.5	19537
Age	10.77	2.42	19553
Grade	4.72	2.55	17752
School: Private	0.35	0.48	19327
School: Public	0.55	0.5	19327
School: NGO	<0.01	0.04	19327
School: Madrassa	0.02	0.14	19327
School: Out of School	0.08	0.27	19327
Test Score: Reading (0-4)	2.54	1.53	18693
Test Score: Math (0-3)	1.21	1.14	18682
Test Score: Writing (0/1)	0.55	0.5	18663
Perceived Reading (0-4)	3.29	1.21	5973
Perceived Math (0-3)	2.18	1.03	5860
Perceived Writing (0/1)	0.8	0.4	5859

Household Characteristics

Variable	Mean	Std. Dev.	N
Caste: Brahmin	0.09	0.28	2713
Caste: Kshatriya	0.05	0.22	2713
Caste: Vaisya	0.03	0.17	2713
Caste: Shudra	0.73	0.44	2713
Caste: Muslim	0.1	0.3	2713
Primary Household Occupation: Government Employment	0.02	0.14	2713
Primary Household Occupation: Farming	0.44	0.5	2713
Primary Household Occupation: Labor	0.21	0.41	2713
Complained	0.33	0.47	2630
Number of children	2.26	1.24	8419
Education of respondent	3.55	4.81	2710
Proportion who think education in village can be improved	0.53	0.5	2322
Member of Parent Teacher Associations	<0.01	0.04	2716
Attended Gram Sabha village meetings	0.16	0.37	2341

Note: Statistics ignore observations with values missing for any given variable

In Table 1 above, I use the baseline data from 2005 to describe the children and households who are the subjects of my analysis. Girls made up almost half of the children in the full sample. At baseline, the average child was about eleven years old, and attended fifth grade. About 90 percent of the children attended private (35 percent) or public (55 percent) schools. About eight percent were out of school. Two percent attended Madrassas (Islamic schools) and less than one percent attended NGO schools. The average child scored about 2.5 out of four in the reading test, and 1.2 out of three in the math test. About 55 percent of the children could write. Notably, close to three

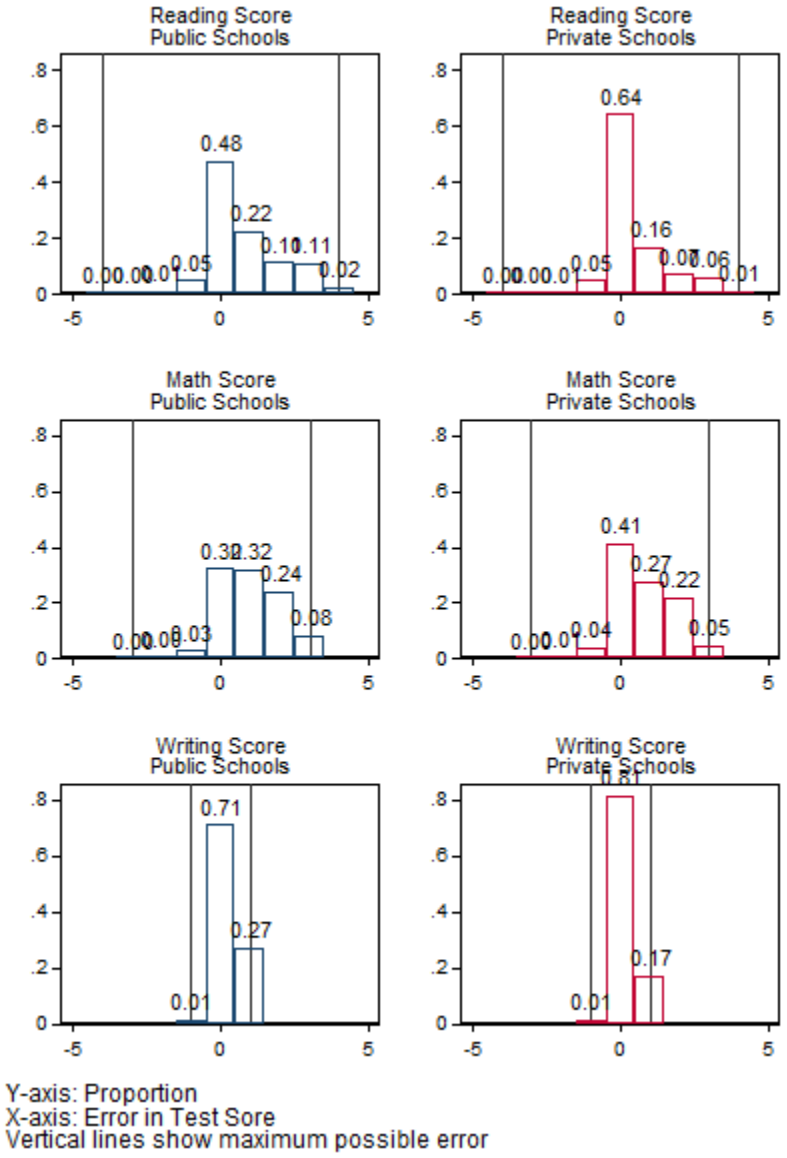
quarters of the households in the data belonged to the Shudra caste— the lowest in hierarchy out of the four castes in the Hindu Vedic caste system. Brahmins, at the top of the hierarchy, made up nine percent, Kshatriyas, second in hierarchy after Brahmins, made up five percent, and Vaisyas, third in the caste hierarchy, made up three percent of the households. Muslims, who fall outside the Hindu Vedic caste categorization, constitute ten percent of the households. About 44 percent of the households relied primarily on farming for their income, and about a fifth relied on labor. About two percent of the households earned income mainly from employment in the government. The average household had about 2.3 children. The average person who answered the interview questions on behalf of their household had achieved about 3.5 years of education— lower by more than a year compared to the education of the average child in our data. The table also provides clues about attitudes towards, and participation in education. Roughly half of the households believed education in their village could be improved. Only 0.2 percent of households, though, held parent teacher association memberships. Notice that this figure is roughly a tenth of what Planning Commission (2010) reported for the whole state of Uttar Pradesh (see Figure 4 above). As we saw for the rest of Uttar Pradesh, most respondents were unaware of existing institutional channels of negotiation with schools. When asked if an institution called Village Education Committee exists in their village, about 92 percent (not shown in table) of the respondents either said no, or that they do not know. In fact, participation in collective decisions generally seems low if we consider the fact that only sixteen percent of households reported attending the Gram Sabha village meetings.

As Banerjee et al. (2010) have also noted, Jaunpur's households did not seem to hold accurate perceptions about the competencies of their children. The literacy and numeracy tests administered by Banerjee et al. (2010) solely served their experiment. Households depend on different sources of information to assess the learning of their children, such as their performance on homework, or the feedback from teachers about their children's schoolwork. For those households which were administered the household survey, the data captures how households perceived the learning of their children by asking them to guess the level of competency each child in their household would demonstrate in each test (see Section IV below for further discussion on the variable). Table 1 above shows that the average household overestimated their children's competencies. The average perceived reading competency was about 3.3 (against the actual reading score of about 2.5), and the average perceived math competency was close to 2.2 (against the actual math score of about 1.2). About four fifths of the children were thought to be able to write when in reality, just over half of them could.

Figure 5 below shows the distribution of error in households' perceptions of the test scores of their children, where I define error as the perceived score minus the actual test score. A positive error means a child's household overestimated their ability. The figure shows the distribution of errors for each test seperately for public and private school students. The distributions show that households did not all have accurate perceptions of the abilities of their children. In guessing the test scores, households were more likely to overestimate rather than underestimate their children's competencies, regardless of the type of school they attended. Compare, however, the proportion of children in each type of school whose scores were guessed correctly (represented by an error of zero). Households were more likely to estimate the test score of private school children correctly.

Among public (private) school students, less than half (over three fifths) of the students had their reading scores guessed correctly, and about a third (two fifths) had their math scores guessed correctly. Similarly, less than three quarters of public school students and about four fifths of private school students came from households who could guess correctly whether or not the children could write.

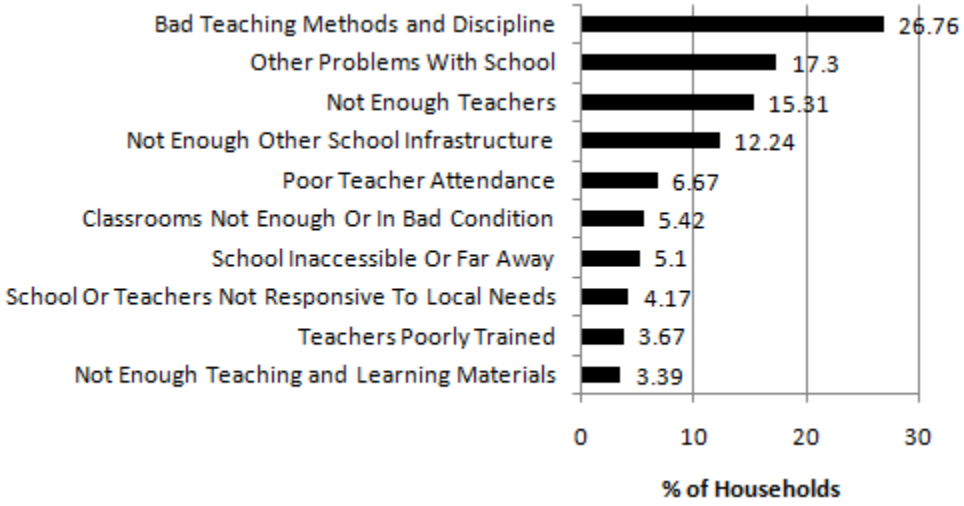
Figure 5 Distribution of Error in Perceived Competency



During the baseline survey, interviewers asked respondents about the three most pressing problems with the public schools in their villages. Figure 6 below summarizes the responses. A little over a quarter reported bad teaching methods and discipline as one of the problems. About seven percent pointed to poor teacher attendance. Similarly, roughly four percent said that teachers were not responsive to local needs. These problems are related to teacher effort and attitudes. Respondents also noted problems with school infrastructure other than classrooms (about twelve

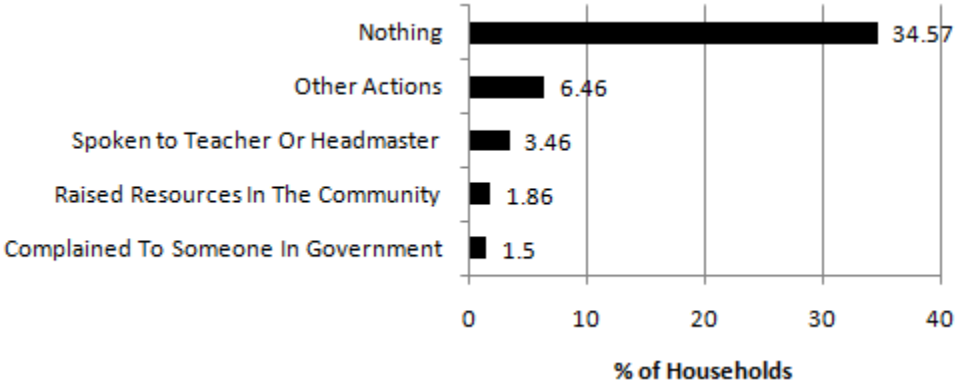
percent), as well as there being too few classrooms or classrooms being in bad conditions (about five percent). As with the lack of infrastructure, there are other problems which cannot be solved without monetary resources. These include the lack of teaching and learning materials cited as a problem by little over three percent of respondents, poor training of teachers cited by about four percent, and lack of teachers mentioned by about fifteen percent. About five percent of respondents said the school was inaccessible or far away, while roughly seventeen percent said there were other problems with their villages' public schools.

Figure 6 Problems with Village Public Schools



When asked what villagers had done to improve education, over a third said that villagers had done nothing, as Figure 7 below shows. Another three or so percent said villagers had spoken to teachers or headmasters, about two percent said villagers had raised resources in their communities, about one percent said villagers had complained to someone in the government, and little over six percent said villagers had taken other actions to improve education.

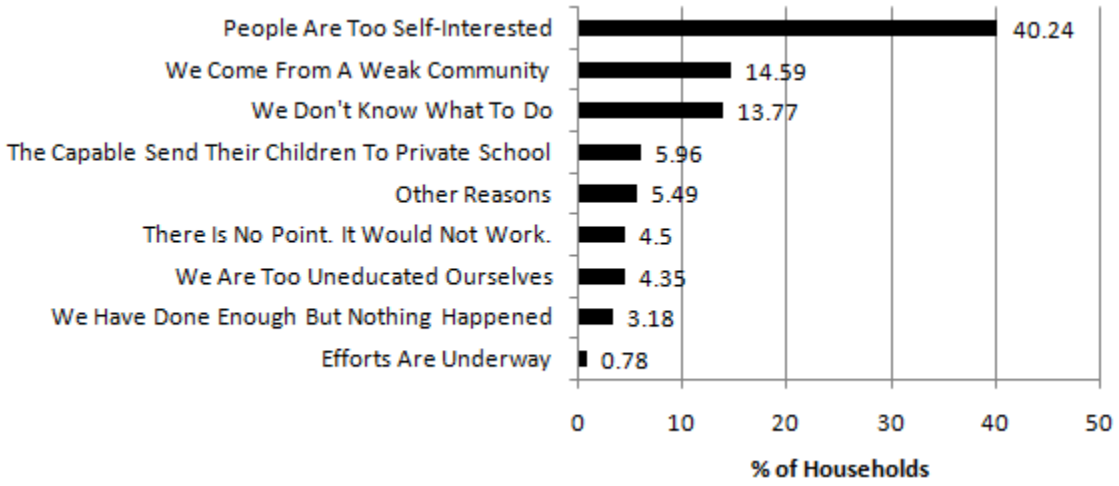
Figure 7 What Villagers Have Done to Improve Education in Village



There seems to be a sentiment of disenchantment among community members with regard to the state of education, as the statistics in Figure 8 below show. When asked why people from the village

cannot do more to improve education, two-fifths of the households said it was because people were too self-interested, almost fifteen percent answered that they came from weak communities, about fourteen percent said they did not know what to do, and roughly four percent said they were too uneducated themselves. These responses corroborate that households do not see collective action as a feasible solution to problems in education. Likewise, over four percent of respondents said "there is no point" and thought that their actions would have no effect, while about three percent said that they had done enough but without results. A small portion, about 0.8 percent, said they were satisfied with what they had done. About five percent said that efforts were underway, and roughly the same proportion of households said that there were other reasons which made them feel nothing more could be done to improve education in their villages. About six percent of households said that those who are capable of improving education in the village send their children to private schools.

Figure 8 Why Villagers Cannot Do More to Improve Education in Village



The evidence which I have presented in this section commands the conclusion that children in the state of Uttar Pradesh, particularly those who attend public schools, learn little. Low levels of teacher accountability, particularly among public school teachers, may result in students learning less. In addition, the statistics show that collective action does not seem to provide a viable option for households to influence the education system for the benefit of their children. Moreover, children from certain socioeconomic backgrounds find it more difficult to access private schools, as I will address further in Section V below. Households also do not seem to possess accurate information about the competencies of their children. Nevertheless, households do not seem to simply observe their children's education as passive spectators. Despite the lack of accurate information about competencies, and the absence of functional formal avenues for coordinated expression of grievances, households complained as individual units. Out of all Jaunpur's households, about a third (see Table 1 above) said they had visited at least one of their children's schools to complain about teachers' or children's performance over the course of twelve months before the baseline. I am interested in understanding whether complaints work.

III. How Might Complaints Work?

Households incur a cost— social or economic— when they complain. They complain only if they consider the expected benefits of complaints to be above the cost incurred. So, households who incur lower costs are more likely to complain. Banerjee et al. (2015), Reinikka and Svensson (2011) and Andrabi et al. (2017) account for the cost in their models, either explicitly or implicitly.

Households can not expect schools to respond to their individual complaints by improving the state of educational inputs such as the pedagogical techniques of the teachers, school infrastructure, or learning materials. If the intervention of Andrabi et al. (2017) had an effect through complaints, complaints likely did not lead to increases in physical inputs. They find no evidence that schools reacted to information— hence any complaints resulting from information— by increasing the qualification of the teachers, or improving infrastructure. Improving these inputs requires money or other resources. Households may be able to influence such inputs only through collective action, if at all. They can only hope to influence teacher effort by complaining as individual units. Still, a teacher is unlikely to come to work more often simply because households complain. Increasing attendance might also require collective action. Nevertheless, it is plausible that teachers respond to complaints by giving more attention to the children of aggrieved households. Andrabi et al. (2017) found evidence that private schools responded to their intervention by decreasing the amount of break time. If we measure teachers' effort by the amount of time spent teaching, their intervention effectively increased teacher effort in private schools. Another study from the Indian state of Andhra Pradesh has found that the amount of homework checked predicts a child's test scores in certain contexts. Singh and Sarkar (2015) So, complaints might cause small changes in teacher effort which might improve learning. From this logic follows my first hypothesis:

> **Hypothesis 1:** Complaints improve students' learning.

Due to the state of teacher accountability in India, it is plausible that public school teachers would be more able to protect themselves from punishment compared to private school teachers. Given that private schools depend on households for revenue, it is also likely that they are more responsive to households' grievances. Accordingly, my second hypothesis is:

> **Hypothesis 2:** Complaints are more effective at improving the learning of private school students.

In Appendix I, I develop a more formal theoretical model based on the effect of complaints on teachers' utility functions.

I posit that two conditions are necessary, if not sufficient, for complaints to improve learning. Firstly, complaints need to pose a credible threat to teachers. Secondly, information on the competencies of children must be complete and symmetric between teachers and households. I discuss these conditions below:

Credible Threat

Complaints would work only if they were costly to the teacher. If complaints do not translate to effective punitive action, teachers have no incentive to respond to them. Reinikka and Svensson (2011) argue that "…communities have different ways to sanction public officials/politicians…". They propose that "…the collective action problem is likely to be a less important constraint in primary education…" because of the presence of institutions such as school management committees. In Jaunpur, though, local institutions do not provide effective channels of collective action (see Section II above).

Similarly, in the theoretical model of Andrabi et al. (2017), the threat comes from the pricing mechanism in each village's schooling market, as well as households' option to change their children's schools. In other words, a school which is found to not teach well would have to either lower their fees, or risk losing children to other schools. The Pakistani context of Andrabi et al. (2017) was such that there were 7.3 schools per village on average. In Jaunpur, however, there were on average 3.6 schools per village at baseline— half the amount in the Pakistani villages. So, in Jaunpur, changing schools was less of a choice compared to complaining.[2]

Information Symmetry

Households may complain at their children's schools if they believe that teachers are not working as much as they ought to, or if they notice that their children are not learning as much as they ought to. In order for households to claim poor performance, they would need to be able to accurately assess competency. And for teachers to agree to the assessment, households would need credible information which teachers cannot dispute. Andrabi et al. (2017) assume in their theoretical model that schools possess accurate information about performance whereas households do not. The authors designed their interventions to reduce the information asymmetry by providing accurate and credible information. In their treatment villages, the authors supplied households and schools with report cards containing information which allowed them to assess the performance of children as well as schools. The cards allowed for comparison of each child's competency with the average competency of all children tested. They also provided information on the average test scores of children in each school in the village, allowing for comparison of schools. Since the information came from external, unbiased researchers, it ensured information symmetry. As Andrabi et al. (2017) also note, Banerjee et al. (2010) provided information on the village level average competency in Jaunpur, but not the average at the level of schools, which did not allow households to compare schools. In other words, even if households in Jaunpur were able to establish that their children learned less than the average child in the village, they would not have been able to credibly assess or assert the extent to which the schools were responsible for the low competency.

[2] A randomized experiment in the Indian state of Rajasthan found that providing households with a certain set of information on child and school performance led them to switch schools of fourth and fifth grade children, even when there were only 2.2 primary schools in each village on average. However, among students who went to private schools at baseline, those who received this set of information were more likely to change to better schools. Among students who went to public schools at baseline, those who changed schools in response to the information changed to schools of similar quality. Thus, for public school teachers, the possibility of students changing schools might not provide a threat if they know that their students have a limited set of schools from which to choose. (Afridi et al. 2017)

Symmetry in information is also a requisite for households to be able to accurately assess whether or not their complaints have an impact. In the absence of external, unbiased means of assessment, teachers have autonomy over the feedback they provide households regarding their children's abilities, be it through verbal mediums, written comments, or scores in examinations administered by the schools themselves. Therefore, teachers have some ability to influence how households perceive children's competencies. Andrabi et al. (2017) have assumed in their own theoretical model that teachers have the ability to "fool" households to a certain degree. The design of their experimental treatment enabled parents to not be fooled. They found evidence that their intervention improved the accuracy of households' perceptions. Perceptions of school quality were more strongly related to children's test scores among households which received their intervention. At baseline, the authors also informed households and schools that the same information would be collected and distributed a year later. Providing the information again at endline gave households a means to accurately assess any changes in learning. So, the researchers curtailed any influence the schools could have had on households' perceptions. However, as I have discussed in Section II above, households in Jaunpur tended to overestimate their children's competencies.

The conditions of credible threat and information symmetry underlie the theoretical models of Reinikka and Svensson (2011), Banerjee et al. (2015), as well as Andrabi et al. (2017). They assume the existence of a mechanism to enforce accountability that is functional, even if crude or informal. They, then, envision their interventions as increasing information symmetry. However, the evidence presented thus far shows that Jaunpur meets neither of the conditions, which I propose are prerequisite for complaints to increase test scores. Yet, I proceed with estimating the effects of complaints on learning. If I find evidence that complaints improve learning, it would serve to falsify the assumption that the conditions are necessary for complaints to work. On the other hand, if I find that complaints do not work, I would be led to question why, then, about a third of the households in Jaunpur complained.

IV. Empirical Strategy

Since the primary objective of this thesis is to understand the effect of complaints on learning, I need a measure of learning. The researchers administered reading, writing, and math tests during each round of survey. I use the resultant *test scores* (t) to measure learning. The researchers administered reading and writing tests in Hindi, a common local language. They also administered alternative tests in the Urdu language to some children, but I do not use these tests for my analysis. The test scores are divided into non-linear levels of competency. The reading scores indicate no reading competency (zero), alphabet recognition (one), word recognition (two), ability to read paragraphs (three), and ability to read story (four). The math scores indicate no competency in math (zero), number recognition (one), subtraction of two digit numbers (two), and division of three digit number by a one digit number (three). Writing scores indicate no ability to write (zero) and ability to write a dictated sentence (one). For the sake of interpretation, I will refer to each

increment in reading or math scores as a level. I will interpret writing scores as the probability of being able to write.

I also need an empirical measure of complaints. I define *complaint* (π) as a binary variable which indicates whether or not a household visited at least one school in the year prior to the survey to complain about child or teacher performance. Note that the act of complaining preceded the administration of tests. The value of the variable is fixed for any child within a household for a given survey round, but not over time. Unlike in this thesis, Andrabi et al. (2017) measure complaints using a proxy— households' engagement with schools as measured by their ability to name teachers, their having met teachers, and their views on teachers' involvement.

In addition to the test scores, the surveys also ask respondents to guess the scores each child in the household would get in reading, math, and writing. I use these expectations as measures of *perceived competency* (t^{prcv}), and estimate the extent to which complaints affect households' perceptions. As with test scores, the act of complaining preceded the measurement of perceived competencies.

I begin my analysis by examining the child and household characteristics which determine private school attendance, complaints, and learning. This exercise convinces me that I need to control for child and household characteristics in estimating the effects of complaints on learning. Afterwards, I test my hypotheses by estimating the effect of complaints on reading, math, and writing scores using ordinary least squares, eventually controlling for household fixed and child fixed effects in order to remove potential sources of bias in estimates. Then, I turn to estimating the effect of complaints on perceived competency. Once again, I estimate the effect of complaints using ordinary least squares, household fixed effects, and child fixed effects specifications.

In order to avoid ambiguity in the interpretation of results, my regressions include in the sample only those children who attend either private or public schools, and exclude children who go to Madrassas, NGO schools, or are out of school, unless otherwise stated explicitly.

Throughout this essay, I make judgments about whether or not the estimated value of a certain statistic is different from its value under some assumed null hypotheses— usually zero. I reject the value of the statistic under the null hypothesis in favor of the estimated value if there is a probability of less than one in twenty that I reject the null hypothesis when it is true. If I reject the null hypothesis in favor of the estimate under this rule, I say that the estimate is statistically significant.

I move further discussion on the definition of variables, and errors in the data to Appendix II.

V. Who Goes To Private Schools?

Not everybody is capable of sending their children to private schools. The poor and those of the lower castes still face barriers (Woodhead et al. 2013; Stash and Hannum 2001), particularly in Uttar Pradesh (Harma 2009; Harma 2011). Barriers seem to exist in Jaunpur, too, at least in the view of the six or so percent of households (see Figure 8 above) who said that those who are capable of influencing education in their villages simply send their children to private schools. In this section, I perform my own analysis of who has access to private schools. My findings are in agreement with the majority of the literature on the socioeconomic determinants of private school attendance.

In order to understand which household and child characteristics determine access to private schools, I estimate the following model:

$$p_{i,r} = \boldsymbol{C}\theta_j + \sigma_{i,r}$$

Model 1

where, the subscript i denotes a child, and the subscript r indicates the second round of survey such that each combination of i and r uniquely identifies a child in a given survey round; $p_{i,r}$ indicates whether or not a child attends private school in a given survey round; $\boldsymbol{C}$ is a matrix of j child and household characteristics; θ_j is the vector of j parameters to be estimated for each child and household characteristic; and $\sigma_{i,r}$ is the unobserved error.

Table 2 below shows my ordinary least squares estimates for variations of Model 1. The estimates show that girls were about seven percentage points less likely to attend private schools compared to boys, consistent with what we already saw for the whole of Uttar Pradesh in Section II above. On average, a child's probability of attending private school increased by about two percentage points with every year added to their age. This relationship implies that children in private schools were older, on average. Likewise, a household with higher education, as measured by the years of education of the respondent, was more likely to send its children to private schools. If the education of the household increased by about ten years, the probability of its children attending private schools increased by about seven to nine percentage points, other factors remaining constant. Whether or not a household was literate had no bearing on the probability of its children attending private school after accounting for education, which is not surprising given that these variables are highly correlated[3].

[3] A bivariate regression (not shown) estimating the relationship between education and the probability of being literate shows that, with every year of education, a household was about eight percentage points more likely to be literate.

Table 2 The Determinants of Private School Enrolment (Ordinary Least Squares)

	(1)	(2)
VARIABLES	Attended Private School	
Female	-0.069***	-0.070***
	(0.012)	(0.012)
Age	0.018***	0.018***
	(0.003)	(0.003)
Household Education	0.009***	0.007**
	(0.003)	(0.003)
Household Literate	-0.000	-0.004
	(0.024)	(0.024)
Caste: Kshatriya	0.032	0.043
	(0.046)	(0.046)
Caste: Vaisya	0.022	0.023
	(0.054)	(0.053)
Caste: Shudra	-0.073**	-0.046
	(0.030)	(0.030)
Caste: Muslim	0.005	0.016
	(0.043)	(0.043)
Occupation: Government Employment		0.079
		(0.051)
Occupation: Farming		-0.028
		(0.021)
Occupation: Labor		-0.174***
		(0.022)
Treatment 1	-0.035	-0.027
	(0.025)	(0.025)
Treatment 2	0.007	0.011
	(0.025)	(0.025)
Treatment 3	-0.032	-0.027
	(0.025)	(0.025)
Year 2006	0.021	0.018
	(0.016)	(0.016)
Constant	0.253***	0.291***
	(0.042)	(0.044)
Observations	10,725	10,725
R-squared	0.031	0.048

Household clustered standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Compared to the excluded category of Brahmin children, who rank highest in the caste hierarchy, the Shudras, who rank the lowest, were about seven percentage points less likely to attend private schools. However, caste did not seem to predict the probability of attending private school when controlling for household occupation, which serves as a proxy for the amount and stability of household income. The specification in the second column includes three mutually exclusive variables indicating each household's primary occupation— government employment, farming, or labor— with the remaining occupations serving as the excluded comparison category. This estimation shows that children from households primarily dependent on labor were about seventeen percentage points less likely to attend private schools. The correlation between caste and occupation explains why the effect of caste evaporates in the second column[4]. The randomized treatments which Banerjee et al. (2010) evaluated show no impact on children's probability of attending private schools. The probability also did not change with the passage of time between the two rounds of survey when controlling for the other explanatory variables.

The estimates show that girls, younger children, and children from households with low income or education were less likely to have access to private schools. As such, my analysis serves to confirm what other authors have already discovered in varied contexts.

VI. Who Complains?

Households might differ in their probabilities of complaining. Though they complain because of poor child or teacher performance, their probability of complaining might also depend on their attitudes towards education, their social status, or their participation in collective decision making processes. In order to understand whether such characteristics predict the probability of complaining, I estimate the following model:

$$\pi_{h,r} = \gamma_p p_{h,r} + \boldsymbol{H}\gamma_m + \tau_{h,r}$$

Model 2

where, the subscript h denotes a household, and the subscript r indicates the second round of survey such that each combination of h and r uniquely identifies a household in a given survey round; $\pi_{h,r}$ indicates whether or not a household complained in a given survey round; $p_{h,r}$ is proportion of children in a household attending private schools in a given round of survey; γ_p is the parameter to be estimated for $p_{h,r}$; $\boldsymbol{H}$ is a matrix of m household characteristics; γ_m is the vector of m parameters to be estimated for each household characteristic; and $\tau_{h,r}$ is the unobserved error.

[4] Regressing the labor household indicator over the caste indicators (not shown), excluding the comparison category of Brahmins, shows that Shudra and Muslim households were respectively about 25 and twelve percentage points more likely to be dependent on labor for income.

Table 3 The Determinants of the Probability of Complaining (Ordinary Least Squares)

	(1)	(2)
VARIABLES	Complaint	
Proportion of Children Who Attended Private Schools	0.048***	0.048***
	(0.016)	(0.017)
Proportion of Children Who Were Female	-0.006	0.003
	(0.018)	(0.019)
Average Age of Children	-0.013***	-0.012***
	(0.004)	(0.004)
Household Education	0.011***	0.010***
	(0.002)	(0.002)
Household Literate	0.018	0.021
	(0.022)	(0.023)
Caste: Kshatriya	0.044	0.032
	(0.040)	(0.042)
Caste: Vaisya	0.005	0.015
	(0.044)	(0.048)
Caste: Shudra	-0.085***	-0.075***
	(0.026)	(0.027)
Caste: Muslim	0.013	0.032
	(0.037)	(0.039)
Occupation: Government Employment	0.052	0.060
	(0.047)	(0.050)
Occupation: Farming	0.029*	0.020
	(0.017)	(0.018)
Occupation: Labor	0.020	0.012
	(0.020)	(0.021)
Attended Gram Sabha		0.065***
		(0.020)
Treatment 1	-0.019	-0.008
	(0.026)	(0.028)
Treatment 2	-0.049*	-0.047*
	(0.025)	(0.028)
Treatment 3	-0.013	-0.012
	(0.025)	(0.028)
Year 2006	0.012	0.017
	(0.019)	(0.021)
Constant	0.441***	0.421***
	(0.052)	(0.056)
Observations	5,007	4,327
R-squared	0.041	0.038

Household clustered standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 3 above presents the results of ordinary least squares estimation for variations of Model 2 above. It shows that the probability of complaining increased with the proportion of children in the household who attended private schools. Compared to a household with no children in private schools, a household with all its children in private schools was about five percentage points more likely to complain. The proportion of children who were females seems to have had no bearing on the probability of complaining. A household was about one percentage point less likely to complain with every year added to the average age of its children. With every additional year of education, households were about one percentage point more likely to complain. As expected, literacy in the household had no bearing on the probability of complaining once I controlled for education. Compared to the excluded comparison group of Brahmins, households belonging to the Shudra caste were about eight percentage points less likely to complain. The estimates show no distinction between Brahmins and the remaining castes with regard to their probabilities of complaining. The specifications also use households' primary occupations as proxies for their incomes. I compare households with the primary occupation of either government employment, farming, or labor with the excluded category of the households with the remaining occupations. Farming households were about three percentage points more likely to complain, though this result was not statistically significant. Occupation, otherwise, had no bearing on the probability of complaining. In the second column of the table, I included a variable which indicates whether or not the household attended Gram Sabha village meetings with the rational of understanding whether or not the probability of complaining depends on a household's participation in collective decision making processes. I found that households which attended the meetings were about six percentage points more likely to complain. It is possible that households who are more engaged in collective decision making, as measured by Gram Sabha meeting attendance, tend to complain more. Or, the correlation could have an entirely different explanation. Village meetings would likely be held at locations closer to the center of the village, and schools are also likely to be located close to the center. In rural India, it is not uncommon for school playgrounds to serve as venues for public gatherings. So, if a household is located close to schools, it might be more likely to attend the meetings, as well as more likely to visit the schools to complain.

The second of the three randomized interventions which Banerjee et al. (2010) evaluated seems to have reduced the probability of complaining by about five percentage points, though the result is not statistically significant. Recall the interventions. The first intervention involved holding village meetings to inform community members about local bodies established to arbitrate between households and public schools. For the second intervention, the authors held these meetings while also teaching community members how to assess the learning of the children in their villages. For the third intervention, the researchers added to the second one by training local volunteers to hold extra classes outside of regular school. Since the third intervention did not affect the probability of complaining, it is difficult to conclude that the second one did. Furthermore, if the interventions indeed had no effect on complaints, complaints may not depend on households' knowledge about institutional channels for collective action alone.

The estimates in Table 3 above tell us that households of the lowest caste, those with little education, those who are more likely to send their children to public schools, and those who do not

participate in decisions which concern their communities are less likely to complain. A household's probability of complaining, then, perhaps reflects its capacity to influence education, or even other factors affecting its own well being.

VII. Who Can Read, Write, and Do Math?

A child's educational achievements may be related to their socioeconomic status. Their status might determine the amount and quality of educational input they receive, which in turn determines their learning. However, their social status might also influence others' behaviors towards them, as well as their own behaviors. For instance, Hoff and Pandey (2006) experimented with students of sixth and seventh grade who belonged to either the highest or the lowest castes. The experimenters asked students to solve mazes. The authors found that students of both castes solved equal number of mazes. However, when the experimenters publicly declared the name and caste of each participant, children of the lower caste were able to solve fewer mazes. Hanna and Linden (2009) conducted another experiment in India where they took exam papers, and randomly assigned cover pages with arbitrary age, gender, and caste information. They found that exam papers which seemingly belonged to lower caste students received lower scores. Studying the mechanisms by which socioeconomic characteristics affect educational performance is beyond the scope of this thesis. However, I do want to understand the extent to which such characteristics predict learning. With this goal, I estimate the following model using ordinary least squares:

$$t_{i,r} = \delta_p p_{i,r} + \boldsymbol{C}\delta_k + \omega_{i,r}$$

Model 3

where, the subscript i denotes a child, and the subscript r indicates the second round of survey such that each combination of i and r uniquely identifies a child in a given survey round; $t_{i,r}$ is the test score of each child in a given survey round; $p_{i,r}$ indicates whether or not a child attends private school in a given survey round; δ_p is the parameter to be estimated for $p_{i,r}$; $\boldsymbol{C}$ is a matrix of k child and household characteristics; δ_k is the vector of k parameters to be estimated for each child and household characteristic; and $\omega_{i,r}$ is the unobserved error.

Table 4 below presents the results of ordinary least squares estimates of variations of Model 3 above. I estimate three separate regressions, one for each type of test— reading, math, and writing. The results show that, holding the other explanatory variables constant, the reading scores of private school students exceeded that of public school students by over half a level. Private school students also had math scores over two fifths of a level higher. Similarly, they were about seventeen percentage points more likely to be able to write a dictated sentence. Relative to boys, girls had reading scores roughly a quarter of a level lower. Girls' average competency in math was lower by over half a level, and they were about nine percentage points less likely to be able to write. Children learned more with age, even after controlling for grade. With each year of age, they attained more skills in reading (about four percent of a level) as well as math (about three percent of a level). Their writing, however did not seem to improve with age.

Table 4 The Determinants of Competency (Ordinary Least Squares)

VARIABLES	(1) Reading	(2) Math	(3) Writing
Private	0.569***	0.438***	0.167***
	(0.032)	(0.027)	(0.011)
Female	-0.257***	-0.516***	-0.088***
	(0.029)	(0.024)	(0.010)
Age	0.044***	0.029***	0.006
	(0.011)	(0.009)	(0.004)
Grade	0.279***	0.178***	0.087***
	(0.011)	(0.008)	(0.004)
Household Education	0.011**	0.018***	0.005***
	(0.005)	(0.005)	(0.002)
Household Literate	0.200***	0.084**	0.051***
	(0.047)	(0.041)	(0.016)
Caste: Kshatriya	0.064	0.124	0.019
	(0.083)	(0.079)	(0.028)
Caste: Vaisya	0.109	0.007	0.022
	(0.090)	(0.092)	(0.029)
Caste: Shudra	-0.144***	-0.168***	-0.042**
	(0.055)	(0.054)	(0.019)
Caste: Muslim	-0.040	-0.025	-0.023
	(0.084)	(0.073)	(0.026)
Occupation: Government Employment	0.257**	0.280***	0.054
	(0.107)	(0.088)	(0.034)
Occupation: Farming	0.010	0.009	0.004
	(0.043)	(0.035)	(0.014)
Occupation: Labor	-0.234***	-0.211***	-0.071***
	(0.052)	(0.039)	(0.017)
Treatment 1	-0.017	-0.043	-0.010
	(0.052)	(0.043)	(0.017)
Treatment 2	0.006	0.033	-0.005
	(0.053)	(0.043)	(0.018)
Treatment 3	0.050	0.044	0.009
	(0.054)	(0.046)	(0.018)
Year 2006	0.068**	0.045	0.059***
	(0.035)	(0.028)	(0.012)
Constant	0.744***	0.218**	0.054
	(0.104)	(0.087)	(0.035)
Observations	10,368	10,379	10,377
R-squared	0.407	0.364	0.323

Household clustered standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Compared to a child in a given grade, another child enrolled in the next higher grade had a reading score over a quarter of a level above, had a math score almost a fifth of a level above, and was about nine percentage points more likely to be able to write. Children's learning also increased with household education. If a household's education increased by ten years, its children experienced an increase of about eleven percent a level in their reading scores, and almost fifth of a level in their math scores. They also become about 0.5 percentage points more likely to be able to write. The seemingly low effect of household education on a child's probability of being able to write could potentially be explained by the inclusion of the household literacy indicator as a regressor. As mentioned in Section V, the two variables are highly correlated. A household's literacy predicted its children's test scores. Compared to children whose households were illiterate, children from literate households had reading scores higher by roughly a fifth of a level. Household literacy also increased the math scores of children by about eight percent of a level. Literacy in the household increased the probability of its children being able to write by about five percentage points. Similarly, children of the Shudra caste appear to have learned less compared to Brahmins who serve as the excluded reference category. Shudras had reading scores lower by about fourteen percent of a level. They obtained math scores lower by about seventeen percent of a level, and were about four percentage points less likely to be able to write. The estimates provide no evidence that the scores of Kshatriya, Vaisya, or Muslims were different from those of Brahmins. Explanatory variables in my regressions include variables which indicate three household occupations, with the remaining occupations serving as the excluded reference category. A household's primary occupation appears to predict its children's test scores. Children whose households received stable incomes from government employment had reading and math scores higher by over a quarter of a level. On the other hand, children from labor households scored over a fifth to a quarter of a level lower in reading and math tests. They were about seven percentage points less likely to be able to write. I find no difference between the scores of children from farming households, and the scores of children whose households engage in the excluded reference occupations. The randomized treatments which Banerjee et al. (2010) tested had no impact on scores. However, children seemed to have improved their reading by about seven percent of a level by the endline in 2006 compared to the baseline in 2005, even when controlling for the other variables. They were also about six percentage points more likely to be able to write at endline.

To summarize, gender, income, and private schooling seem to largely determine test scores. Belonging to the Shudra caste also meant lower scores for a child, though the effect was lower in comparison to, say, being a female. Education and literacy in the household predicted its children's learning as well. Finally, children seem to have improved their reading and writing between baseline and endline, despite controls for the other factors.

VIII. Do Complaints Work?

In section III above, I hypothesized that a household would be able to increase the learning of its children by complaining at their schools. Given an institutional setting which might make private schools more accountable towards households compared to public schools, I developed a second

hypothesis that complaints would be more effective at increasing the learning of children who go to private schools compared to that of children who attend public schools. This section concerns itself with assessing whether or not the evidence favors these hypotheses.

Sections V, VI, and VII above show that private school attendance, the probability of complaining, and test scores are all correlated with children's socioeconomic characteristics. As such, any attempt to estimate the effect of complaints on test scores must account for these correlations. I estimate the following linear model for each of the three tests:

$$t_{i,r} = \beta_\pi \pi_{i,r} + \beta_p p_{i,r} + \beta_{p\pi} p\pi_{i,r} + \boldsymbol{C}\beta_k + \epsilon_h + \varepsilon_i + \mu_{i,r}$$

Model 4

where, the subscript i denotes a child, and the subscript r indicates the second round of survey such that each combination of i and r uniquely identifies a child in a given survey round; the subscript h denotes a household; $t_{i,r}$ is the test score of each child in each survey round; $\pi_{i,r}$ indicates whether or not the household of each child complained in each survey round; β_π is the parameter to be estimated for $\pi_{i,r}$; $p_{i,r}$ indicates whether or not a child attended private school in each survey round; β_p is the parameter to be estimated for $p_{i,r}$; $p\pi_{i,r}$[5] is the interaction between $p_{i,r}$ and $\pi_{i,r}$ for each child in each round; $\beta_{p\pi}$ is the parameter to be estimated for $p\pi_{i,r}$; $\boldsymbol{C}$ is a matrix of k child and household characteristics which are defined for each child in each survey round; β_k is the vector of k parameters to be estimated for each child and household characteristic; ϵ_h is the unobserved error that is fixed to the household between the survey rounds; ε_i is the unobserved error that is fixed to the child between the survey rounds; and $\mu_{i,r}$ is the unobserved error term which is not necessarily fixed to the child between the two rounds of survey. Given the hypotheses, I am interested in accurately estimating β_π, which provides the effect of the complaints on test score, and $\beta_{p\pi}$, which tells us whether the effect is different for private school students. If the hypotheses are correct, the estimation should show beyond reasonable doubt that these parameters are positive.

I estimate Model 4 above for each of the test scores. I first estimate ordinary least squares specifications controlling for child and household characteristics. Afterwards, I eliminate the unobserved errors fixed to the household and child. Table 5 below presents the estimated values of β_π, the marginal effect of complaint on test score; and $\beta_{p\pi}$, the marginal effect of complaint on the test scores of private school students. The first three columns present specifications which exclude $p\pi_{i,r}$, the interaction between private schooling and complaint. First, consider the results of the ordinary least squares estimation in these columns. These coefficients provide no evidence that complaints have any effect on reading scores, or the probability of being able to write. The estimates show that children whose households complain have math scores higher by about five percent of a level, but the result is not statistically significant. Now, consider the last three columns which show results for the specification which include the interaction between private schooling

[5] In matrix notation, given the vectors $p_{i,r}$ and $\pi_{i,r}$, $p\pi_{i,r} = p\sum_{a=1}^{n(i,r)} e_a^T \pi_{i,r} e_a e_a^T$, where $n(i,r)$ is the number of unique combinations of i and r, while e_a is the a^{th} vector in the $n(i,r) \times n(i,r)$ identity matrix $\boldsymbol{I}$.

and complaint. The effects of complaints do not differ for public and private school students when considering reading and writing scores. Nevertheless, when considering math scores, private school students experience a higher effect of complaints relative to public school students (as given by $\beta_{p\pi}$), and the difference is statistically significant.

To better understand this result, compare two children the first of whom comes from a household which complains, while the second child comes from a household which does not complain. Suppose they are similar in all other respects, including the type of school they attend. If these children both attend public schools, then their test scores do not differ. However, if they attend private schools, the first child has a math score higher by about twelve percent of a level compared to the scores of the second child.

The marginal effect of complaints on tests scores of private school children might not necessarily represent a causal relationship. After all, households complain because of poor academic performance to begin with. The possibility of a reverse causality— that of the test scores causing complaints— is unlikely for two reasons. First, as mentioned in section IV above, the act of complaining precedes the measurement of test scores. Secondly, we would see a negative correlation between test scores and complaints if households complained due to lower scores. That is, lower test scores would lead to a higher probability of complaining. However, the estimates show positive correlations between complaints and test scores, if any at all.

The survey questions are phrased in a manner that allows for the certainty that households complain due to poor performance of children or teachers. Nevertheless, the possibility remains that some households are more likely than others to complain at any given level of child or teacher performance. The characteristics which drive complaints might be related to children's private school attendance, or their academic performance, or both. We have accounted for some of these characteristics by including them as controls in our model. However, there might be unobservable reasons that lead certain households to complain more. Section VI above noted that households which attended Gram Sabha village meetings were more likely to complain. As discussed in the section, the correlation could arise if the meeting venues and schools were located in close proximity. If such were the case, people close to the schools and meeting venues would be more likely to complain, as well as more likely to attend the meetings. Distance to schools has been found to reduce the likelihood of school attendance (Hazarika and Bedi 2003), and is plausibly negatively related to learning as well. However, the data does not contain information on distance to school. Even if Gram Sabha meeting attendance captured a household's political capital, or a different phenomenon altogether, the possibility remains that these characteristics or phenomena might be correlated with test scores in unforeseen ways.

Omitting variables such as households' political capital, their attitudes towards education, or their distance from schools could result in the estimates of β_{π} and $\beta_{p\pi}$ being biased. Since these variables are effectively fixed over the period of a year, I employ a household fixed effects strategy to eliminate the biases. In other words, I remove the correlations between $\pi_{i,r}$ and ϵ_h, and between $p_{i,r}$ and ϵ_h in Model 4. Table 5 below also presents the estimates after removing household fixed

effects. They show no evidence that complaints affect test scores after controlling for household fixed effects.

Table 5 The Effect of Complaints on Competency

	(1)	(2)	(3)	(4)	(5)	(6)
OLS	Reading	Math	Writing	Reading	Math	Writing
Complaint	0.027	0.046*	0.016	-0.002	-0.003	0.008
	(0.030)	(0.025)	(0.010)	(0.040)	(0.030)	(0.013)
PrivateXComplaint				0.069	0.118**	0.019
				(0.056)	(0.047)	(0.019)
Observations	10,357	10,368	10,366	10,357	10,368	10,366
R-squared	0.407	0.364	0.323	0.407	0.365	0.323
Household Fixed Effects						
Complaint	-0.022	0.015	0.003	-0.015	-0.009	-0.000
	(0.024)	(0.020)	(0.010)	(0.033)	(0.026)	(0.013)
PrivateXComplaint				-0.016	0.056	0.008
				(0.050)	(0.042)	(0.019)
Observations	10,196	10,206	10,204	10,196	10,206	10,204
R-squared	0.716	0.693	0.625	0.716	0.693	0.625
Child Fixed Effects						
Complaint	-0.031	0.007	0.002	-0.019	-0.017	0.001
	(0.022)	(0.020)	(0.010)	(0.031)	(0.025)	(0.013)
PrivateXComplaint				-0.028	0.057	0.004
				(0.043)	(0.039)	(0.019)
Observations	8,988	9,004	9,000	8,988	9,004	9,000
R-squared	0.909	0.883	0.840	0.909	0.883	0.840

All specifications include controls for private schooling, grade, endline indicator, and indicators for three randomized treatments.

OLS specifications includes controls for age, gender (Female), caste (Kshatriya, Vaisya, and Shudra), household education, household literacy, and primary household occupation (Government employment, Farming, and Labor)

Household clustered standard errors in parentheses

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

Still, controlling for household fixed effects would not remove any bias arising from the unobserved differential treatment of children within households. Adhvaryu and Nyshadham (2016) have shown, for instance, that children in Tanzania who were exposed to the government's iodine supplement program *in utero* were breastfed for longer and were more likely to receive vaccines. In the same manner, it is possible that our households invest more in children who have more

inherent ability, and confront schools more often on their behalf. Or, instead of complementing inherent ability with additional investment, they could supplement it so that they invest more in children who are inherently less able. Such an inverse correlation between complaints and inherent ability could bias our estimates, causing us to mistakenly conclude that complaints are ineffective, despite removing household fixed effects. The data gives reveals observable reasons to believe that households do not treat all of their children the same when it comes to education. One fifth of Jaunpur's households sent their children to more than one type of school. I cannot explicitly control for households' attitudes towards education, or the educational input received by children. Nonetheless, a child fixed effects specification eliminates any bias due to these, as well as other unobservable characteristics fixed for each child within the span of a year, represented by ε_i in Model 4. Table 5 above presents the results of the child fixed effects specifications as well. The estimates, though, do not vary much relative to those obtained from the household fixed effects specifications. As such, they only serve to corroborate what the household fixed effects specifications revealed. Note, however, that my estimates do not account for any correlation which might exist between the idiosyncratic error term $\mu_{i,r}$, and complaint $\pi_{i,r}$, or between $\mu_{i,r}$ and private schooling $p_{i,r}$ in Model 4.

In summary, I find no evidence in favor of my hypotheses. I retain my null hypothesis— that households can not improve basic literacy and numeracy of their children by complaining at their schools. While Andrabi et al. (2017) defend that "…verifiable information increases complaints and thus imposes utility costs on public functionaries— teachers and principals…", I am led to conclude that the conditions of credible threat and information symmetry are both necessary, if not sufficient, for complaints to raise test scores, as I proposed in Section III above.

IX. Do Complaints Deceive?

Complaints are costly to households. In Jaunpur, the cost of complaints which households incur is at least as large as the cost of travelling to the schools to complain. There might be other economic or social costs to complaining. So, if households believed complaining to produce no returns, they would not complain. And yet, about a third of the households in Jaunpur complained. The lack of evidence on any effect of complaints on test scores does not preclude that complaints can influence households' beliefs about their children's competencies. As discussed in Section III above, the nature of the information asymmetry in Jaunpur allows for hosueholds' beliefs to deviate from reality. Recall that teachers have a certain degree of autonomy over the signals they can send to households regarding their children's competencies. It is possible, therefore, that teachers signal improvements in learning to aggrieved households even when there are none. So, complaints could affect perceived competency. In order to estimate any effect complaints might have on perceived competency, I estimate the following model:

$$t_{i,r}^{prcv} = \alpha_t t_{i,r} + \alpha_\pi \pi_{i,r} + \alpha_p p_{i,r} + \alpha_{p\pi} p\pi_{i,r} + \boldsymbol{C}\alpha_k + \vartheta_h + \varphi_i + e_{i,r}$$

Model 5

where, the subscript i denotes a child, and the subscript r indicates the second round of survey such that each combination of i and r uniquely identifies a child in a given survey round; the subscript h denotes a household; $t_{i,r}^{prcv}$ is the perceived test score of each child in each survey round; $t_{i,r}$ is the test score of each child in each survey round; α_t is the parameter to be estimated for $t_{i,r}$; $\pi_{i,r}$ indicates whether or not the household of each child complained in each survey round; α_π is the parameter to be estimated for $\pi_{i,r}$; $p_{i,r}$ indicates whether or not a child attended private school in each survey round; α_p is the parameter to be estimated for $p_{i,r}$; $p\pi_{i,r}$[6] is the interaction between $p_{i,r}$ and $\pi_{i,r}$ for each child in each round; $\alpha_{p\pi}$ is the parameter to be estimated for $p\pi_{i,r}$; $\boldsymbol{C}$ is a matrix of k child and household characteristics which are defined for each child in each survey round; α_k is the vector of k parameters to be estimated for each child and household characteristic; ϑ_h is the unobserved error that is fixed to the household between the survey rounds; φ_i is the unobserved error that is fixed to the child between the survey rounds; and $e_{i,r}$ is the unobserved error term which is not necessarily fixed to the child between the two rounds of survey. I am interested in accurately estimating α_π, which provides the effect of complaints on perceived competency, and $\alpha_{p\pi}$, which tells us whether the effect is different for private school students.

In estimating the effect of complaints on test scores in Model 4 above, I used ordinary least squares with controls for child and household characteristics. Given the potential correlations between complaints and the unobserved errors, I later eliminated errors fixed to the household, and those fixed to the child. Since the same sources of bias persist for Model 5, I also estimate it using ordinary least squares, household fixed effects, and child fixed effects. First, consider a variation which excludes the interaction between private schooling and complaint $p\pi_{i,r}$. Table 6 below presents the estimated coefficients α_t, α_π, and α_p. Take the ordinary least squares estimates. If households were perfectly informed of their children's competencies, the actual scores would have coefficients equal to one, and other variables in the specifications would have no bearing on perceptions after controlling for the actual scores. However, the table shows that a one level increase in each of the scores corresponds to a rise of just over a third of a level in perceived reading competency, and just over a quarter of a level in perceived math competency. Compare two children who are identical in all other regards, but are different in that the first can write, and the second one cannot. The first child would have been thought to be about 26 percentage points more likely to be able to write compared to the second. Households estimated the competencies of private school children to be higher. Private school children were thought to have reading competency about ten percent of a level higher, and math competency almost a fifth of a level higher. Households speculated that private school students were about four percentage points more likely to be able to write compared to their public school counterparts. Perhaps households enrolled children of higher perceived competencies in private schools to begin with. The estimates of the effect of complaints show that households which complained perceived their children to have math scores higher by about three percent of a level, and perceived them to be about one percentage point more likely to be able to write. Nevertheless, these effects of complaints are not statistically significant.

[6] In matrix notation, given the vectors $p_{i,r}$ and $\pi_{i,r}$, $p\pi_{i,r} = p\sum_{a=1}^{n(i,r)} e_a^T \pi_{i,r} e_a e_a^T$, where $n(i,r)$ is the number of unique combinations of i and r, while e_a is the a^{th} vector in the $n(i,r) \times n(i,r)$ identity matrix $\boldsymbol{I}$.

Now, allow for the possibility that complaints are correlated with unobserved characteristics fixed to the household. I estimate variations of the model after controlling for the household fixed unobservables represented by ϑ_h. Table 6 shows the result of these estimates as well. Notice that, compared to the ordinary least squares estimates, the coefficients of the actual scores drop. In comparison, the coefficients of private schooling remain effectively unchanged. The coefficients of complaint increase for perceived reading and writing competencies. Now, complaints seem to increase perceived reading competency by about six percent of a level. Likewise, after eliminating household fixed effects, the estimates show that a household which complained was about three percentage points more likely to think their children could write.

Finally, I allow child fixed characteristics φ_i to be correlated with complaints. I employ child fixed effects specifications to eliminate the unobservables fixed to the child. Table 6 also shows the estimates for the child fixed effects specifications. Removing child fixed effects reduces the coefficients of the actual reading and math scores by almost a half, and that of writing scores by over a half compared to the household fixed estimates. Private schooling now has a lower influence on perceptions, if at all. Private school students are now perceived to have math and reading competencies higher by about six to seven percent of a level of the respective scores, though these results are not statistically significant. Private schooling no longer influences households' perceptions about their children's ability to write. In other words, what the household fixed estimates showed to be the influence of actual scores or private schooling on perceived competency is, at least partially, accounted for by the perceptions which households inherently have of each of their children. When interpreting the effect of private schooling in the child fixed specifications, it is important to keep in mind that the variation in private schooling comes only from those children who changed from public to private schools, or vice versa, between baseline and endline. Controlling for child fixed effects does not change the coefficients of complaint much compared to the coefficients estimated using household fixed effects. However, the effect of complaints on perceived reading competency is no longer statistically significant.

I now estimate Model 5 above in its full form, allowing the effect of complaints to differ for public and private school students. Table 7 below presents the estimated coefficients α_t, α_π, α_p and $\alpha_{p\pi}$. The ordinary least squares estimates suggest that the effect of complaints on the perceived writing competency of public and private school students might differ. However, the difference disappears with household and child fixed effects. Therefore, none of the specifications provide evidence that the effect of complaints on the perceived competency might be different for private and public school students.

Table 6 The Effect of Complaints on Perceived Competency

VARIABLES	(1) Perceived Reading	(2) Perceived Math	(3) Perceived Writing	(4) Perceived Reading	(5) Perceived Math	(6) Perceived Writing	(7) Perceived Reading	(8) Perceived Math	(9) Perceived Writing
Reading	0.352***			0.331***			0.180***		
	(0.011)			(0.014)			(0.024)		
Math		0.270***			0.234***			0.123***	
		(0.009)			(0.012)			(0.019)	
Writing			0.258***			0.232***			0.106***
			(0.009)			(0.012)			(0.019)
Complaint	0.024	0.034*	0.015*	0.064**	0.031	0.028**	0.054*	0.045	0.025**
	(0.021)	(0.020)	(0.008)	(0.032)	(0.028)	(0.012)	(0.032)	(0.028)	(0.012)
Private	0.100***	0.185***	0.044***	0.113***	0.170***	0.046***	0.066*	0.057*	0.006
	(0.019)	(0.018)	(0.007)	(0.025)	(0.024)	(0.010)	(0.035)	(0.034)	(0.013)
Observations	9,487	9,304	9,322	9,223	9,013	9,026	7,630	7,342	7,368
R-squared	0.407	0.418	0.297	0.620	0.647	0.541	0.747	0.772	0.706
OLS	YES	YES	YES	-	-	-	-	-	-
Household FE	-	-	-	YES	YES	YES	-	-	-
Child FE	-	-	-	-	-	-	YES	YES	YES

All specifications include controls for grade, endline indicator, and indicators for three randomized treatments.

OLS specifications includes controls for age, gender (Female), caste (Kshatriya, Vaisya, and Shudra), household education, household literacy, and primary household occupation (Government employment, Farming, and Labor)

standard

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

Table 7 The Effect of Complaints on Perceived Competency (Including Interaction with Private Schooling)

VARIABLES	(1) Perceived Reading	(2) Perceived Math	(3) Perceived Writing	(4) Perceived Reading	(5) Perceived Math	(6) Perceived Writing	(7) Perceived Reading	(8) Perceived Math	(9) Perceived Writing
Reading	0.352***			0.331***			0.180***		
	(0.011)			(0.014)			(0.024)		
Math		0.271***			0.234***			0.123***	
		(0.009)			(0.012)			(0.019)	
Writing			0.258***			0.232***			0.106***
			(0.009)			(0.012)			(0.019)
Complaint	0.028	0.054*	0.029***	0.077*	0.042	0.041***	0.062	0.035	0.037**
	(0.031)	(0.028)	(0.011)	(0.043)	(0.036)	(0.015)	(0.047)	(0.039)	(0.017)
Private	0.104***	0.201***	0.056***	0.124***	0.179***	0.056***	0.072*	0.049	0.016
	(0.024)	(0.023)	(0.009)	(0.031)	(0.029)	(0.012)	(0.040)	(0.039)	(0.015)
PrivateXComplaint	-0.011	-0.047	-0.034**	-0.031	-0.025	-0.028	-0.017	0.022	-0.027
	(0.038)	(0.036)	(0.015)	(0.047)	(0.042)	(0.017)	(0.056)	(0.051)	(0.020)
Observations	9,487	9,304	9,322	9,223	9,013	9,026	7,630	7,342	7,368
R-squared	0.407	0.418	0.297	0.620	0.647	0.541	0.747	0.772	0.706
OLS	YES	YES	YES	-	-	-	-	-	-
Household Fixed Effects	-	-	-	YES	YES	YES	-	-	-
Child Fixed Effects	-	-	-	-	-	-	YES	YES	YES

All specifications include controls for grade, endline indicator, and indicators for three randomized treatments.

OLS specifications includes controls for age, gender (Female), caste (Kshatriya, Vaisya, and Shudra), household education, household literacy, and primary household occupation (Government employment, Farming, and Labor)

Household clustered standard errors in parentheses

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

After eliminating potential biases due to household and child fixed unobservables, my estimates provide evidence that complaints increase households' perceptions of their children's competencies. I find no evidence that complaints have different effects on the perceived competencies of private and public school students. Note that any possible correlation between complaint and the unobserved idiosyncratic error $e_{i,r}$ in Model 5 might still have introduced bias in the estimates. Also, as Appendix III below discusses, information on perceived competency is more likely to be missing for children with certain socioeconomic characteristics. As such, conclusions regarding the effect of complaints on perceived competency may not extend to the entire population of Jaunpur.

Despite these caveats, the analysis provides evidence in favor of the argument that, when households complain, teachers respond by misleading them into falsely perceiving improvements in competency. The sign as well as the magnitude of the effect of complaints on perceived competency are consistent with the assumption in the theoretical model of Andrabi et al. (2017) that "… it is easier to 'fool' [households] when the school produces a quality just below what it announces." Consider the effect of complaints on perceived competency as estimated using the child fixed specification. Complaints increased the perceived reading competency by about three percent of the standard deviation of the actual reading scores, and led households to believe that their children were about two percentage points more likely to be able to write. If teachers tried to signal larger improvements, they might not succeed.

Alternatively, complaints could inflate perceived competency without ever eliciting a response from teachers. Sending signals to households about their children's competencies requires teachers to exert effort. As such, teachers incur costs by signaling. If complaints pose no credible threats, as might be the case for Jaunpur, teachers have no incentive to send signals, misleading or otherwise. It is possible that increases in perceived competency arise within the psychology of households when they complain. Here, the theory of cognitive dissonance (Festinger 1985) provides an explanation. The theory states that when individuals encounter a reality which contradicts their beliefs, they incur a psychological cost termed cognitive dissonance. Individuals may reduce the cost by changing their beliefs. Goetzmann and Peles (1997), for instance, observed the phenomenon among investors in the financial market. The authors found that investors in the United States perceived the returns to their past investments to have been higher than the actual returns, even when they were able to observe the actual returns. The authors argue that investors changed their beliefs to justify past actions of investment. Similarly, in the case of Jaunpur, households would have potentially experienced cognitive dissonance if they were to realize that complaints had no effect on learning. In order to avoid the dissonance, households could have adjusted their perceptions of their children's competencies, justifying to themselves the effort they put into complaining.

X. Concluding Discussions

In recent years, the argument that information improves bargaining power of service recipients, and allows them to hold service providers accountable by complaining has gained momentum. Using evidence from the schooling system in India, this thesis argues that complaints do not work in the absence of either (a) information symmetry between service recipients and service providers, or (b) an accountability enforcement mechanism to make the threat of complaints credible. Information dissemination creates information symmetry, and has produced positive outcomes in certain contexts. However, these contexts also had enforcement mechanisms, however rudimentary, that made the threat of complaints credible. In the absence of such mechanisms, information might not produce desirable results *through complaints*. In Uttar Pradesh, where both conditions were likely unmet, I found no evidence that households could improve their children's competencies by complaining at their schools. However, as a possible result of the information asymmetry, or that of cognitive dissonance, complaints led households to perceive improvements which did not occur. Whatever mechanism underlies the relationship between complaints and perceived competency, households seemed to consider the small improvements worth the trouble of complaining.

Reducing asymmetry in information would lead to more accurate perceptions, but could it have undesirable consequences? Suppose some households come to realize that they had been overestimating their children's competencies. They could potentially interpret the discord to mean that their investments in education bear no fruit, and subsequently divest from education. Andrabi et al. (2017) did not find conclusive evidence of any negative effects of information on the amount of time households spend with children in educational activities, or on educational spending. In Jaunpur, however, children who were perceived to have high competencies were less likely to drop out of school— an admittedly extreme form of divestment— even when controlling for age, gender, and household fixed effects (See Appendix IV). The basic analysis does not show that changes in perceptions can cause changes in the probability of dropout. It does, however, provide reason to be cautious of the undesirable consequences of influencing perceptions through information, particularly when households have limited control over the education of their children.

Information may improve outcomes in education, or other dimensions of public services, through various channels— increased participation, informed choice, or complaints. However, it can improve outcomes *through complaints* only in the presence of functional mechanisms of arbitration between service recipients and service providers.

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Appendix I

A Model[7] of Complaints

A Note on Notation: Below, the notation "prime" using an apostrophe, such as in $u'(E)$, denotes differentiation with respect to E. So $u'(E) = \frac{\partial u}{\partial E}$, and $u''(E) = \frac{\partial^2 u}{\partial E^2}$. Differentiation with respect to any other variable does not use the "prime" notation.

Suppose the teacher at a school has a continuous utility function $u(E)$, which is a twice differentiable function of the effort E that the teacher applies on a given student. We define $u(E)$ such that:

$u(E) \geq 0, u'(E) < 0$, and $u''(E) = a < 0$, where a is a constant and $E \in [0,1]$.
Relation 1

The teacher's utility is highest when he does no work at all, and lowest when he works with full effort. Such a utility function is plausible in a context where additional effort does not generate any additional reward, and there are no penalties for poor performance. Therefore, $max[u(E)] = u(0)$, and $min[u(E)] = u(1)$.

The household has a utility function $T(E)$ that is increasing in E, the effort which the teacher affords a child in the household. The household observes the teacher's effort and may choose to bargain with the school for higher effort through complaints. Higher the effort, lower the probability $\pi(E)$ of the household complaining. Though the probability of the household complaining also depends on the cost of complaining, the dependency is not explicitly modeled here. So, $\pi'(E) < 0$, and $\pi(1) = 0$. Suppose the function $\pi(E)$ is linear in E, and can be written as:

$\pi(E) = n(1 - E)$, where $n > 0$ is a constant.
Relation 2

If the household complains to the school, the teacher faces a cost C in the form of a penalty. We can therefore fully specify the teacher's utility as:

$U(E) = u(E) - \pi(E)C$
Relation 3

The teacher maximizes his utility $U(E)$ by choosing E such that $U'(E) = 0$. Substituting, Relation 2 in Relation 3, we get $U'(E) = u'(E) + nC$. We assume that the magnitude of nC is big enough that:

[7] For examples of models of bargaining, protests, and complaints, see Banerjee et al. (2015), Andrabi et al. (2017), or Reinikka and Svensson (2004). For an example of the use of utility functions in modeling principal-agent problems between households and schools, see Jayachandran (2014).

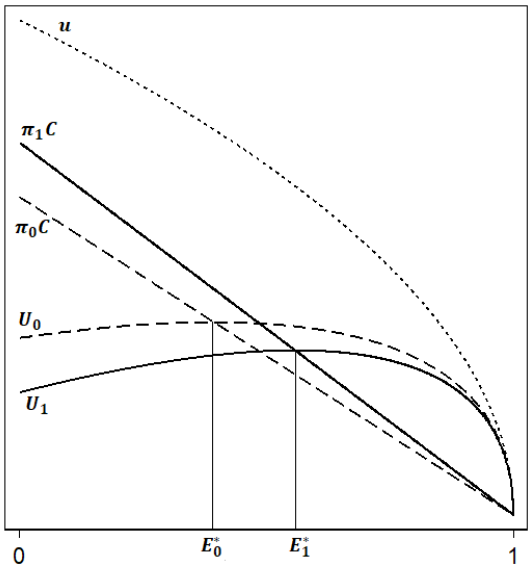
$U'(0) = u'(0) + nC > 0$,
Relation 4

which ensures that a local maxima exists for $U(E)$ where $E \in (0,1]$. Therefore, the utility maximizing level of effort E^* is given by:

$u'(E^*) = -nC$
Relation 5

It follows from Relation 1 and Relation 5 that the level of effort exerted by a utility maximizing teacher for any given child E^* is directly proportional to the cost C he faces, and n , which is proportional to the probability with which the child's household complains.

Two Children with Different Probabilities of Complaint



Suppose a teacher has two students represented by the subscripts 0 and 1 with two different probabilities of complaining π_0 and π_1. Now suppose:

$\pi_0(E) = n_0(1-E) < \pi_1(E) = n_1(1-E)$, which implies $n_0 < n_1$.
Relation 6

From Relation 5 and Relation 6, we get $u_0'(E_0^*) = -n_0C < u_1'(E_1^*) = -n_1C$. Therefore, from Relation 1,

$E_1^* > E_0^*$
Relation 7

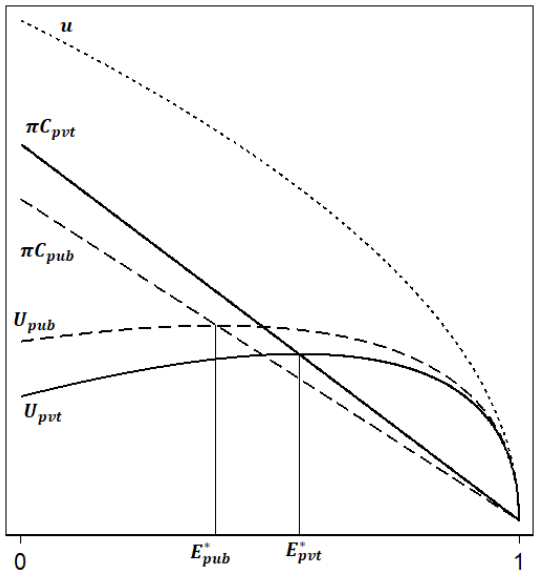
Finally,

$T(E_1^*) > T(E_0^*)$
Relation 8

From Relation 8, we get

Hypothesis 1: Complaints improve learning.

Private versus Public Schools



Now, let the subscript pvt denote private school, and pub denote public school. Let C_{pvt} be the cost faced by a private school teacher, and C_{pub} be that faced by a public school teacher. We assume that both teachers have the same initial utility function $u(E)$. After accounting for the cost of complaints, the utility functions of the private and public school teachers are respectively $U'_{pvt}(E) = u'(E) - nC_{pvt}$ and $U'_{pub}(E) = u'(E) - nC_{pub}$. Furthermore,

$C_{pvt} > C_{pub}$,
Relation 9

so $U'_{pvt}(E) < U'_{pub}(E)\ \forall\ E \in [0,1)$. From Relation 5 and Relation 9, we get $u'(E^*_{pvt}) = -nC_{pvt} < u'(E^*_{pub}) = -nC_{pub}$. Therefore, from Relation 1,

$E^*_{pvt} > E^*_{pub}$
Relation 10

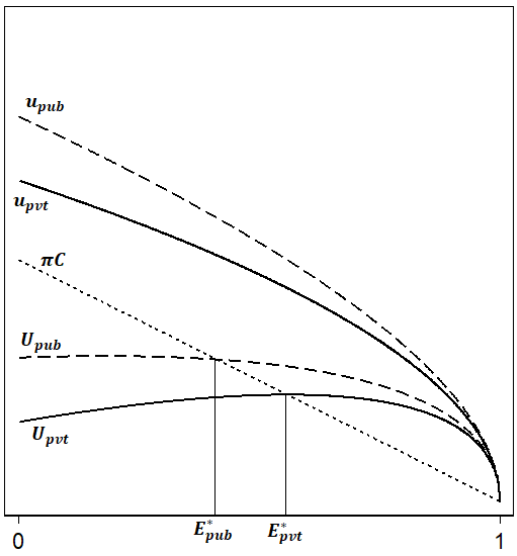
Finally,

$T(E^*_{pvt}) > T(E^*_{pub})$
Relation 11

From Relation 11, we get

Hypothesis 2: Complaints are more effective at improving the learning of private school students compared to that of public school students.

Private versus Public Schools: An Alternative Mechanism



Let us assume that the cost of complaint C for both private and public school teachers is the same. Suppose $u_{pvt}(E)$ represents the utility of a teacher who works at a private school, and $u_{pub}(E)$ represents the utility of those who works at a public school. Public school teachers generally have higher compensation and privileges compared to teachers who work at private schools. Therefore, at any given level of effort except $E = 1$, public school teachers have higher utility compared to private school teahers. Neither kind of teacher gets any utility when they work with full effort. That is, $u_{pub}(1) = u_{pvt}(1) = 0$. If the extra utility the public school teacher derives compared to the private teacher at $E = 0$ is given by a constant $m = u_{pub}(0) - u_{pvt}(0) > 0$, we can write:

$u_{pub}(E) = u_{pvt}(E) + m(1 - E)$
Relation 12

So, $u_{pub}(E) > u_{pvt}(E)\ \forall\ E \in [0,1)$, and we get:

$u'_{pub}(E) = u'_{pvt}(E) - m$
Relation 13

So, $u'_{pub}(E) < u'_{pvt}(E)$ for any given E. Given the utility maximizing condition in Relation 5, the two teachers maximize their utilities by choosing E such that $u'_{pub}\left(E^*_{pub}\right) = u'_{pvt}\left(E^*_{pvt}\right) = -nC$. Therefore, given Relation 1:

$E^*_{pvt} > E^*_{pub} \ \forall -nC,$
Relation 14

which is the same as Relation 10.

Since we do not have reliable information on teacher effort in our data, we will not be able to empirically test Relation 7 or Relation 10.

Appendix II

Definitions, Errors, and Missing Data

The variable Female indicates whether or not a child is a girl. The data assumes gender is binary. So, any child who is not a girl is a boy. Gender information was missing for about two percent of the full sample at baseline. Out of all children in the full sample at baseline, close to three percent were recorded to have changed their gender by endline.

About 97 percent of the children in the full sample at baseline were of age seven to fourteen. The data does not contain age information for about two percent of the children. Age ranged from one to eighteen at baseline. Between baseline and endline, age increased by one year for about 90 percent of the children in the full sample.

The data contains no information on the type of school each child attended— private, public, NGO, Madrassa, or out of school— for about two percent of children in the full sample at baseline. In the sample of households which were administered the household surveys, the data allows for the unique identification of schools at baseline. Almost eight percent of schools were reported to be of more than one type.

Information on grade is missing for about nine percent of children in the full sample at baseline. One percent of children were enrolled in grade zero. By endline, about three quarters of children either repeated their grades or progressed to the next grade.

The data also contains information on the number of years of education completed by the respondent. Likewise, at the time of interview, the surveyors also asked respondents to read a sentence in order to assess whether or not they were literate. I use these variables as proxies for the education and literacy in the respondent's household. Certain features of these variables seem erroneous. About four percent of the respondents who completed at least fifth grade were illiterate.

Appendix III

Perception versus Reality

Here, I direct my attention to understanding if children's socioeconomic characteristics determine how their households perceive their competencies. I estimate the following model using ordinary least squares:

$$t_{i,r}^{prcv} = \zeta_t t_{i,r} + \zeta_p p_{i,r} + \boldsymbol{C}\zeta_k + v_{i,r}$$

Model 6

where, the subscript i denotes a child, and the subscript r indicates the second round of survey such that each combination of i and r uniquely identifies a child in a given survey round; $t_{i,r}^{prcv}$ is the perceived competency of each child in a given survey round; $t_{i,r}$ is the test score of each child in a given survey round; ζ_t is the parameter to be estimated for $t_{i,r}$; $p_{i,r}$ indicates whether or not a child attends private school in a given survey round; ζ_p is the parameter to be estimated for $p_{i,r}$; $\boldsymbol{C}$ is a matrix of k child and household characteristics; ζ_k is the vector of k parameters to be estimated for each child and household characteristic; and $v_{i,r}$ is the unobserved error.

Table 8 below shows the results of my ordinary least squares estimation of Model 6. A child's gender seemed to have no bearing on the perception of their competency. Even with controls for grade, and actual competency, the estimates provide ground to believe that children's age influenced households' perceptions of their literacy and numeracy. With every year added to a child's age, the child was perceived to have reading competency higher by about two percent of a level, and math competency higher by about four percent of a level. Households also thought children were about two percentage points more likely to be able to write simply by virtue of one-year increments in the children's ages. Once again, despite controls for the actual test scores, and age, a child's grade predicted how their household perceived their competencies. As children ascended one grade, they were believed to have reading and math competencies higher by about seven to eleven percent of a level. Their households also expected them to be about two percentage points more likely to be able to write. I find no evidence that a household's level of education had any bearing on its perception of reading competency. Nonetheless, every ten years of schooling in the household corresponded to them estimating their children's math competency to be higher by about 0.5 percent of a level, and their probability of being able to write to be lower by about 0.2 percentage points. However, none of the effects of household education were statistically significant. A literate household, similarly, estimated reading competency to be higher by about ten percent of a level, though literacy seemed to have no relationship with the perception of the math, or writing competency.

Table 8 The Determinants of Perceived Competency (Ordinary Least Squares)

VARIABLES	(1) Perceived Reading	(2) Perceived Math	(3) Perceived Writing
Female	-0.001	-0.014	-0.004
	(0.019)	(0.018)	(0.007)
Age	0.025***	0.045***	0.019***
	(0.007)	(0.007)	(0.003)
Grade	0.066***	0.107***	0.024***
	(0.007)	(0.007)	(0.003)
Household Education	-0.001	0.005*	-0.002*
	(0.003)	(0.003)	(0.001)
Household Literate	0.099***	-0.009	0.015
	(0.031)	(0.030)	(0.012)
Caste: Kshatriya	0.002	0.021	0.017
	(0.042)	(0.042)	(0.017)
Caste: Vaisya	0.001	-0.004	0.011
	(0.052)	(0.050)	(0.021)
Caste: Shudra	0.007	-0.043	-0.000
	(0.031)	(0.028)	(0.011)
Caste: Muslim	-0.037	-0.043	0.001
	(0.050)	(0.046)	(0.019)
Occupation: Government Employment	-0.015	0.002	0.051***
	(0.051)	(0.050)	(0.016)
Occupation: Farming	0.002	0.028	0.012
	(0.023)	(0.022)	(0.009)
Occupation: Labor	-0.072**	-0.027	-0.009
	(0.036)	(0.032)	(0.013)
Treatment 1	-0.064*	-0.053	-0.032**
	(0.037)	(0.035)	(0.013)
Treatment 2	0.002	-0.019	-0.015
	(0.035)	(0.035)	(0.013)
Treatment 3	-0.060*	-0.055	-0.032**
	(0.036)	(0.036)	(0.013)
Year 2006	0.061**	0.078***	0.021**
	(0.027)	(0.027)	(0.010)
Constant	1.771***	0.823***	0.331***
	(0.070)	(0.060)	(0.026)
Observations	9,497	9,314	9,332
R-squared	0.407	0.417	0.296

Specifications include controls for actual scores— reading in column (1), math in column (2), and writing in column (3)— as well as private schooling.
Household clustered standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

The estimates provide no evidence that caste had any bearing on the perception of competency when controlling for the other variables. The specifications also include controls for three household occupations— government employment, farming, and labor— with households of the remaining occupations serving as a reference category. The estimates show that households which rely primarily on government employment for their income considered their children to be about five percentage points more likely to be able to write. On the contrary, labor households predicted their children to have reading competency lower by about seven percentage points.

The first and third randomized interventions which Banerjee et al. (2010) tested seemed to have lowered households' perceptions of their children's reading competencies by six percent of a level, though this result is not statistically significant. The same interventions also made households believe that their children were about three percentage points less likely to be able to write. Meanwhile, the second intervention seemed to have no effect. The coefficient of the second intervention introduces inconsistency in the results. As described in Section II above, the second intervention built on the first, and the third on the second. So, if the first and third interventions affected perceptions, we would have expected the second to have some effect as well. A year after the baseline, households perceived higher competencies. Their expectations of their children's reading competencies were higher by about six percent of a level, and math competencies by about eight percent of a level. They also considered their children to be about two percentage points more likely to be able to write.

The estimates show that socioeconomic factors predict households' perceptions of children's reading, writing, and math competencies. Despite controlling for their actual abilities, households expect children to learn more with age, and with the ascension of each grade. Note that estimates of Model 6 above, which have perceived competency as dependent variable, use smaller samples compared estimates of Model 4. Data on perceived competency is missing for a sizable portion of the sample, and they are not missing at random. Table 9 below estimates Model 6 replacing the dependent variable with a variable which indicates whether or not the perceived competency is missing for each of the tests for each child in each survey round. The ordinary least squares estimates show that perceived competencies were less likely to be missing for children with higher test scores, for children of literate and more educated households, as well as for children whose households depended on government employment or farming for income. Compared to children of the Brahmin caste, perceived competencies were more likely to be missing for children from the lower castes, but not necessarily for Muslims. Households' perceptions about certain dimensions of competency were also less likely to be missing for private school children, and for children of higher grades.

Table 9 Determinants of Missing Data on Perceived Competency (Ordinary Least Squares)

VARIABLES	(1) Reading Percep. Missing	(2) Math Percep. Missing	(3) Writing Percep. Missing
Reading	-0.015***		
	(0.003)		
Math		-0.026***	
		(0.003)	
Writing			-0.049***
			(0.008)
Private	-0.009	-0.007	-0.017**
	(0.006)	(0.007)	(0.007)
Female	-0.005	-0.008	-0.002
	(0.006)	(0.006)	(0.006)
Age	0.001	0.003	0.002
	(0.002)	(0.003)	(0.003)
Household Education	-0.003***	-0.005***	-0.004***
	(0.001)	(0.001)	(0.001)
Household Literate	-0.070***	-0.060***	-0.072***
	(0.010)	(0.013)	(0.012)
Caste: Kshatriya	0.010	0.026*	0.028**
	(0.009)	(0.016)	(0.013)
Caste: Vaisya	0.044**	0.057**	0.063***
	(0.021)	(0.023)	(0.024)
Caste: Shudra	0.028***	0.033***	0.031***
	(0.007)	(0.008)	(0.007)
Caste: Muslim	0.009	0.006	0.025
	(0.014)	(0.016)	(0.016)
Occupation: Government Employment	-0.024	-0.040**	-0.043***
	(0.015)	(0.016)	(0.016)
Occupation: Farming	-0.017**	-0.025**	-0.021**
	(0.008)	(0.010)	(0.009)
Occupation: Labor	0.020	0.015	0.024*
	(0.013)	(0.014)	(0.014)
Grade	-0.004	-0.005**	-0.006**
	(0.003)	(0.003)	(0.003)
Year 2006	0.003	0.014	0.008
	(0.011)	(0.012)	(0.012)
Constant	0.161***	0.150***	0.169***
	(0.020)	(0.022)	(0.022)
Observations	10,318	10,328	10,326
R-squared	0.063	0.066	0.067

Specifications include controls for three randomized treatments.
Household clustered standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Appendix IV

Does Perceived Competency Predict Divestment from Education?

Households in Jaunpur arguably have limited control over their children's education, either due to economic limitations, or due to lack of schooling choice. If they receive information which shows them they had been overestimating their children's competencies, they could conclude that their investments in education bear no fruits. They could respond by divesting from education. I take dropouts to be a measure of such divestment, and estimate the effect of perceived competency on the probability of dropout using the following model:

$$D_{i,r} = b_{prcv}\, t_{i,r}^{prcv} + b_t t_{i,r} + \boldsymbol{C} b_k + w_h + z_{i,r}$$

Model 7

where, the subscript i denotes a child, and the subscript r indicates the second round of survey such that each combination of i and r uniquely identifies a child in a given survey round; $D_{i,r}$ indicates whether or not a child is out of school in a given survey round; $t_{i,r}^{prcv}$ is the perceived test score of each child in a given survey round; b_{prcv} is the parameter to be estimated for $t_{i,r}^{prcv}$; $t_{i,r}$ is the test score of each child in a given survey round; b_t is the parameter to be estimated for $t_{i,r}$; $\boldsymbol{C}$ is a matrix of k child and household characteristics; b_k is the vector of k parameters to be estimated for each child and household characteristic; w_h is the unobserved error fixed to the household; and $v_{i,r}$ is the unobserved error not necessarily fixed for the household.

Table 10 below presents the household fixed estimation of Model 7 above. The sample includes children of any school type— private, public, NGO, or Madrassa— as well as children who are out of school.

The estimates show that an increase in perceived reading (math) competency by one level corresponds to a reduction of about four (five) percentage points in the probability of dropout. Similarly, if a child who can not write is perceived to be able to write, they are about nine percentage points less likely be out of school. These effects might not be causal because, among other reasons, they are time inconsistent. Households decided whether or not to pull their children out of school prior to the measurement of their perceptions.

Table 10 The Effect of Perceived Competency on the Probability of Dropout (Household Fixed Effects)

VARIABLES	(1) Out of School	(2) Out of School	(3) Out of School
Perceived Reading	-0.042***		
	(0.004)		
Reading	-0.024***		
	(0.003)		
Perceived Math		-0.053***	
		(0.005)	
Math		-0.025***	
		(0.003)	
Perceived Writing			-0.091***
			(0.010)
Writing			-0.061***
			(0.008)
Observations	10,313	10,077	10,097
R-squared	0.597	0.588	0.582

All specifications include controls for the endline indicator, indicators for three randomized treatments, age, and gender (Female)
Household clustered standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1