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# Wealth inequalities in perceptions of school quality in Pakistan

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## Abstract

This paper assesses the factors driving parental perceptions about school quality in rural Pakistan. Using a three-period longitudinal database on rural households in three districts, this study estimates different models to answer this question: ordered and generalised ordered logit specifications as well as linear probability models with household and school fixed effects. The results are preoccupying as we observe strong differences between privileged and disadvantaged households. Only the richest households take into account test scores when forming their perceptions. This finding suggests that access to information is unequal and could penalize the poorest children. Both rich and poor households tend to overestimate the quality of private schools which can explain the recent growth in private enrollment. Other school characteristics such as the size of the school, the medium of instruction (English teaching) or school infrastructure are also valued by parents.

*Keywords:* Education, Inequalities, Pakistan, Perceptions, Private Schools, Schooling quality, Test scores

## Résumé

Cet article cherche, pour la première fois, à comprendre comment les parents forment leurs perceptions en termes de qualité d'éducation. La façon dont ils perçoivent la qualité des institutions scolaires peut expliquer leurs décisions en termes d'éducation. En utilisant des données de panel dans trois districts ruraux du Pakistan, plusieurs modèles sont estimés pour comprendre les déterminants de la perception: des modèles de logit ordonnés ainsi que des modèles de probabilité linéaires avec des effets fixes écoles et ménages. Les résultats soulèvent des questions en termes d'inégalités puisque l'on observe des différences significatives selon le niveau de richesse des ménages. Seuls les ménages les plus aisés prennent en compte les résultats scolaires des écoles quand ils doivent évaluer leur qualité. Ce résultat suggère que l'accès à l'information est inégal et pourrait nuire aux plus défavorisés. Tous les ménages, quel que soit leur niveau de richesse, ont tendance à surestimer la qualité des écoles privées, ce qui peut expliquer la croissance de l'enseignement privé que l'on observe dans de nombreux pays en développement. Enfin, les parents valorisent d'autres facteurs scolaires comme la taille de l'école, la langue d'instruction et les infrastructures disponibles.

*Keywords:* Education, Ecoles Privées, Inégalités, Pakistan, Perceptions, Qualité de l'Education, Résultats scolaires

*JEL* classification: I21, I24, I28

# 1 Introduction

When making schooling decisions for their children, parents take into account various factors. They form perceptions about what will be the returns to education and, based on this, they decide to enroll their children or not. They would invest in their children's education if the present value of expected future earnings is higher than the cost of schooling. Expected future earnings depend on how long the child has been studying (the quantity of schooling) but also on the skills he has acquired (the quality of schooling) (Behrman et al., 2008; Boissiere et al., 1985; Card and Krueger, 1992; Green and Craig Riddell, 2003; Hanushek, 2005; Murnane et al., 2000). Parents would be more likely to invest in education if they think that schools provide valuable knowledge. To get children into schools and increase school participation, it is important to understand what factors are valued by parents. Analyzing the determinants of parental perceptions about school quality is therefore crucial as it would be helpful to design appropriate policies to increase school participation.

International and regional standardised tests have increasingly been conducted to measure educational quality. For instance, the TIMSS<sup>1</sup> and PIRLS<sup>2</sup> surveys are international comparative assessments in Mathematics and Science in more than 60 countries. Similarly, the PISA<sup>3</sup> test has been designed to quantify the knowledge of 15-year-old students in more than 70 countries. In Africa, the SACMEQ<sup>4</sup> and PASEC<sup>5</sup> assess student abilities in Mathematics and Reading. Test scores have been widely used in the recent literature to assess schooling quality (Behrman and Birdsall, 1983; Boissiere et al., 1985; Card and Krueger, 1992; Hanushek and Kimko, 2000; Hanushek and Woessmann, 2012).

These tests allow to quantify the knowledge acquired during the schooling life but they do not include other possible objectives of the educational system such as the development of specific attitudes and behaviors or values. The notion of schooling quality can encompass different aspects going beyond simple test scores. This is the first reason why parental perceptions about school quality may differ from test scores. For instance, parents can value their child's well-being or the languages of instruction. The second reason why school quality perceptions may differ from academic results resides in a potential lack of information. Parents may be ill-informed about academic performances in the different available schools. If so, they form their perceptions based on other characteristics than test scores using for instance observable characteristics such as the type of the school.

To our knowledge, no paper has tried to explain how parents form their judgments about school quality. This study aims to fill this void in the literature. The perception of school quality is related with objective test-based measures of school quality and other covariates.

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<sup>1</sup>Trends in International Mathematics and Science Study

<sup>2</sup>Progress in International Reading Literacy Study

<sup>3</sup>Program for International Student Achievement

<sup>4</sup>Southern and Eastern Africa Consortium for Monitoring Educational Quality

<sup>5</sup>Programme d'Analyse des Systèmes Educatifs de la CONFEMEN

We are able to determine what factors are being claimed when parents assess the quality of a school by studying the relationship between objective and reported school quality, a largely unexplored field. We use ordered logit specifications but also linear probability models with school and household fixed effects. The decomposition method proposed by Fairlie (2005) is implemented to analyze the perception gap between private and public schools. These models are applied to primary schools in three districts of Punjab province in Pakistan using a unique and longitudinal database (LEAPS database).

The results raise concerns in terms of inequality as only the richest households take into account test scores when forming their perceptions. This implies that only the wealthiest parents are able to choose the best schools for their children. Access to information is not equal and could penalize poorer children. Both poor and rich households tend to overestimate the quality of private schools. This residual premium granted to private institutions is not explained by the differences of school characteristics. Other school characteristics such as the size of the school, the medium of instruction or school infrastructure also explain parental perceptions.

The rest of the papers is organized as follows. In Section 2, we review the relevant literature. Section 3 details the empirical specifications. In Section 4, we briefly describe the educational system in Pakistan before presenting the LEAPS database along with the variables of interest. Sections 5 and 6 respectively present the empirical results and some robustness tests. Finally, the last Section concludes with the implications for educational policies in Pakistan and suggestions for future research.

## 2 Literature Review

Recently, a substantial body of research has been conducted to understand how quality of education is determined and how it affects development. Getting children into schools is only a first step, we also need to ensure that they are learning useful and valuable knowledge and skills.<sup>6</sup> Increases in the quantity of education could be jeopardized by weaknesses in the quality of education. Even though the quality of schooling has become a priority in developing countries<sup>7</sup>, improving the quality of primary schooling remains a challenge in developing countries as many pupils leave primary schools without knowing how to read or to count. For instance, in Malawi and in Zambia, only respectively 22 and 25 percent of students enrolled in grade 6 reach the minimum literacy level (Abadzi, 2006; Nielsen et al., 2006). In India, around half of the students enrolled in grade 5 could not read a story or do a two-digit subtraction (Pratham et al., 2015).

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<sup>6</sup>As stated by Pritchett (2013), “Schooling ain’t learning”.

<sup>7</sup>For instance, the sixth Education For All (EFA) Dakar goal states that nations should improve “all aspects of the quality of education and ensuring excellence of all so that recognized and measurable learning outcomes are achieved by all, especially in literacy, numeracy and essential life skill”.

The low quality of schooling in developing countries has substantial economic consequences. First, decisions about education are derived from the utility associated with schooling. Rational individuals invest in education if the increase of income associated with additional education overcomes the costs of education. As quality of education is associated with an increase in future individual earnings (Behrman et al., 2008; Boissiere et al., 1985; Card and Krueger, 1992; Green and Craig Riddell, 2003; Hanushek, 2005; Murnane et al., 2000), increasing the quality of schooling would lead to an increase in enrollment. In India, Drèze and Kingdon (2001) find that decreasing pupils-teacher ratio, increasing teacher qualification and presence increase female school participation. Moreover, once enrolled if the quality of the education delivered is low, students could be incited to drop out of school sooner (Hanushek et al., 2008). A report by UNESCO (2014) shows that, in Ethiopia, India, Peru and Vietnam, children aged 12 with lower scores in Mathematics are more likely to drop out by age 15 than those who perform better. Similarly, in Egypt, Hanushek et al. (2008) find that students with greater achievement remain longer in schools. Gould et al. (2003) use a natural experiment (massive migration of Ethiopians in Israel) and find that attending an elementary school with good academic results in Mathematics reduces the probability of dropping out from 10 percent to 4.9 percent. Similar results were found in China where students performing poorly were more likely to drop out (Yi et al., 2012). Parents may choose to keep their children out of school if they think that the quality of local school is insufficient to yield benefits. Two related strands of the literature confirm the fact that parents are sensitive to school quality when taking educational decisions.

The first relevant literature concerns school choice, a widely discussed topic initiated by Friedman (1955, 2009). Advocates of school choice have been arguing that expanding schooling options (through for instance the construction of new schools) would lead to an increase in competition between schools. As schools would have to lower their costs and increase their learning outcomes to attract children, school choice would theoretically lead to efficiency gains in terms of both quality and costs (Holmes et al., 2003; Hoxby, 2007; Friedman, 2009). Two recent studies using randomised controlled trials in respectively Afghanistan and Burkina Faso show that building new schools improves test scores (Burde and Linden, 2013; Kazianga et al., 2013). However, this relationship between school choice and efficiency is not straightforward because educational markets are distorted in many ways (Härmä, 2011). One reason why expanding school choice would not necessarily lead to efficiency gains resides in an asymmetry of information. Parents are not fully informed about schools' performances (Watkins, 2004) therefore increasing the supply of schools would not mean that parents would leave low-performing schools to enroll their children in the best schools. The second reason why it may not be the case is because parents may value something else than academic results. They may choose to leave their children in low-performing schools because these schools have other specific characteristics valued by households. Understanding the factors driving parents' attitudes towards schools is therefore crucial to apprehend the consequences of school choice expansion.

The second related strand of the literature looks into the impacts of disseminating information on school quality measured by test scores. If releasing information about the quality of available schools leads to an increase in test scores it could be that parents make better decisions about where to enroll their children. While some studies find that information on test scores at the school level do not have any impact on learning outcomes (Banerjee et al., 2010; Mizala and Urquiola, 2013), two recent papers in Pakistan and Brazil suggest otherwise (Andrabi et al., 2014; Camargo et al., 2011). Using a randomized experiment implemented in the same districts than those studied in this article, Andrabi et al. (2014) find that providing school and child test scores to parents increases test scores by 0.11 standard deviation and increases primary enrollment by 4.5 percent. Their results support a model of asymmetric information suggesting that parents do not have access to all the information about schools. Camargo et al. (2011) assess another report card experiment in Brazil and find that releasing information about test scores increases the performance of students in private schools by 0.2-0.6 standard deviation. They however find no significant effect for students attending public institutions. One potential explanation to the absence of effects found by Banerjee et al. (2010) and Mizala and Urquiola (2013) lies in the heterogeneity of parental preferences. Parents may not respond to information on test scores because they value other characteristics than just academic results. Assessing how parents perceive the quality of the schools is therefore crucial as it could help to boost enrollment and improve overall schooling quality.

To our knowledge, no paper has tried to assess the factors driving parents' perceptions about school quality. If parents are not able to assess the quality of schools, due to poor information, they would not enroll their children in the best schools and this would harm the human capital accumulation process. Moreover, increasing test scores would not raise enrollment if parents value something else than traditional academic standards measured by tests.

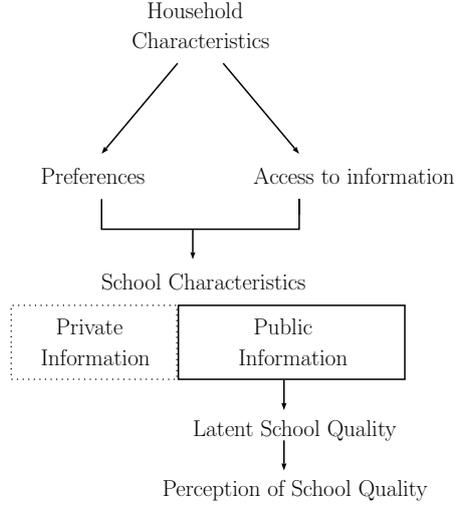
### 3 Empirical specifications

#### 3.1 Determinants of perceptions

Perception is a subjective judgment made by parents about the quality of a school. The conceptual framework representing how perceptions are formed is presented in Figure 1.

Parents operate in an asymmetric information setting where the principal (school) has more information (private information) than the agents (parents). The latter cannot access the private information owned by the school and have to rely on public (observable) information. The public information collected on the school determines the latent school quality which in turn explains the perception of school quality. Two households can rate a same school differently for two main reasons. First, they can have heterogeneous preferences. For instance, one household may value more religious education than the other. Second, they

Figure 1: Conceptual framework for school quality perceptions



may not have access to the same information concerning schools. Both the amount of information available and households' preferences are functions of household characteristics. Based on their preferences and access to information, parents collect information about the school. Heterogeneous preferences affect the characteristics included in the latent quality function whereas differences in access to information lead to variations in the allocation between private and public information.

Parents rank the quality of a school using a Likert scale where one refers to very poor quality and five to excellent quality. Because of the small size of extreme categories, very poor and poor quality classifications as well as good and excellent quality categories are gathered together. The structural model can be presented as:

$$y_{hs}^* = X_{hs}\beta + \epsilon_{hs} \quad (1)$$

Where  $y_{hs}^*$  represents the latent quality perceived by the household  $h$  for the school  $s$ .  $X_{hs}$  refers to a vector including household variables ( $H_h$ ) and school characteristics ( $QS_s$ ):  $X_{hs} = (H_h, QS_s)$ .  $\epsilon_{hs}$  is the error term. The measurement model associated can be depicted as:

$$y_{hs} = \begin{cases} 1 & \text{si } y_{hs}^* < \tau_1 \\ 2 & \text{si } \tau_1 \leq y_{hs}^* < \tau_2 \\ 3 & \text{si } \tau_2 \leq y_{hs}^* \end{cases} \quad (2)$$

Where  $\tau_m$  refers to the cut-point associated with the  $m^{th}$  category. This model can be estimated through a ordered logit specification. The predicted probabilities of ranking the quality of the school as  $m$  ( $m = 1, 2, 3$ ) are given by:

$$\begin{aligned} Pr(y = 1|x) &= F(\tau_1 - X\beta) \\ &= \frac{1}{1 + \exp(-\tau_1 + X\beta)} = \frac{\exp(\tau_1 - X\beta)}{1 + \exp(\tau_1 - X\beta)} \end{aligned} \quad (3)$$

$$\begin{aligned}
Pr(y = 2|x) &= F(\tau_2 - X\beta) - F(\tau_1 - X\beta) \\
&= \frac{1}{1 + \exp(-\tau_2 + X\beta)} - \frac{1}{1 + \exp(-\tau_1 + X\beta)} \\
&= \frac{\exp(\tau_2 - X\beta)}{1 + \exp(\tau_2 - X\beta)} - \frac{\exp(\tau_1 - X\beta)}{1 + \exp(\tau_1 - X\beta)}
\end{aligned} \tag{4}$$

$$\begin{aligned}
Pr(y = 3|x) &= 1 - F(\tau_2 - X\beta) \\
&= 1 - \frac{1}{1 + \exp(-\tau_2 + X\beta)} = 1 - \frac{\exp(\tau_2 - X\beta)}{1 + \exp(\tau_2 - X\beta)}
\end{aligned} \tag{5}$$

Where  $F$  represents the cumulative distribution logistic function. Though the ordered logit model specified above produces straightforward results easy to interpret, it however assumes the proportional odds assumption. To relax this assumption two different models would be implemented as robustness checks: the generalised ordered logit and the multinomial logit models. Linear probability models are also estimated in order to see how perceptions evolve over time.

### 3.2 Gap decomposition

The results show substantial differences of perceptions between private and public schools. This perception gap is decomposed using a technique proposed by Fairlie (1999, 2005) who extends the traditional Oaxaca-Blinder decomposition method (Blinder, 1973; Oaxaca, 1973) to non-linear models. This method has been extensively used to examine various group differences (gender, racial, religion, etc..) associated with non-linear outcomes such as stock market participation rates (Grinblatt et al., 2011), child survival (Bhalotra et al., 2010), mortality rates (Finks et al., 2011), etc. Stuit and Smith (2012) use this method to assess the differences between school types (charter and traditional public schools) in teacher turnover rates.

The first-step is to estimate low perception probabilities using a binomial logit specification:

$$P_{hs} = P(p_{hs} = 1) = F(X_{hs}\hat{\beta}) = \frac{\exp(X_{hs}\hat{\beta})}{1 + \exp(X_{hs}\hat{\beta})} \tag{6}$$

Where  $p_{hs}$  is a binary variable equal to one if the household  $h$  ranks the quality of the school  $s$  as poor or very poor.  $F$  refers to the cumulative function distribution from the logistic distribution.  $X_{hs}$  is a vector including both household and school characteristics.  $\hat{\beta}$  represents the associated coefficients. These coefficients are estimated through full maximum likelihood procedure. Standard errors are adjusted for the clustering of perceptions within schools. The model includes both village and time fixed effects.

The decomposition of the gap between public and private schools can be written as:

$$\begin{aligned} \bar{P}_{hs}^g - \bar{P}_{hs}^p &= \left[ \sum_{hs=1}^{N^g} \frac{F(X_{hs}^g \hat{\beta})}{N^g} - \sum_{hs=1}^{N^p} \frac{F(X_{hs}^p \hat{\beta})}{N^p} \right] \\ &+ \left[ \sum_{hs=1}^{N^p} \frac{F(X_{hs}^p \hat{\beta}^g)}{N^p} - \sum_{hs=1}^{N^p} \frac{F(X_{hs}^p \hat{\beta}^p)}{N^p} \right] \end{aligned} \quad (7)$$

Where the superscripts  $g$  and  $p$  identify coefficients and values for respectively public and private schools.  $\bar{P}_{hs}^j$  represents the average probability of low perception for the school type  $j$ .  $N^j$  refers to the sample size of the school type  $j$ .  $\hat{\beta}$  refers to the coefficients from the pooled sample of public and private schools.  $\hat{\beta}^j$  represents the coefficients from the sample of school type  $j$ .

The first term in brackets captures the portion of the school type gap explained by differences in distributions of  $X$  for public and private schools. It is computed as the change in the average predicted probability of poor perception when the distributions of public schools are replaced by the distributions of private schools. The second term in brackets represents the portion of school type gap that stems from differences in the coefficients of  $X$  along with unobserved factors. Following Fairlie (2005), we focus on the first part of equation (5) as the second quantity is hard to interpret. The left part of equation (5) provides an estimate of the contribution of all public-private school distributional differences in the full set of explanatory variables. In addition, the individual contribution of each independent variable can be computed using the coefficient estimates from a logit regression for the pooled sample. For instance, the independent contribution of  $X_1$  to the school type gap can be depicted as:

$$\frac{1}{N^g} \sum_{hs=1}^{N^g} F(\hat{\alpha} + X_{1hs}^g \hat{\beta}_1 + X_{2hs}^g \hat{\beta}_2 + \dots + X_{khs}^g \hat{\beta}_k) - F(\hat{\alpha} + X_{1hs}^p \hat{\beta}_1 + X_{2hs}^g \hat{\beta}_2 + \dots + X_{khs}^g \hat{\beta}_k) \quad (8)$$

The contribution of each variable is found as the change in the average predicted probability when the public school distribution of that variable is replaced by the private school distribution, holding constant the distributions of all the other explanatory variables.

In order to compute equation (6), we need to match one-to-one observations from the two samples. However the sample sizes of both groups are not the same with the private school sample being smaller than the public sample. To overcome this issue, Fairlie (2005) proposes a two-step procedure. First, the pooled coefficients are used to compute the predicted probabilities  $\hat{P}_{hs}$ . Then, a random subsample of public observations is drawn to equal the full private sample. All observations in the public and private samples are separately ranked according to their predicted probabilities and are matched by their rankings. Obviously, the decomposition results depend on the chosen subsamples of public observations. Following

Fairlie (2005) and Stuit and Smith (2012), this decomposition exercise is performed for 1000 random subsamples of public observations.

## 4 Database and variables

### 4.1 Educational context in Pakistan

Even though 10% of primary age out-of-school children of the world reside in Pakistan (UNESCO, 2014), access to education have been improving. Between 1971 and 2014, the gross enrollment ratios increased from 47% to 94%, from 16% to 42% and from 2% to 10% for respectively the primary, secondary and tertiary levels. However, of the children attending primary schools, 39% drop out before completing the last grade in 2012. Girls as well as children living in rural areas or coming from poorer households are still more likely to be excluded from the education system.<sup>8</sup>

These two last decades, private enrollment has sharply increased (Andrabi et al., 2008). Whereas only 12% of primary school enrolled children were attending a private institution in 1992-93, this percentage increased to 37% in 2013-14. Recent estimates show that the percentage of students attending primary private schools in developing countries doubled from 11% to 20% between 1990 and 2010 (Baum et al., 2014). These new private schools are mainly low-cost private institutions that target at disadvantaged families. Today, the annual charged fees in an average private school in rural Pakistan amount to Rs 3,311 (\$33.5)<sup>9</sup> whereas the monthly income by household belonging to the lowest quintile amounts to Rs 11,386 (\$115)<sup>10</sup>. Private schools have managed to keep their fees low by lowering teachers' salaries. They recruit local young women, less educated and untrained, who accept lower wages because of low employment opportunities for women in Pakistan (Andrabi et al., 2008; Kingdon, 2008; Muralidharan and Kremer, 2006).

The quality of schooling in Pakistan is relatively low. According to the ASER national survey, at the end of primary (grade 5), only 54% of the children can read a story in Urdu, 52% are able to read a sentence in English and 47% can divide 3-digit numbers.<sup>11</sup> When they leave schools, often even before completing grade five, most of the students still do not possess the basic knowledge valued by the labor market. The gap in learning between private and government schools is significant (Andrabi et al., 2008; Aslam, 2009; Das et al., 2006; Khan and Kiefer, 2007). Andrabi et al. (2008) find that, even after controlling for

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<sup>8</sup>Only 66.4% of primary age girls actually attend a primary school. 70.2% of primary school age children living in urban areas are enrolled in a primary school vs. 55.7% of children in rural areas (DHS, 2013). 81.6% of the primary school age children belonging to the 20% richest households attend a primary school vs. 35.8% for the children belonging to the 20% poorest households (DHS, 2013).

<sup>9</sup>2011-2012 Pakistan Social and Living Standards Measurement (PSLM)

<sup>10</sup>2010-2011 Household Integrated Economic Survey (HIES)

<sup>11</sup>Every year since 2008, the ASER (Annual Status of Education Report) project estimates the learning level of 5-16 years old children in 138 rural districts of Pakistan and, since 2011, in urban centers. In each district, 30 villages are selected randomly. In each village, 20 households are randomly selected and the children of these households are tested in Reading (Urdu, Pashto and Sindhi), Mathematics and English.

parental education, wealth, child’s age and gender, an average primary student in private school performs better in English than the top third of children in the public sector. This finding is consistent with other studies in India (Chudgar and Quin, 2012; Desai et al., 2009; French and Kingdon, 2010; Goyal, 2009; Kingdon, 2008; Muralidharan and Sundararaman, 2013; Pal, 2010) or in other developing countries (Anand et al., 2009; Tooley and Dixon, 2007a; Tooley et al., 2011; Thapa, 2015).

## 4.2 Description of the database

The data used come from the Learning and Educational Achievement in Pakistan Schools (LEAPS) project.<sup>12</sup> Between 2001 and 2005, the LEAPS team gathered data on the distribution and the quality of schools in rural Punjab. The sample covers 823 schools (first round) in 112 villages in three districts: Attock (North), Faisalabad (Central) and Rahim Yar Khan (South). The sample is not representative because the villages were randomly chosen from a list of villages with both public and private schools.<sup>13</sup> As expected, the population in the sample villages is wealthier, larger and more educated than the typical population in an average rural village in Pakistan.

All private and public schools within each village boundaries and within a short walk of any village household were surveyed.<sup>14</sup> Multiple questionnaires were distributed to different groups to obtain a complete picture of the educational environment: head-teachers, school owners, teachers and children. During the first wave, all children in grade three were tested in English, Urdu (the vernacular) and Mathematics. They were tracked and retested in grades four (2005) and five (2006). These tests provide an observed (objective) measure of the quality of each school. Among children who were tested during the first wave, 87% were retested in the second or third waves and 67% were tested at all waves.

In addition, in each village, 16 households were surveyed. Twelve households were randomly chosen among the households with at least one child eligible for and enrolled in grade three. Four households were randomly chosen from the list of households with at least one child eligible for grade three, aged between 8 and 10 years old, but not enrolled.<sup>15</sup> Each household was asked to rank the quality of each school located in his village.

The base unit represents household-school observations. Each year, each household was asked to rank the quality of the different schools located in his village. We therefore have an

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<sup>12</sup>This project was implemented by Andrabi (Pomona College), Das (World Bank, DEC), Khwaja (Harvard University), Viswanath (World Bank, South Asia) and Zajonc (Harvard University).

<sup>13</sup>Note that at the time of the LEAPS survey, around 50 percent of the rural population in Punjab lived in villages with at least one private school (Andrabi et al., 2007).

<sup>14</sup>Short walk distance was defined as 15 minutes walking distance for Attock and Faisalabad and 30 minutes for Rahim Yar Khan, a less densely populated district. Villages with more than 24 schools were excluded.

<sup>15</sup>96% of the households were tested during all the three waves. The remaining 4% were tested during two waves.

observation for each household, each school and each year. The final sample contains 16142 observations representing 1807 unique households and 2591 unique schools. During the first and the last round both female and male households' adults were asked to assess the quality of the schools in their villages. In order to construct a unique perception variable for each household, when one member was not able to rank the quality of the school, we kept the information on the perception of the other member. For 57% of school-household observations, the perception was the same for both household's members. For 22% of observations, the respondent was the woman and for the remaining 21% it was the man. The potential differences arising because of the gender of the respondent are analyzed in the robustness checks.

Educational competition within a village is quite high with seven schools in a typical village, five of which (three private and two public schools) are located in the main settlement and are within 50-100 meters of each other.<sup>16</sup> On average, a school has three other schools at less than 15 minutes walking distance. For each village and year, we compute the market share in terms of primary school students (grades one to five) of each school. On average, each school gathers 14% of students market share. The Herfindahl-Hirschman index is consistent with a competitive environment.<sup>17</sup>

### 4.3 Variables and descriptive statistics

Table 1 presents the distribution of perceived quality, the dependent variable. More than half of the schools are perceived as average. Very few schools are rated as having a very poor or an excellent quality (respectively less than 1% and 2%). For this reason, only three categories of subjective quality are used: poor (including very poor), average and good (including excellent) quality. As a considerable number of schools were not assessed by households, this could lead to a potential endogenous bias. This issue is analyzed in the next subsection.

Descriptive statistics of the households are reported in Table 2. On average, households were asked to rank the quality of seven schools, that are all the public and private schools located in their neighborhoods. Both the level of education of the parents and the wealth of the household are included in the explanatory variables as we expect that the richest and the most educated households may be more demanding when it comes to assess school quality. The levels of schooling of parents are relatively low as mothers and fathers have studied on average respectively one and four years. The wealth indicator is represented by quintiles of consumption per capita to allow for a potential non-linear effect and to take into account the household size. Parents may value the ethnic composition of a school. They may prefer

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<sup>16</sup>The sample villages have an average population of 4125 individuals compared with 2665 individuals in an average village in the three districts. This high population is explained by the sampling procedure.

<sup>17</sup>The Herfindahl-Hirschman index is a widely used measure of the size of firms in relation to their industry. It indicates the degree of competition within firms in a same industry. In our case, it is computed as  $H = \sum_{i=1}^N s_i^2$  where  $s_i$  is the market share (in terms of students) of school  $i$  in the village and  $N$  is the number of schools in the village. The average Herfindahl-Hirschman index is of 0.11 indicating a competitive educational marketplace.

Table 1: Descriptive statistics of perceived quality

Perceived quality	All	Year 1	Year 2	Year 3
Very poor	1%	1%	1%	0%
Poor	9%	9%	9%	9%
Average	56%	54%	61%	54%
Above average	32%	34%	28%	33%
Excellent	2%	1%	1%	4%
Observations	16142	4646	4993	6503

*Notes:* Cells represent household-school-year observations.

*Source:* Author using the three waves of the LEAPS project.

to send their children in an institution where most of the students come from the child's caste. Two different measures of the school's ethnic structure are therefore included in the explanatory variables. The first indicator is a dummy variable that is equal to one if most of the students are from the same caste than the household. The second variable is more restrictive and equal to one if the main caste of the students in the school corresponds to the household's caste and if this caste represents more than 50% of the students in the school. Information on the caste of the household was not available in the second round. To avoid losing observations, the caste of the households is assumed to be time invariant.<sup>18</sup> We are therefore able to compute this variable for households interviewed at least twice. In 11% of the schools the main caste is the same than the household.

Table 2: Descriptive statistics of households

	All		Year 1		Year 2		Year 3	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Perceived quality (1=very poor, 5=excellent)	3.26	0.7	3.24	0.7	3.19	0.7	3.35	0.7
Mother's years of Schooling	1.39	3	1.40	3.1	1.4	3.1	1.36	2.9
Father's years of Schooling	3.93	4.2	3.90	4.2	3.93	4.2	3.97	4.2
1st quintile hh consumption per cap	0.21	0.4	0.30	0.5	0.28	0.5	0.03	0.2
2nd quintile hh consumption per cap	0.20	0.4	0.29	0.5	0.19	0.4	0.12	0.3
3rd quintile hh consumption per cap	0.19	0.4	0.18	0.4	0.14	0.3	0.25	0.4
4th quintile hh consumption per cap	0.19	0.4	0.12	0.3	0.16	0.4	0.31	0.5
5th quintile hh consumption per cap	0.21	0.4	0.11	0.3	0.22	0.4	0.30	0.5
Number of schools surveyed	7.06	3.9	6.98	3.8	7.02	3.8	7.17	4.2
% of schools where the main caste is the same than hh	0.11	0.2	0.12	0.3	.	.	0.09	0.2
% of schools where the main caste is the same than hh and represents 50% children or more	0.07	0.2	0.09	0.2	.	.	0.06	0.2
Observations	5315		1807		1768		1740	

*Notes:* Cells represent household-year observations.

*Source:* Author using the three waves of the LEAPS project.

The variables included in the school vector are reported in Table 3. The first variables considered are test scores. These scores are the standardised average scores obtained in the schools. To compute these scores, the results in three subject-specific tests (Mathematics,

<sup>18</sup>This assumption seems to be relevant as for households who were interviewed in the first and the third rounds, the caste is the same.

Urdu and English) were summed up for each child. These scores were then averaged by schools and standardised by year. Figure 2 shows that there is a potential positive relationship between test scores and perceived quality.

Table 3: Descriptive statistics of schools

	All		Year 1		Year 2		Year 3	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Standardised mean overall score in school	-0.01	1.0	-0.00	0.1	-0.02	1.0	-0.00	1.0
Private school	0.37	0.5	0.38	0.5	0.36	0.5	0.36	0.5
Average annual fees	490.12	841.6	473.97	787.4	463.77	789	531.85	937.2
Number of students	175.67	159.8	167.09	151.6	176.28	156.9	183.48	169.9
Ratio pupils-teacher	31.91	29.1	30.51	23.4	33.24	38.6	31.98	22.6
Classes taught in English	0.13	0.3	0.14	0.3	0.12	0.3	0.14	0.3
Classes taught in Urdu	0.50	0.5	0.56	0.5	0.49	0.5	0.45	0.5
Classes taught in Urdu and Punjabi	0.26	0.4	0.23	0.4	0.29	0.5	0.27	0.4
Classes taught in other language	0.10	0.3	0.07	0.3	0.10	0.3	0.13	0.3
School has a library	0.29	0.5	0.19	0.4	0.33	0.5	0.34	0.5
% of teachers with <1 year of exp	0.13	0.2	0.13	0.2	0.18	0.2	0.08	0.1
% of teachers with 1-3 years of exp	0.20	0.2	0.19	0.3	0.18	0.2	0.22	0.2
% of teachers with >3 years of exp	0.67	0.3	0.68	0.3	0.64	0.3	0.69	0.3
Mean days of absence of teachers	2.44	2.7	2.63	2.8	2.08	2.2	2.60	2.9
% of teachers with matric or less	0.42	0.3	0.44	0.3	0.42	0.3	0.41	0.3
% of teachers with FA-FSc	0.25	0.2	0.26	0.2	0.25	0.2	0.25	0.2
% of teachers with BA-BSc	0.22	0.2	0.21	0.2	0.22	0.2	0.23	0.2
% of teachers with Master or more	0.10	0.2	0.09	0.2	0.10	0.2	0.11	0.2
Observations	2368		784		785		799	

*Notes:* Cells represent school-year observations.

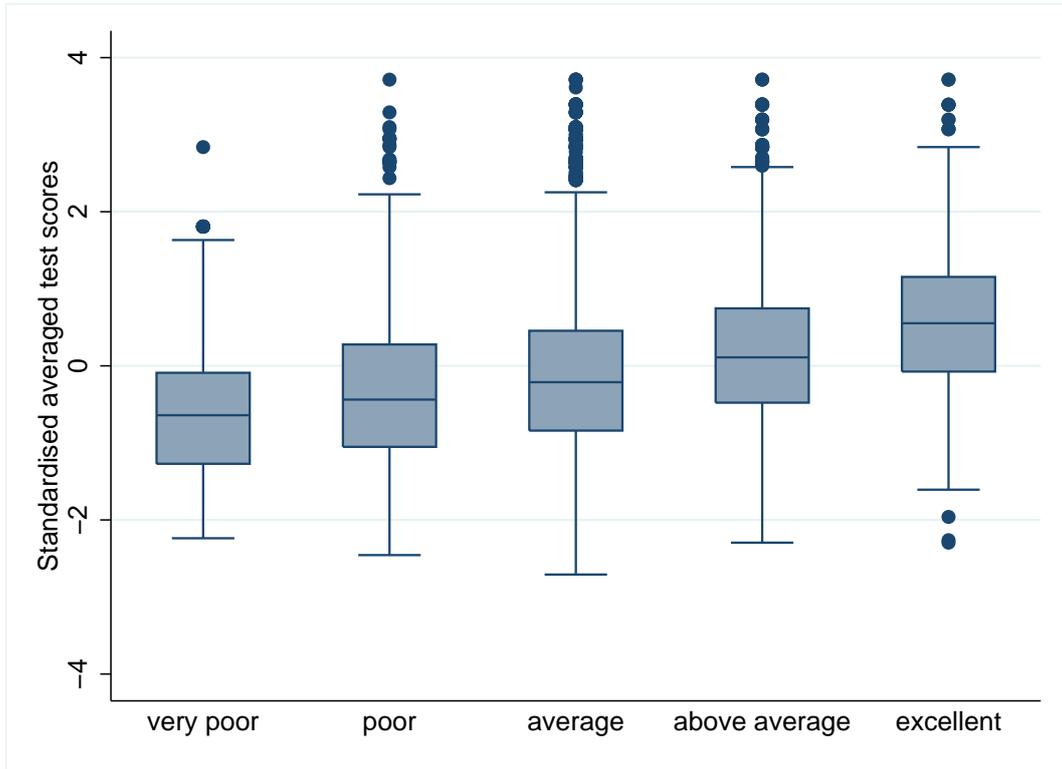
*Source:* Author using the three waves of the LEAPS project.

As parents may by default think that private schools are better than public institutions, a dummy variable indicating whether the school is privately managed is included in the independent variables. 37% of the schools are private institutions. Figure 3 shows that there are some differences in perceptions according to school type. Parental perceptions about school quality seem to relate to test scores for public schools but not for private schools.

Because the price of a school can be seen as a signal of good quality by parents, we also integrate the average fees charged by the school.<sup>19</sup> On average, schools charge 490 Rs. by year (4.7\$). These fees are mainly driven by private schools where the annual fees amount to 1258 Rs. (12\$). In order to avoid multicollinearity, fees are only included when the sample is restricted to private schools. As parents may value the language of instruction of the school, a dummy variable indicating whether the classes are taught in English is included. Half of the schools use only Urdu, which is not the local language in Punjab but one of the two official languages of Pakistan (the second being English), as their medium of instruction. 13% of the schools use English (English alone or combined with Urdu) whereas the remaining 36% use a local language (combined with Urdu or not). Parents may value the quality of the infrastructures available in a school. To test this assumption, an indicator variable that

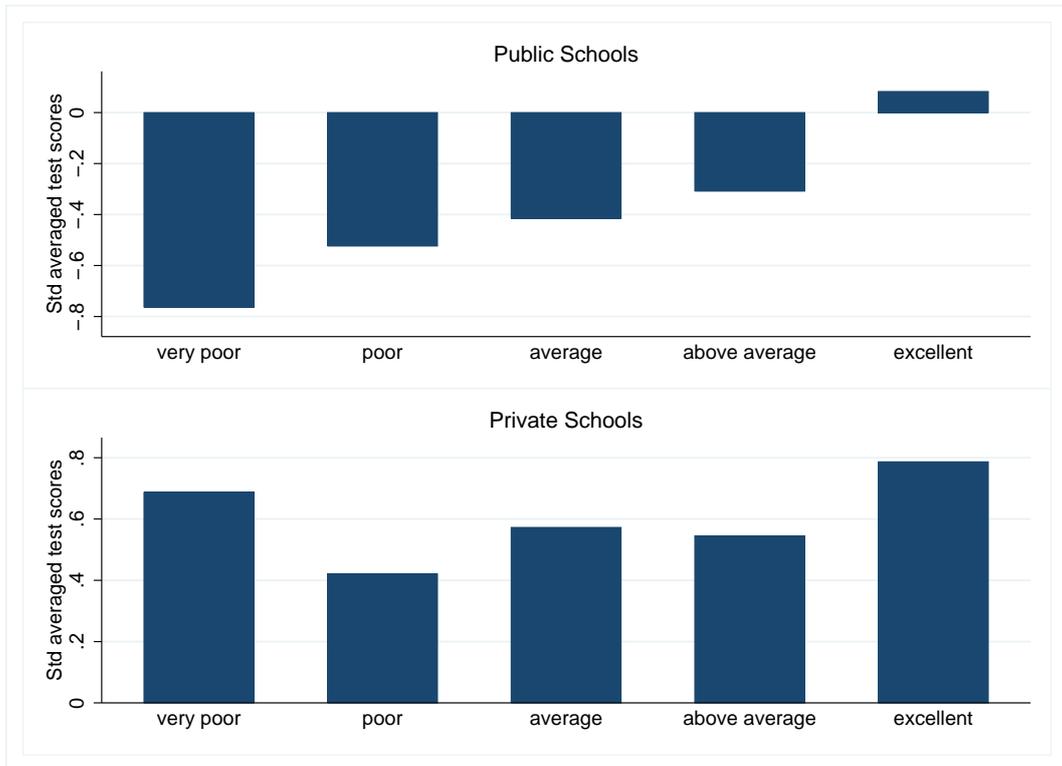
<sup>19</sup>These fees include both admission and annual fees for students enrolled in grades one to three.

Figure 2: Parental school perceptions and overall test scores



Source: Author using the three waves of the LEAPS survey

Figure 3: Parental school perceptions and overall test scores by school type



Source: Author using the three waves of the LEAPS survey

is equal to one if the school has a library is added to the list of the explanatory variables. We expect this variable to positively impact perceptions. 29% of the sample schools have a library.

Turning to teacher characteristics, schools with experienced and educated teachers with low absenteeism rates are expected to be ranked as high quality schools. On average, in sample schools, 67% of the teachers have more than three years of experience and only 10% have a Master degree. Teachers have on average been absent more than two days in the last month. Finally, time and village fixed effects are also added to the estimates in order to control for temporal trends and for the heterogeneity of villages.

#### 4.4 Missing observations

Households are not always able to rank the quality of a school leading to missing observations and to a potential selection bias. On average, households declare they could not assess the quality of 23% of the schools located in their villages.<sup>20</sup> Three-quarters evaluate half of the schools of their village. That is the reason why a threshold of 50% has been chosen to differentiate households who are often able to assess the quality of the schools from other households. Table 4 presents the descriptive statistics for each group along with a test of the equality of means. Households who tend to form perceptions about school quality more often do not rank schools more or less severely. One interesting result is that better-off households with educated fathers are more able to form opinions about school quality than poorer households suggesting that wealthy and educated households may have access to more information about schools than poorer households.

Table 4: Analysis of household selection

	Low level of missing perceptions <sup>a</sup>		High level of missing perceptions <sup>b</sup>		Differences	
	Mean	SD	Mean	SD	Diff	T-statistic
Perceived quality (1=very poor, 5=excellent)	3.27	0.7	3.24	0.6	0.021	(0.53)
Mother's years of Schooling	1.41	3.0	1.33	3.4	0.083	(0.72)
Father's years of Schooling	4.06	4.2	3.47	4.1	0.589***	(3.75)
1st quintile hh consumption per cap	0.18	0.4	0.36	0.5	-0.187***	(-11.86)
2nd quintile hh consumption per cap	0.20	0.4	0.22	0.4	-0.021	(-1.30)
3rd quintile hh consumption per cap	0.20	0.4	0.14	0.3	0.063***	(4.04)
4th quintile hh consumption per cap	0.21	0.4	0.12	0.3	0.094***	(6.05)
5th quintile hh consumption per cap	0.21	0.4	0.16	0.4	0.051**	(3.20)
Observations	4183		984		5167	

*Notes:* T-statistics in parentheses: \*  $p < .05$ , \*\*  $p < .01$ , \*\*\*  $p < .001$ . <sup>a</sup>: households who have declared they could not assess the quality of 50% or less of schools. <sup>b</sup>: households who have declared they could not assess the quality of more than 50% of schools.

*Source:* Author using the three waves of the LEAPS project.

If schools that are systematically not rated have specific characteristics, it could lead to

<sup>20</sup>Only 7% of the households were not able to rank any school and 57% were able to rank all the schools.

a selection bias. On average, each year, nine different households were asked to rank the quality of each school and two of them could not assess the quality of the school. Three-quarters of schools were successfully evaluated by four or more households.<sup>21</sup> That is the reason why a threshold of four households has been chosen to differentiate schools who are often rated by households from other schools. Table 5 presents the descriptive statistics for each group along with a test of the equality of means. Schools that are less often rated are not significantly worse (in terms of academic performances) than other schools. Private schools are more often assessed than public schools probably because by default households think that private schools are good. Not surprisingly, bigger schools are also more often assessed.

Table 5: Analysis of school selection

	Low level of missing perceptions <sup>a</sup>		High level of missing perceptions <sup>b</sup>		Differences	
	Mean	SD	Mean	SD	Diff	T-statistic
Standardized mean overall score in school	-0.02	1.0	0.03	1.0	-0.058	(-1.20)
Private school	0.39	0.5	0.30	0.5	0.083***	(3.65)
Average annual fees	529.05	888.3	374.10	680.1	154.9***	(3.88)
No. of students	184.28	166.5	153.18	137.8	31.10***	(4.10)
Ratio pupils-teacher	32.06	30.8	31.61	23.8	0.449	(0.32)
Classes taught in English	0.14	0.4	0.10	0.3	0.047**	(2.92)
Classes taught in Urdu	0.49	0.5	0.54	0.5	-0.057*	(-2.40)
Classes taught in Urdu and Punjabi	0.28	0.4	0.23	0.4	0.046*	(2.18)
Classes taught in other language	0.09	0.3	0.13	0.3	-0.036*	(-2.52)
School has a library	0.30	0.5	0.25	0.4	0.045*	(2.11)
% of teachers with <1 year of exp	0.12	0.2	0.14	0.2	-0.020*	(-2.11)
% of teachers with 1-3 years of exp	0.21	0.2	0.16	0.2	0.045***	(3.94)
% of teachers with >3 years of exp	0.67	0.3	0.69	0.3	-0.026	(-1.66)
Mean days of absence of teachers	2.47	2.7	2.36	2.6	0.118	(0.93)
% of teachers with matric or less	0.41	0.3	0.45	0.3	-0.045**	(-3.21)
% of teachers with FA-FSc	0.26	0.2	0.25	0.2	0.006	(0.51)
% of teachers with BA-BSc	0.23	0.2	0.21	0.2	0.018	(1.66)
% of teachers with Master or more	0.11	0.2	0.09	0.2	0.021**	(2.60)
Observations	1753		593		2346	

*Notes:* T-statistics in parentheses: \* p < .05, \*\* p < .01, \*\*\* p < .001. <sup>a</sup>: schools that could be assessed by 45% or less of households. <sup>b</sup>: schools for which 45% or more of households have declared they could not assess the quality.  
*Source:* Author using the three waves of the LEAPS project.

<sup>21</sup>Only 5% of schools are not rated by any household whereas 39% are rated by all the relevant households.

## 5 Empirical results

### 5.1 Determinants of quality perceptions

To assess the factors explaining how parents form their perceptions, ordered logit models are implemented where the dependent variable ranges from one to three, one indicating a poor (or very poor) quality and three a good (or excellent) perceived quality. Results, in terms of odd-ratios, are reported in Table 6 for the whole sample and in Table 7 by quintile of wealth.

We do not observe systematic perception differences between low and high educated or between rich and poor households. Neither the level of education of the parents nor the household wealth explain school perceptions. Only the households belonging to the second quintile of wealth tend to rate the quality of the schools lower than the wealthiest households but this effect is significant only at 10%. The richest or the poorest parents do not systematically overestimate or underestimate the quality of schools. Note that we try to include fixed effects for the caste of the household and the results were similar.<sup>22</sup>

One crucial question is whether parental perceptions depend on observed school quality, measured by the average of test scores in the school. If so, increasing school choice could improve the overall schooling quality as schools compete to attract students. Results suggest that parental perceptions depend on test scores. An increase of one in standardised test scores is associated with a 17% increase in the odds of reporting the school quality as good instead of average or poor. A deeper analysis shows that parents value more learning outcomes in Mathematics and in English than in Urdu (Annex, Table A4). The effect of test scores could reflect a peer effect due to the composition of students: parents value the fact that students in the school come from a privileged social background. To test whether the effect of test scores is only a reflection of the social composition of the schools, the percentage of students in the school with uneducated parents is added to the explanatory variables (Annex, Table A5). Schools with students coming from less educated households are less likely to be perceived as good schools. Even after controlling for the average level of parental education in the school, test scores are still significant.

Interestingly, only better-off households derive their perceptions from test scores (Table 7). For the richest households, each increase in school's test scores is associated with a 31% increase in the odds of reporting good vs. average or poor quality. Test scores have no significant impact on quality perceptions for the poorest parents. Two plausible explanations can be put forward. First, wealthier parents may be more informed about the academic results of the different schools. This seems to be confirmed by the data as on average the poorest parents (lowest quintile) do not know how to rate 36% of the schools whereas this proportion amounts to 17% for the richest households. It could also be that better-off households value

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<sup>22</sup>Results are available on demand.

Table 6: Ordered logit estimates - Odd Ratios

Dep var: perception of quality of school	(1)	(2)	(3)	(4)	(5)
Mother's years of education	1.00 (0.01)	1.00 (0.01)	1.00 (0.01)	1.00 (0.01)	1.00 (0.01)
Father's years of education	0.99 (0.00)	0.99 (0.00)	0.99 (0.00)	0.99 (0.00)	1.00 (0.00)
1st quintile hh consumption per cap	1.00 (0.06)	0.98 (0.06)	0.98 (0.06)	0.98 (0.06)	0.98 (0.06)
2nd quintile hh consumption per cap	0.90* (0.05)	0.90* (0.05)	0.91* (0.05)	0.90* (0.05)	0.90* (0.05)
3rd quintile hh consumption per cap	0.93 (0.05)	0.94 (0.05)	0.94 (0.05)	0.94 (0.05)	0.94 (0.05)
4th quintile hh consumption per cap	0.93 (0.05)	0.94 (0.05)	0.94 (0.05)	0.94 (0.05)	0.94 (0.05)
Std average scores in school	1.24*** (0.03)	1.19*** (0.03)	1.20*** (0.03)	1.19*** (0.03)	1.17*** (0.03)
Private school	2.82*** (0.13)	2.90*** (0.16)	2.89*** (0.16)	2.89*** (0.16)	2.38*** (0.16)
Log of no. of students		1.52*** (0.05)	1.52*** (0.05)	1.52*** (0.05)	1.57*** (0.05)
Log ratio pupils-teacher		0.84*** (0.04)	0.84*** (0.04)	0.84*** (0.04)	0.83*** (0.04)
Classes taught in English		1.26*** (0.07)	1.25*** (0.07)	1.26*** (0.07)	1.22*** (0.07)
School has a library		1.14*** (0.05)	1.14*** (0.05)	1.14*** (0.05)	1.13*** (0.05)
First caste of school is the same than hh			1.11 (0.07)		
First caste of school is the same than hh and represents more 50% of children or more				1.04 (0.07)	
% teachers with <1 year of exp					1.05 (0.12)
% teachers with 1-3 years of exp					1.76*** (0.17)
Mean days of absence of teachers					0.99 (0.01)
% teachers with matric or less					1.10 (0.15)
% teachers with FA-FSc					1.41** (0.20)
% teachers with BA-BSc					0.88 (0.13)
Observations	13923	13897	13897	13897	13730
Pseudo R <sup>2</sup>	0.078	0.088	0.088	0.088	0.090
FE Villages	Yes	Yes	Yes	Yes	Yes
FE Years	Yes	Yes	Yes	Yes	Yes

*Notes:* Odd-ratios are reported. Robust standard errors in parentheses: \*  $p < .1$ , \*\*  $p < .05$ , \*\*\*  $p < .01$

*Reference categories:* The household belongs to the highest quintile of wealth, classes are taught in another language than English, % of teachers with more than three years of experience and with a Master or more.

*Source:* Author using the three waves of the LEAPS project. The base unit represents household-school observation.

Table 7: Ordered logit estimates by wealth quintile - Odd Ratios

Dep var: perception of quality of school	1st quintile (1)	2nd quintile (2)	3rd quintile (3)	4th quintile (4)	5th quintile (5)
Mother's years of education	0.99 (0.02)	1.03 (0.02)	0.95*** (0.02)	1.03** (0.02)	1.00 (0.01)
Father's years of education	1.00 (0.01)	1.00 (0.01)	1.00 (0.01)	1.00 (0.01)	0.98 (0.01)
Std average scores in school	1.08 (0.07)	1.09 (0.06)	1.18*** (0.06)	1.22*** (0.06)	1.31*** (0.08)
Private school	2.73*** (0.54)	3.42*** (0.60)	2.92*** (0.42)	1.81*** (0.26)	2.10*** (0.31)
Log of no. of students	1.61*** (0.15)	1.58*** (0.14)	1.52*** (0.12)	1.72*** (0.13)	1.53*** (0.12)
Log ratio pupils-teacher	0.89 (0.12)	0.91 (0.12)	0.70*** (0.07)	0.85 (0.09)	0.87 (0.09)
Classes taught in English	1.15 (0.19)	1.19 (0.17)	0.91 (0.13)	1.31** (0.16)	1.78*** (0.23)
School has a library	1.07 (0.12)	1.15 (0.12)	1.15 (0.12)	1.10 (0.10)	1.16 (0.11)
% teachers with <1 year of exp	0.94 (0.27)	0.71 (0.19)	1.21 (0.32)	1.35 (0.39)	1.19 (0.31)
% teachers with 1-3 years of exp	2.43*** (0.69)	1.74** (0.45)	1.02 (0.22)	2.08*** (0.44)	2.13*** (0.46)
Mean days of absence of teachers	1.00 (0.02)	0.98 (0.02)	0.98 (0.02)	1.00 (0.01)	1.00 (0.02)
% teachers with matric or less	2.21** (0.85)	0.69 (0.23)	1.04 (0.28)	1.72* (0.49)	0.70 (0.22)
% teachers with FA-FSc	3.03*** (1.23)	1.04 (0.37)	1.34 (0.40)	2.13** (0.65)	0.78 (0.27)
% teachers with BA-BSc	1.23 (0.48)	0.57 (0.20)	1.35 (0.41)	1.21 (0.37)	0.50** (0.17)
Observations	2288	2713	2867	2943	2919
Pseudo R <sup>2</sup>	0.131	0.120	0.106	0.102	0.113
FE Villages	Yes	Yes	Yes	Yes	Yes
FE Years	Yes	Yes	Yes	Yes	Yes

*Notes:* Odd-ratios are reported. Robust standard errors in parentheses: \*  $p < .1$ , \*\*  $p < .05$ , \*\*\*  $p < .01$

*Reference categories:* Classes are taught in another language than English, % of teachers with more than three years of experience and with a Master or more.

*Source:* Author using the three waves of the LEAPS project. The base unit represents household-school observation.

more quality of education because their children have higher labor opportunities (parental networks). Poorer households would have no incentive to enroll their children in the best schools if they think they would not benefit from this better education. It is possible that they prefer to enroll them in average schools in order to be sure they would get graduated. In any case, this finding is preoccupying. Indeed, if only better-off households are able to choose the best schools for their children it could lead to increase in inequalities with children coming from disadvantaged households being doomed to stay in the worst schools. When mother's education is interacted with test scores, the coefficient associated is significant and positive.<sup>23</sup> Households with educated mothers put more value on academic results. When raw test scores are replaced by gains in scores, that are the differences between scores in  $t$  and in  $t - 1$ , these variables are not significant suggesting that parents value the level of academic results instead of improvements in test scores.<sup>24</sup>

In order to test whether differences in terms of access to information could play a role, we estimate the results separately for households with children enrolled in primary schools and for households with no children enrolled in any primary school. The results presented in Table A1 of the Appendix, show that scores have a positive and significant impact only for households who have at least one child enrolled in a primary school. This finding suggests that maybe parents with enrolled children are more aware about the academic levels of the different available schools. We also estimate the ordered logit model separately for schools that provide reports on children's performances to parents or to the children themselves and for schools that do not provide these reports. The results reported in Table A2 of the Appendix show that access to information probably plays a role in explaining the effect of test scores. Indeed, schools' academic performances are only significant when the sample contain schools providing academic reports.

There is a clear premium for private schools even after controlling for differences in test scores. The odds of reporting good quality instead of average or poor quality are 2.38 times greater when the school is a private institution. This finding holds for both poor and wealthy households even though the magnitude of the effect is slightly stronger for poor households. For schools with similar academic results, parents think that a private school is better than a public institution which can explain the recent growth of private enrollment in Pakistan. In order to see whether these results are driven by households with children enrolled in private institutions, the ordered logit specification is estimated separately for households with at least one child enrolled in a private school and for other households. The results are reported in the Appendix in Table A3. Even though all the households tend to think that private schools are better than public schools, the magnitude of the effect is stronger for households with at least one child attending a private schools. This suggests that parents are to some extent satisfied by private education.

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<sup>23</sup>Results are available on request. Note that the interaction between father's education and test scores is not significant.

<sup>24</sup>Results are available upon request.

The size of schools is perceived by parents as a mark of quality. Bigger schools have higher ratings than smaller institutions probably because of a reputation effect. This effect holds for all levels of wealth. The size of the class in the school does not explain parental perceptions towards school quality. Parents have a clear preference for schools where classes are taught in English. Being a school where teaching is done in English is associated with a 22% increase in the odds of being perceived as a school providing an education of good quality instead of an education of average or poor quality. This effect holds only for the richest parents. One potential explanation is that better-off parents value more English than poorer households because their children would be more likely to be employed in occupations where English speaking is required. The presence of a library in the school is also seen as a signal for good quality. When a school has a library, it increases the likelihood of being reported as a good school instead of an average or a bad school by 13%.<sup>25</sup> The ethnic composition of the school does not explain quality perceptions.

Concerning teacher variables (column 5), very few variables are significant. Parents tend to value schools where most teachers have between one and three years of experience compared with teachers with more than three years of experience. This finding may reflect a preference for young teachers. It could also be that parents think that teacher experience is more important at the beginning of the career. They also tend to prefer a school where teachers a higher secondary certificate (two-year diploma) instead of a master diploma. This surprising result as well as the non-significance of the other teacher variables are probably due to a lack of information concerning teachers. Only 20% of the parents with at least one enrolled child could report the level of education of the current child’s teacher. Less than half could say whether the teacher was absent during the last week and almost 40% could not tell if the child’s teacher is good or not.

## 5.2 Household heterogeneity

In order to alleviate the omitted variable bias and because the households were surveyed at three different waves, a linear probability model is estimated with household fixed effects. This model aims to determine what factors affect the changes of parental perceptions over time. We also include school fixed effects in addition with household fixed effects to explain why a same household ranks a same school differently over time. The dependent variable is an indicator variable equal to one if the school is perceived as good or excellent and zero otherwise. The results are presented in Table 8.

When only household fixed effects are included, the previous results remain valid. An

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<sup>25</sup>Other measures of infrastructure were also added but were not significant: an index of the level of the infrastructure (based on a Principal Component Analysis), variables indicating whether the school has computer facilities, sport facilities, an activity room, a bathroom, electricity, chairs and desks and drinking water.

Table 8: Linear probability model

Dep var: perception of quality of school	(1)	(2)
1st quintile hh consumption per cap	-0.04 (0.02)	-0.04 (0.03)
2nd quintile hh consumption per cap	-0.06*** (0.02)	-0.08*** (0.02)
3rd quintile hh consumption per cap	-0.03* (0.02)	-0.04** (0.02)
4th quintile hh consumption per cap	-0.01 (0.02)	-0.02 (0.02)
Std average scores in school	0.03*** (0.01)	-0.02 (0.01)
Private	0.19*** (0.02)	
Log of no. of students	0.09*** (0.01)	0.08** (0.04)
Log ratio pupils-teacher	-0.05*** (0.01)	-0.02 (0.02)
Classes taught in English	0.04*** (0.01)	0.00 (0.02)
School has a library	0.02** (0.01)	-0.01 (0.02)
% teachers with <1 year of exp	0.01 (0.02)	0.03 (0.06)
% teachers with 1-3 years of exp	0.12*** (0.02)	0.10* (0.06)
Mean days of absence of teachers	0.00 (0.00)	0.00 (0.00)
% teachers with matric or less	0.03 (0.03)	0.07 (0.11)
% teachers with FA-FSc	0.08** (0.03)	0.06 (0.11)
% teachers with BA-BSc	-0.01 (0.03)	0.03 (0.10)
Observations	14063	14063
Adjusted R <sup>2</sup>	0.115	0.025
FE Households	Yes	Yes
FE Schools	No	Yes
FE Years	Yes	Yes

*Notes:* Robust standard errors in parentheses: \*  $p < .1$ , \*\*  $p < .05$ , \*\*\*  $p < .01$

*Reference categories:* The household belongs to the highest quintile of wealth, classes are taught in another language than English, % of teachers with more than three years of experience and with a Master or more.

*Source:* Author using the three waves of the LEAPS project. The base unit represents household-school observation.

increase in test scores, in school size along with English teaching and providing a library increase the probability of reporting a school as good. We also observe a significant negative effect of overcrowding in classes. When school fixed effects are added, very few observed characteristics explain why perceptions change over time. This is probably due to the time persistence of perceptions (hence the low  $R^2$  once school fixed effects are included). 70% of the schools that were perceived by the household as not good in time  $t$  are still considered the same in  $t + 1$ . The time variation is higher for good perceptions. 48% of the schools that were perceived as good in  $t$  are still perceived as good in  $t + 1$ . Over the span of the survey (three years only), test scores are quite constant within a school (the average time variation of standardised test scores is equal to -0.015). This little time variation can explain why when including school fixed effects, test scores are not significant anymore. One interesting result however is that when the size of the school increases over time, it positively affects the perceptions made by the parents.

### 5.3 Private and public schools' gap

As the factors influencing parental perceptions may vary between private and public schools, the ordered logit model is estimated separately for public and for private schools (Table 9). Please note that, for the private school sample, an additional explanatory variable is included: the fees charged the schools. Educated fathers tend to be more demanding when it comes to assessing private schools. One additional year of education for the father is associated with a decrease in the probability of ranking the private school as good. One major difference is that test scores explain perceptions about school quality only for state-run schools. This is in line with our previous results suggesting that private schools are perceived as providing high quality education even after controlling for test scores. The size of the school is perceived as a sign of good quality for both types of school but the magnitude of the effect is higher for private schools. This is probably due to a reputation effect: unusually small private schools can be perceived as a negative sign for parents who think that these schools cannot attract students because they are of low quality. For both types of schools, parents think that school quality may be hampered by overcrowded classes. An increase in the pupils-teacher ratio is associated with a decrease in the odds of being rated as a good school. The presence of a library is only significant for public schools. This difference between private and public schools is probably due to a composition difference. 37% of private schools have a library whereas it is the case of only 23% public schools.

Table 10 reports the Fairlie (2005)'s decomposition estimates for the perception gap between private and public schools. The probabilities of assessing a school as low quality are of 12.1% and 4.9% for respectively public and private schools, indicating a perception gap of 7.2%. Public schools are more systematically perceived as lower quality schools. This gap is not well explained by differences in the distributions of the explanatory variables (99% of the gap is not explained).

Table 9: Ordered logit estimates by type of schools - Odd Ratios

Dep var: perception of quality of school	Public Schools (1)	Private Schools (2)
Mother's years of education	0.99 (0.01)	1.02* (0.01)
Father's years of education	1.00 (0.01)	0.98** (0.01)
1st quintile hh consumption per cap	1.00 (0.08)	0.94 (0.11)
2nd quintile hh consumption per cap	0.92 (0.07)	0.85* (0.08)
3rd quintile hh consumption per cap	0.91 (0.07)	0.98 (0.09)
4th quintile hh consumption per cap	0.98 (0.07)	0.86* (0.08)
Std average scores in school	1.20*** (0.04)	1.05 (0.05)
Log of no. of students	1.45*** (0.07)	2.04*** (0.16)
Log ratio pupils-teacher	0.81*** (0.05)	0.72** (0.09)
Log of annual fees		1.16*** (0.03)
Classes taught in English	1.25** (0.14)	1.05 (0.09)
School has a library	1.14** (0.07)	1.09 (0.08)
% teachers with <1 year of exp	1.24 (0.22)	1.01 (0.19)
% teachers with 1-3 years of exp	1.44** (0.21)	1.29 (0.23)
Mean days of absence of teachers	0.98* (0.01)	1.02 (0.01)
% teachers with matric or less	1.22 (0.20)	1.46 (0.72)
% teachers with FA-FSc	1.43** (0.25)	1.53 (0.79)
% teachers with BA-BSc	0.97 (0.16)	1.58 (0.89)
Observations	8805	4920
Pseudo R <sup>2</sup>	0.055	0.086
FE Village	Yes	Yes
FE Year	Yes	Yes

*Notes:* Odd-ratios are reported. Robust standard errors in parentheses: \*  $p < .1$ , \*\*  $p < .05$ , \*\*\*  $p < .01$

*Reference categories:* The household belongs to the highest quintile of wealth, classes are taught in another language than English, % of teachers with more than three years of experience and with a Master or more.

*Source:* Author using the three waves of the LEAPS project. The base unit represents household-school observation.

Table 10: Decomposition of private-public gap in perceptions

Sample used for coefficients	All Private and Public Schools Pooled		
	Est.	Std. Err.	Pct. Of Gap
<b><i>Public-Private perception gap</i></b>			
Prob of low perception : public schools	0.1210		
Prob of low perception : private schools	0.0489		
Public-Private gap	0.0724		
<b><i>Contribution of independent variables to gap</i></b>			
<b>Household Characteristics (Total)</b>	<b>-0.003</b>	<b>(0.0016)*</b>	<b>-4.1%</b>
Mother's years of schooling	-0.001	(0.0004)*	-1.4%
Father's years of schooling	0.000	(0.0002)	0.0%
1st quintile hh consumption per cap	-0.001	(0.0012)	-1.4%
2nd quintile hh consumption per cap	-0.001	(0.0008)	-1.4%
3rd quintile hh consumption per cap	0.000	(0.0003)	0.0%
4th quintile hh consumption per cap	-0.001	(0.0010)	-1.4%
<b>School Characteristics (Total)</b>	<b>-0.026</b>	<b>(0.0165)</b>	<b>-35.9%</b>
Standardised average test scores	0.005	(0.0033)	6.9%
Log of annual fees	-0.019	(0.0158)	-26.2%
Log ratio pupils-teacher	0.001	(0.0055)	1.4%
Log of no. of students	-0.016	(0.0037)***	-22.1%
Classes taught in English	0.003	(0.0026)	4.1%
School has a library	0.000	(0.0014)	0.0%
<b>Teacher Characteristics (Total)</b>	<b>0.007</b>	<b>(0.0086)</b>	<b>9.7%</b>
% of teachers with <1 year of exp	-0.004	(0.0032)	-5.5%
% of teachers with 1-3 years of exp	0.006	(0.0056)	8.3%
Mean days of absence of teachers	0.001	(0.0015)	1.4%
% of teachers with matric or less	0.000	(0.0012)	0.0%
% of teachers with FA-FSc	0.004	(0.0046)	5.5%
% of teachers with BA-BSc	0.000	(0.0024)	0.0%
<b>Village fixed effects</b>	<b>0.002</b>	<b>(0.0030)</b>	<b>2.8%</b>
<b>Year fixed effects</b>	<b>0.020</b>	<b>(0.0056)***</b>	<b>27.6%</b>
<b>All included explanatory variables</b>	<b>0.0008</b>		<b>1%</b>
<b>Unexplained part of gap</b>	<b>0.0716</b>		<b>99%</b>
<b>Observations</b>	7710		

*Notes:* Results based on logit coefficient from pooled samples. Estimates represent mean values from 1000 replications of the randomized matching procedure. Standard errors in parentheses: \*  $p < .1$ , \*\*  $p < .05$ , \*\*\*  $p < .01$   
*Source:* Author using the three waves of the LEAPS project. The base unit represents household-school observation.

Except for time fixed effects, the only significant contributor to the public-private gap is the number of students in the school. The differences in the distributions of the size of the school reduce the public-private gap in perceptions by 22%. This is expected as we found that an increase in school size is associated with higher quality perceptions (Table 6) and private schools are significantly smaller. An average private school has 135 students when a typical public schools has 173 students.

## 6 Robustness Checks

### 6.1 Alternatives to the ordered logit model

If the ordered logit model produces straightforward results easy to interpret, it however assumes the proportional odds assumption also called the parallel regressions (or parallel-lines) assumption. In ordered logit model, because only the threshold  $\tau_m$  differs across values of  $m$ , the regression lines are assumed to be parallel. However, it is common that some coefficients differ across the values of  $m$ . If the proportional odds assumption is violated, the ordered logit model may be too restrictive.

One solution to relax the proportional odds assumption is to implement a generalised ordered logit. This model, also called partial proportional odds model, allows the  $\beta$ 's coefficients to vary across values of  $j$  for the variables that violate the parallel-lines assumption (see Williams et al. (2006) for a discussion on this model). The generalised ordered logit specification yields:

$$\begin{aligned} Pr(y = 1|x) &= F(\tau_1 - X\beta_1) = \frac{\exp(\tau_1 - X\beta_1)}{1 + \exp(\tau_1 - X\beta_1)} \\ Pr(y = 2|x) &= F(\tau_2 - X\beta_2) - F(\tau_1 - X\beta_2) = \frac{\exp(\tau_2 - X\beta_2)}{1 + \exp(\tau_2 - X\beta_2)} - \frac{\exp(\tau_1 - X\beta_1)}{1 + \exp(\tau_1 - X\beta_1)} \\ Pr(y = 3|x) &= 1 - F(\tau_2 - X\beta_3) = 1 - \frac{\exp(\tau_2 - X\beta_2)}{1 + \exp(\tau_2 - X\beta_2)} \end{aligned} \tag{9}$$

The generalised ordered logit model (equation 9) allows the threshold parameters to depend on explanatory variables, meaning that perception thresholds can vary according to households' and schools' characteristics. This model has been used in studies assessing self-reported health (Jürges, 2007).

A Brant test (Long and Freese, 2006) confirms that the proportional odds assumption of the ordered logit is violated. The results of the partial proportional odds model are reported in the Annex, Table A6. The first column contrasts category one (poor perceived quality) with categories two and three (average and high perceived quality). This column gives results that are quite similar to a logistic regression where the category one has been recoded to zero and the categories two and three have been recoded to one. The second column contrasts category one and two with category three. This column gives results that are quite close to a logistic regression where the categories one and two have been recoded to zero and the category three has been recoded to one.<sup>26</sup> An odd-ratio superior to one indicates that higher values on the explanatory variable increase the likelihood for the household to report a higher quality than the current one (Williams et al., 2006). The generalised ordered logit model helps to disentangle the effects underlined by the ordered logit estimates. It is

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<sup>26</sup>As the two equations are estimated simultaneously, the results are slightly different than those obtained by separated logit estimates.

now possible to see for instance whether an explanatory variable decreases the probability of being ranked as a low quality or increases the likelihood of being perceived as good quality.

The results suggest that the parallel-lines assumption holds for several variables (fathers' education, quintiles of wealth, test scores, school size, pupils-teacher ratio, English teaching, library and most of the teacher characteristics). However, for the other variables the proportional odds assumption is violated. The results presented above remain valid. The greatest positive effect of private school is through increasing the likelihood of giving more strongly favorable perceptions. Being a privately run institution is associated with a decrease in the probability of ranking the school as bad but it is above all associated with an increase in the likelihood of ranking it as good (instead of average or bad).

To relax the proportional odds assumption, another solution is to implement a multinomial logit model. Please note that, contrary to the generalised ordered logit specification, this model possibly includes more parameters than necessary as this model frees all variables from the parallel-lines constraint even when the assumption is not violated. The results of the multinomial logit model are reported in Annex Table A7. The main results remain unchanged. An increase in test scores is associated with a decrease in the probability of ranking the school as bad or average. The residual premium given to private schools is still observable. Schools that have a library or schools where classes are taught in English are more likely to be perceived as good or excellent.

## 6.2 Non linearity of test scores effect and other potential measures of schooling quality

So far, to measure the academic results in each school, we have used the average scores of the students of the school. However, academic performances can have a non linear effect on parental perceptions. In order to test this assumption, we replace the average test scores by quintiles of scores. The results obtained from the ordered logit specification are presented in Annex, Table A8. Most of the previous findings remain valid even though some differences are worth mentioning. The poorest households (lowest quintile of wealth) do take into account test scores but only for the worst schools. They would rate the worst schools (lowest quintile of scores) lower than other schools. The differences with richer households appears for better schools. The poorest parents would not rate the best performing schools differently than the schools belonging to the second, third and fourth quintiles of scores. The differential effect of test scores, according to the level of wealth, emerges after the first quintile of scores.

In addition with test scores, we also include another measure for quality of schooling, the repetition rate of each school.<sup>27</sup> Even though the repetition does have a negative impact

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<sup>27</sup>Unfortunately we have no measure on the probability of being graduated or on the odds of pursuing education after primary schools.

of parental perceptions, test scores still have a significant and positive impact on quality ratings.<sup>28</sup>

In order to test whether our results vary according to the gender of the respondent, we also include a dummy indicating the gender of the household's individual that assesses the quality of the school. As this information is available only for the first and the last round, the number of observations is reduced. The reference category is a dummy equal to one if both male and female adults have assessed the quality of the school and agree on this quality. In a second estimate, we also include variables interacting schools' test scores and the gender of the respondent. The results are presented in Annex, Table A9. The previous results remain unchanged. We however observe some differences due to the gender of the respondent. When only one adult assesses the quality of the school, no matter whether it is a man or a woman, he tends to give lower ratings. The coefficients associated with the interaction variables (second column) show that he also tends to attach less importance to schools' test scores probably because he has access to less information on the academic performances of each school.

Finally, we also add a dummy variable indicating whether the school select children, in order to see whether parents think that selective schools are better than other schools. The results show that this is not the case and the previous findings remain unchanged.<sup>29</sup>

## 7 Conclusion

Understanding how parents perceive school quality is paramount because it would affect their decisions in terms of education. This paper is the first to our knowledge to look into the determinants of perception about school quality. The results confirm that parents value academic results when they assess the quality of the schools available in their villages. However, this finding holds only for the wealthiest households suggesting that they may have access to more information about school quality. This finding is concerning as it could increase inequalities with poorer parents not able to choose the best schools for their children. The future research should try to analyze the reasons for this gap between poor and wealthy households in order to provide potential solutions to reduce it. Before increasing school choice, policy makers would have to be sure that all the households have accessed to information on the quality of the different schools available in order to avoid exacerbating inequalities.

Even after controlling for school, household and teacher characteristics, private schools remain perceived as better than public institutions by poorer households. This means that poorer parents tend to overestimate the quality of private schools. When trying to explain

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<sup>28</sup>Results are available on demand.

<sup>29</sup>Results are available on demand.

this gap in perceptions between private and public schools, very few characteristics are found significant suggesting that there is a residual (unexplained) premium in quality granted to private schools. This premium probably explains the growth in private school enrollment in Pakistan. Understanding deeper the reasons of this premium would help policy makers to provide schools that would meet the requirements of the demand.

Other school characteristics also explain parental perceptions. Larger schools with a library are perceived as better by parents. Schools using English as a medium of instruction are valued by households, especially the wealthiest ones. Improving the level of infrastructures available in schools as well as developing English teaching could have an impact on the demand for education. Very few teacher characteristics are found significant probably because parents do not have access to information concerning the teachers employed in the schools.

## 8 Annexes

Table A1: Ordered logit model for households with and without enrolled children - Odd Ratios

Dep var: perception of quality of school	Households with enrolled child (1)	Households without any enrolled child (2)
Mother's years of education	1.00 (0.01)	0.98 (0.11)
Father's years of education	1.00 (0.00)	1.00 (0.05)
1st quintile hh consumption per cap	0.99 (0.06)	0.26** (0.17)
2nd quintile hh consumption per cap	0.90* (0.05)	0.48 (0.28)
3rd quintile hh consumption per cap	0.95 (0.06)	0.69 (0.39)
4th quintile hh consumption per cap	0.96 (0.05)	0.77 (0.45)
Std average scores in school	1.18*** (0.03)	1.16 (0.14)
Private school	2.37*** (0.16)	3.47*** (1.30)
Log of no. of students	1.59*** (0.06)	1.18 (0.23)
Log ratio pupils-teacher	0.82*** (0.04)	0.74 (0.20)
Classes taught in English	1.27*** (0.08)	0.46** (0.18)
School has a library	1.13*** (0.05)	1.13 (0.29)
% teachers with <1 year of exp	1.05 (0.13)	0.75 (0.84)
% teachers with 1-3 years of exp	1.70*** (0.17)	3.56** (1.83)
Mean days of absence of teachers	1.00 (0.01)	0.92*** (0.03)
% teachers with matric or less	1.17 (0.16)	0.22* (0.19)
% teachers with FA-FSc	1.48*** (0.22)	0.32 (0.27)
% teachers with BA-BSc	0.93 (0.14)	0.17* (0.15)
Observations	13195	528
Pseudo R <sup>2</sup>	0.091	0.188
FE Villages	Yes	Yes
FE Years	Yes	Yes

*Notes:* Odd-ratios are reported. Robust standard errors in parentheses: \* p < .1, \*\* p < .05, \*\*\* p < .01

*Reference categories:* The household belongs to the highest quintile of wealth, classes are taught in English, % of teachers with more than three years of experience and with a Master or more.

*Source:* Author using the three waves of the LEAPS project. The base unit represents household-school observation.

Table A2: Ordered logit model for schools providing reports on children's performances and other schools - Odd Ratios

Dep var: perception of quality of school	Schools providing reports children's performances	
	No <sup>a</sup> (1)	Yes <sup>b</sup> (2)
Mother's years of education	1.02 (0.02)	1.00 (0.01)
Father's years of education	0.99 (0.01)	1.00 (0.01)
1st quintile hh consumption per cap	1.16 (0.18)	0.98 (0.07)
2nd quintile hh consumption per cap	0.96 (0.14)	0.91 (0.06)
3rd quintile hh consumption per cap	1.08 (0.16)	0.93 (0.06)
4th quintile hh consumption per cap	1.05 (0.15)	0.92 (0.06)
Std average scores in school	1.12 (0.08)	1.17*** (0.03)
Private school	2.48*** (0.52)	2.53*** (0.19)
Log of no. of students	1.35*** (0.15)	1.60*** (0.06)
Log ratio pupils-teacher	0.92 (0.13)	0.86*** (0.05)
Classes taught in English	1.00 (0.19)	1.27*** (0.08)
School has a library	1.36** (0.18)	1.11** (0.05)
% teachers with <1 year of exp	1.28 (0.44)	0.97 (0.13)
% teachers with 1-3 years of exp	1.65* (0.45)	1.75*** (0.20)
Mean days of absence of teachers	0.95*** (0.02)	1.00 (0.01)
% teachers with matric or less	1.39 (0.50)	0.89 (0.14)
% teachers with FA-FSc	1.71 (0.66)	1.21 (0.21)
% teachers with BA-BSc	0.98 (0.38)	0.73* (0.12)
Observations	2687	10828
Pseudo R <sup>2</sup>	0.121	0.091
FE Villages	Yes	Yes
FE Years	Yes	Yes

Notes: Odd-ratios are reported. Robust standard errors in parentheses: \* p < .1, \*\* p < .05, \*\*\* p < .01

Reference categories: The household belongs to the highest quintile of wealth, classes are taught in English, % of teachers with more than three years of experience and with a Master or more. <sup>a</sup> only schools that do not provide reports on children's performances to parents or children. <sup>b</sup> only schools that provide reports on children's performances to parents or children.

Source: Author using the three waves of the LEAPS project. The base unit represents household-school observation.

Table A3: Ordered logit model for households with and without enrolled children - Odd Ratios

Dep var: perception of quality of school	Households with an enrolled child	
	in a private school (1)	in a public school but not in private (2)
Mother's years of education	1.00 (0.01)	1.01 (0.01)
Father's years of education	1.00 (0.01)	1.00 (0.01)
1st quintile hh consumption per cap	0.95 (0.10)	0.98 (0.08)
2nd quintile hh consumption per cap	0.96 (0.09)	0.82** (0.07)
3rd quintile hh consumption per cap	0.90 (0.08)	0.91 (0.07)
4th quintile hh consumption per cap	1.06 (0.09)	0.85** (0.07)
Std average scores in school	1.21*** (0.05)	1.17*** (0.04)
Private school	3.10*** (0.34)	1.94*** (0.18)
Log of no. of students	1.50*** (0.09)	1.67*** (0.08)
Log ratio pupils-teacher	0.79*** (0.06)	0.83*** (0.05)
Classes taught in English	1.14 (0.10)	1.37*** (0.12)
School has a library	1.27*** (0.09)	1.03 (0.06)
% teachers with <1 year of exp	1.04 (0.19)	1.11 (0.18)
% teachers with 1-3 years of exp	1.72*** (0.27)	1.70*** (0.23)
Mean days of absence of teachers	0.98 (0.01)	1.00 (0.01)
% teachers with matric or less	0.96 (0.21)	1.35* (0.24)
% teachers with FA-FSc	1.03 (0.25)	1.85*** (0.35)
% teachers with BA-BSc	0.69 (0.17)	1.16 (0.22)
Observations	5415	7753
Pseudo R <sup>2</sup>	0.118	0.087
FE Villages	Yes	Yes
FE Years	Yes	Yes

*Notes:* Odd-ratios are reported. Robust standard errors in parentheses: \* p < .1, \*\* p < .05, \*\*\* p < .01

*Reference categories:* The household belongs to the highest quintile of wealth, classes are taught in English, % of teachers with more than three years of experience and with a Master or more.

*Source:* Author using the three waves of the LEAPS project. The base unit represents household-school observation.

Table A4: Ordered logit estimates with subject-specific scores - Odd Ratios

Dep var: perception of quality of school	(1)	(2)	(3)	(4)
Mother's years of education	1.00 (0.01)	1.00 (0.01)	1.00 (0.01)	1.00 (0.01)
Father's years of education	1.00 (0.00)	1.00 (0.00)	1.00 (0.00)	1.00 (0.00)
1st quintile hh consumption per cap	0.98 (0.06)	0.98 (0.06)	0.98 (0.06)	0.98 (0.06)
2nd quintile hh consumption per cap	0.90* (0.05)	0.90* (0.05)	0.90* (0.05)	0.90* (0.05)
3rd quintile hh consumption per cap	0.94 (0.05)	0.94 (0.05)	0.94 (0.05)	0.94 (0.05)
4th quintile hh consumption per cap	0.94 (0.05)	0.94 (0.05)	0.94 (0.05)	0.94 (0.05)
Std average scores in English	1.18*** (0.03)			1.14*** (0.04)
Std average scores in Math		1.15*** (0.03)		1.08** (0.04)
Std average scores in Urdu			1.13*** (0.03)	0.97 (0.04)
Private school	2.33*** (0.16)	2.46*** (0.16)	2.48*** (0.17)	2.33*** (0.16)
Log of no. of students	1.58*** (0.05)	1.57*** (0.05)	1.57*** (0.05)	1.57*** (0.05)
Log ratio pupils-teacher	0.82*** (0.04)	0.82*** (0.04)	0.82*** (0.04)	0.82*** (0.04)
Classes taught in English	1.21*** (0.07)	1.25*** (0.07)	1.24*** (0.07)	1.22*** (0.07)
School has a library	1.12*** (0.05)	1.14*** (0.05)	1.13*** (0.05)	1.13*** (0.05)
% teachers with <1 year of exp	1.05 (0.12)	1.07 (0.13)	1.04 (0.12)	1.06 (0.13)
% teachers with 1-3 years of exp	1.74*** (0.17)	1.81*** (0.18)	1.79*** (0.18)	1.75*** (0.17)
Mean days of absence of teachers	0.99 (0.01)	0.99 (0.01)	0.99 (0.01)	0.99 (0.01)
% teachers with matric or less	1.14 (0.15)	1.11 (0.15)	1.07 (0.14)	1.14 (0.15)
% teachers with FA-FSc	1.45** (0.21)	1.44** (0.21)	1.40** (0.20)	1.44** (0.21)
% teachers with BA-BSc	0.90 (0.13)	0.87 (0.13)	0.88 (0.13)	0.88 (0.13)
Observations	13730	13730	13730	13730
Pseudo R <sup>2</sup>	0.090	0.090	0.089	0.090
FE Villages	Yes	Yes	Yes	Yes
FE Years	Yes	Yes	Yes	Yes

Notes: Odd-ratios are reported. Robust standard errors in parentheses: \* p < .1, \*\* p < .05, \*\*\* p < .01

Reference categories: Classes are taught in another language than English, % of teachers with more than three years of experience and with a Master or more.

Source: Author using the three waves of the LEAPS project. The base unit represents household-school observation.

Table A5: Ordered logit estimates with peer measures - Odd Ratios

Dep var: perception of quality of school	All	Wealth Quintile		Type of school	
	(1)	First quintile (2)	Fifth quintile (3)	Public (4)	Private (5)
Mother's years of education	1.00 (0.01)	0.99 (0.02)	1.00 (0.01)	1.02* (0.01)	0.99 (0.01)
Father's years of education	1.00 (0.00)	1.00 (0.01)	0.98 (0.01)	0.98** (0.01)	1.00 (0.01)
1st quintile hh consumption per cap	0.98 (0.06)			0.94 (0.11)	1.01 (0.08)
2nd quintile hh consumption per cap	0.90* (0.05)			0.85* (0.08)	0.91 (0.07)
3rd quintile hh consumption per cap	0.94 (0.05)			0.98 (0.09)	0.90 (0.07)
4th quintile hh consumption per cap	0.94 (0.05)			0.85* (0.08)	0.97 (0.07)
Std average scores in school	1.17*** (0.03)	1.07 (0.07)	1.30*** (0.08)	1.05 (0.05)	1.15*** (0.04)
Private school	2.30*** (0.16)	2.64*** (0.52)	2.05*** (0.31)		
Log of no. of students	1.50*** (0.06)	1.55*** (0.15)	1.50*** (0.12)	1.95*** (0.16)	1.35*** (0.07)
Log ratio pupils-teacher	0.83*** (0.04)	0.90 (0.12)	0.87 (0.09)	0.74** (0.10)	0.87** (0.05)
Log of annual fees				1.16*** (0.03)	1.00 (.)
Classes taught in English	1.21*** (0.07)	1.12 (0.19)	1.78*** (0.23)	1.04 (0.08)	1.12 (0.12)
School has a library	1.12*** (0.05)	1.06 (0.12)	1.16 (0.11)	1.08 (0.08)	1.12* (0.07)
% of tested students with uneducated father	0.82 (0.10)	0.64 (0.18)	0.65 (0.20)	1.00 (0.24)	0.65*** (0.10)
% of tested students with uneducated mother	0.83* (0.09)	1.02 (0.27)	1.10 (0.29)	0.63** (0.12)	0.93 (0.15)
% teachers with <1 year of exp	1.06 (0.12)	0.93 (0.27)	1.22 (0.32)	1.01 (0.19)	1.01 (0.18)
% teachers with 1-3 years of exp	1.76*** (0.17)	2.42*** (0.69)	2.11*** (0.46)	1.29 (0.23)	1.03 (0.15)
Mean days of absence of teachers	0.99 (0.01)	1.00 (0.02)	1.00 (0.02)	1.02 (0.01)	0.98* (0.01)
% teachers with matric or less	1.09 (0.15)	2.13** (0.82)	0.69 (0.22)	1.65 (0.82)	1.02 (0.17)
% teachers with FA-FSc	1.40** (0.20)	3.03*** (1.23)	0.78 (0.27)	1.70 (0.88)	1.17 (0.20)
% teachers with BA-BSc	0.87 (0.13)	1.22 (0.48)	0.49** (0.17)	1.77 (0.99)	0.90 (0.15)
Observations	13730	2288	2919	4920	8805
Pseudo R <sup>2</sup>	0.090	0.132	0.113	0.087	0.060
FE Villages	Yes	Yes	Yes	Yes	Yes
FE Years	Yes	Yes	Yes	Yes	Yes

Notes: Odd-ratios are reported. Robust standard errors in parentheses: \*  $p < .1$ , \*\*  $p < .05$ , \*\*\*  $p < .01$   
Reference categories: Classes are taught in another language than English, % of teachers with more than three years of experience and with a Master or more.

Source: Author using the three waves of the LEAPS project. The base unit represents household-school observation.

Table A6: Generalised ordered logit model - Odd Ratios

Dep var: perception of quality of school	Poor vs average and high quality (1)	Poor and average vs. high quality (2)
Mother's years of education	0.98** (0.01)	1.01 (0.01)
Father's years of education	1.00 (0.00)	1.00 (0.00)
1st quintile hh consumption per cap	0.97 (0.06)	0.97 (0.06)
2nd quintile hh consumption per cap	0.89* (0.05)	0.89* (0.05)
3rd quintile hh consumption per cap	0.94 (0.05)	0.94 (0.05)
4th quintile hh consumption per cap	0.93 (0.05)	0.93 (0.05)
Std average scores in school	1.18*** (0.03)	1.18*** (0.03)
Private school	1.84*** (0.18)	2.52*** (0.17)
Log of no. of students	1.60*** (0.06)	1.60*** (0.06)
Log ratio pupils-teacher	0.82*** (0.04)	0.82*** (0.04)
Classes taught in English	1.24*** (0.07)	1.24*** (0.07)
School has a library	1.13*** (0.05)	1.13*** (0.05)
% teachers with <1 year of exp	0.79 (0.14)	1.15 (0.14)
% teachers with 1-3 years of exp	1.77*** (0.17)	1.77*** (0.17)
Mean days of absence of teachers	0.98** (0.01)	1.00 (0.01)
% teachers with matric or less	1.07 (0.15)	1.07 (0.15)
% teachers with FA-FSc	1.39** (0.21)	1.39** (0.21)
% teachers with BA-BSc	0.88 (0.13)	0.88 (0.13)
Observations		13730
Pseudo R <sup>2</sup>		0.107
FE Villages		Yes
FE Years		Yes

*Notes:* Odd-ratios are reported. Robust standard errors in parentheses: \*  $p < .1$ , \*\*  $p < .05$ , \*\*\*  $p < .01$

*Reference categories:* The household belongs to the highest quintile of wealth, classes are taught in English, % of teachers with more than three years of experience and with a Master or more.

*Source:* Author using the three waves of the LEAPS project. The base unit represents household-school observation.

Table A7: Multinomial logit estimates - Average Marginal Effects

Dep var: perception of quality of school	(1)	(2)	(3)
	Poor or very poor quality	Average quality	Good or excellent quality
Mother's years of education	0.00** (0.00)	-0.00*** (0.00)	0.00* (0.00)
Father's years of education	-0.00 (0.00)	0.00* (0.00)	-0.00 (0.00)
1st quintile hh consumption per cap	0.00 (0.01)	0.01 (0.01)	-0.01 (0.01)
2nd quintile hh consumption per cap	0.00 (0.01)	0.02 (0.01)	-0.02** (0.01)
3rd quintile hh consumption per cap	0.01 (0.01)	0.00 (0.01)	-0.01 (0.01)
4th quintile hh consumption per cap	0.01 (0.01)	-0.00 (0.01)	-0.01 (0.01)
Std average scores in school	-0.01*** (0.00)	-0.02*** (0.01)	0.03*** (0.00)
Private school	-0.05*** (0.01)	-0.12*** (0.01)	0.17*** (0.01)
Log of no. of students	0.01 (0.01)	0.03*** (0.01)	-0.04*** (0.01)
Log ratio pupils-teacher	-0.04*** (0.00)	-0.06*** (0.01)	0.10*** (0.01)
Classes taught in English	-0.02* (0.01)	-0.03* (0.01)	0.04*** (0.01)
School has a library	-0.01* (0.01)	-0.01 (0.01)	0.02** (0.01)
% teachers with <math>\leq 1</math> year of exp	0.02 (0.02)	-0.06** (0.03)	0.03 (0.02)
% teachers with 1-3 years of exp	-0.03** (0.01)	-0.09*** (0.02)	0.12*** (0.02)
Mean days of absence of teachers	0.00** (0.00)	-0.00 (0.00)	0.00 (0.00)
% teachers with matric or less	0.00 (0.02)	-0.02 (0.03)	0.02 (0.03)
% teachers with FA-FSc	-0.02 (0.02)	-0.06 (0.03)	0.07** (0.03)
% teachers with BA-BSc	0.02 (0.02)	-0.00 (0.03)	-0.02 (0.03)
Observations	13730	13730	13730
Pseudo R <sup>2</sup>	0.108	0.108	0.108
FE Villages	Yes	Yes	Yes
FE Years	Yes	Yes	Yes

*Notes:* Average marginal effects are reported. Robust standard errors in parentheses: \*  $p < .1$ , \*\*  $p < .05$ , \*\*\*  $p < .01$   
*Reference categories:* The household belongs to the highest quintile of wealth, classes are taught in English, % of teachers with more than three years of experience and with a Master or more.

*Source:* Author using the three waves of the LEAPS project. The base unit represents household-school observation.

Table A8: Ordered logit estimates by wealth quintile with quintiles for scores - Odd Ratios

Dep var: perception of quality of school	1st quintile (1)	2nd quintile (2)	3rd quintile (3)	4th quintile (4)	5th quintile (5)
Mother's years of education	0.99 (0.02)	1.03* (0.02)	0.95*** (0.02)	1.03** (0.02)	1.00 (0.01)
Father's years of education	1.00 (0.01)	1.00 (0.01)	1.00 (0.01)	1.00 (0.01)	0.98 (0.01)
1st quintile std scores	0.53*** (0.10)	0.79 (0.14)	0.56*** (0.09)	0.57*** (0.09)	0.41*** (0.07)
2nd quintile std scores	0.90 (0.15)	0.96 (0.16)	0.76* (0.11)	0.74** (0.11)	0.55*** (0.08)
3rd quintile std scores	1.21 (0.21)	1.07 (0.17)	0.78* (0.11)	1.00 (0.14)	0.82 (0.12)
4th quintile std scores	0.99 (0.17)	1.16 (0.18)	1.07 (0.14)	1.09 (0.14)	0.64*** (0.09)
Private school	2.53*** (0.50)	3.36*** (0.59)	2.81*** (0.41)	1.75*** (0.25)	2.10*** (0.31)
Log of no. of students	1.57*** (0.14)	1.56*** (0.14)	1.52*** (0.12)	1.72*** (0.13)	1.53*** (0.12)
Log ratio pupils-teacher	0.89 (0.12)	0.89 (0.12)	0.69*** (0.07)	0.84 (0.09)	0.87 (0.09)
Classes taught in English	1.12 (0.19)	1.18 (0.17)	0.89 (0.12)	1.32** (0.16)	1.77*** (0.23)
School has a library	1.06 (0.12)	1.15 (0.12)	1.14 (0.12)	1.10 (0.10)	1.16 (0.11)
% teachers with <1 year of exp	0.98 (0.28)	0.73 (0.20)	1.22 (0.32)	1.48 (0.42)	1.26 (0.33)
% teachers with 1-3 years of exp	2.41*** (0.68)	1.77** (0.45)	1.01 (0.22)	2.23*** (0.48)	2.16*** (0.47)
Mean days of absence of teachers	1.00 (0.02)	0.98 (0.02)	0.98 (0.02)	1.00 (0.01)	1.00 (0.02)
% teachers with matric or less	2.41** (0.93)	0.70 (0.23)	1.03 (0.28)	1.74* (0.49)	0.69 (0.22)
% teachers with FA-FSc	3.13*** (1.28)	1.04 (0.37)	1.30 (0.39)	2.12** (0.66)	0.77 (0.27)
% teachers with BA-BSc	1.49 (0.59)	0.60 (0.22)	1.35 (0.41)	1.27 (0.39)	0.51** (0.18)
Observations	2288	2713	2867	2943	2919
Pseudo R <sup>2</sup>	0.137	0.121	0.108	0.104	0.116
FE Villages	Yes	Yes	Yes	Yes	Yes
FE Years	Yes	Yes	Yes	Yes	Yes

Notes: Odd-ratios are reported. Robust standard errors in parentheses: \* p < .1, \*\* p < .05, \*\*\* p < .01

Reference categories: Classes are taught in another language than English, % of teachers with more than three years of experience and with a Master or more.

Source: Author using the three waves of the LEAPS project. The base unit represents household-school observation.

Table A9: Gender of the respondent

Dep var: perception of quality of school	(1)	(2)
Mother's years of education	1.01 (0.01)	1.01 (0.01)
Father's years of education	0.99 (0.01)	0.99 (0.01)
Female repondent	0.70*** (0.04)	0.70*** (0.04)
Male repondent	0.82*** (0.04)	0.82*** (0.04)
1st quintile hh consumption per cap	1.10 (0.10)	1.10 (0.10)
2nd quintile hh consumption per cap	1.01 (0.07)	1.01 (0.07)
3rd quintile hh consumption per cap	0.98 (0.07)	0.98 (0.07)
4th quintile hh consumption per cap	0.94 (0.06)	0.94 (0.06)
Std average scores in school	1.15*** (0.03)	1.30*** (0.05)
Female repondent*test scores		0.86*** (0.05)
Male repondent*test scores		0.77*** (0.04)
Private school	2.73*** (0.22)	2.72*** (0.22)
Log of no. of students	1.57*** (0.07)	1.57*** (0.07)
Log ratio pupils-teacher	0.76*** (0.05)	0.76*** (0.05)
Classes taught in English	1.17** (0.08)	1.17** (0.08)
School has a library	1.24*** (0.07)	1.23*** (0.07)
% teachers with <1 year of exp	1.06 (0.16)	1.03 (0.16)
% teachers with 1-3 years of exp	1.68*** (0.20)	1.68*** (0.20)
Mean days of absence of teachers	0.99 (0.01)	0.99 (0.01)
% teachers with matric or less	1.13 (0.18)	1.11 (0.17)
% teachers with FA-FSc	1.38* (0.23)	1.36* (0.23)
% teachers with BA-BSc	0.97 (0.16)	0.97 (0.16)
Observations	9625	9625
Pseudo R <sup>2</sup>	0.093	0.095
FE Villages	Yes	Yes
FE Years	Yes	Yes

*Notes:* Robust standard errors in parentheses: \*  $p < .1$ , \*\*  $p < .05$ , \*\*\*  $p < .01$

*Reference categories:* The household belongs to the highest quintile of wealth, classes are taught in another language than English, % of teachers with more than three years of experience and with a Master or more.

*Source:* Author using the three waves of the LEAPS project. The base unit represents household-school observation.

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