Estimating The Demand for School Attributes in Pakistan

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February 2010

[Preliminary Version]

Abstract

This paper studies the determinants of parental choices of school attributes in Pakistan, a country where a long fraction of schools are private. We estimate a standard model of demand for differentiated products using a rich dataset with school attributes, household and child characteristics, and school choices. We find that a one-standard deviation increase in the quality of basic facilities is valued at about 210 rupees, which corresponds to an increase of the average school fee by around 45 per cent. In terms of distance, a one standard deviation decrease (on average an 800 meter decrease) is valued at about 180 rupees. There is some evidence that the determinants of school choice change with household/student characteristics, like gender and parents education, in particular regarding price and distance.

Keywords: Education, School Choice, Pakistan, Demand, Discrete choice model

JEL Classification:I20,I21

1 Introduction

Although the study of the effect of school competition on school quality is extensive, this topic is still one of the most important in the field of educational economics and at an educational policy level, in particular in the US and UK.

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In the last decade, many empirical studies emerged in the U.S. (a good example is Hoxby (2003) and more recently Hastings, Kane and Staiger (2009)) and the quality of educational institutions became a worldwide concern. School choice is one of the most debated policies aimed at increasing welfare[1]. Those in favour advocate that school choice may create incentives for schools to increase productivity, offering a product closer to students demand, and expand the choice set for poor students. In contrast, opponents argue that school choice may increase segregation, may decrease school quality to poor students by moving good peers to other schools, and may produce competition in irrelevant attributes if parents are careless about educational outcomes.

This paper studies the determinants of parents choices among different schools when they are allowed to do so. Do they consider price?, quality? distance?. This line of research is relevant from a policy perspective as it allows to have a clear understanding of how students are allocated to schools in equilibrium. An extended literature have analysed this topic: i) simple logit models for the choice between different type of schools (for example, Alderman, Orazem and Patterno (2001) for Pakistan, Checchi and Japelli (2004) for Italy), ii) structural choice models using information on a particular area (Bayer and McMillan (2006)and iii) mixed logit models with information about the first and second choices in a particular area (Hastings, Kane and Staiger (2009) and Hastings and Weinstein (2007)) and iv) logit model for the choice of an individual school between public and voucher schools (Gallego and Hernando (2009) for Chile)[2].

We extend the literature to a developing country using detailed information on the school choices in Punjab province, the largest state in Pakistan, in a context in which parents can choose among all schools (public and private)[3]. During the 1970's Pakistan actively discouraged private schooling, to the point of nationalizing many private schools. While this policy was reversed in the following decade, the trend towards private schools has accelerated in recent years. For example, the number of primary private schools increased more than 10 times in the last 25 years (47000 in 2005 compared with 3800 in 1983). Therefore, some characteristics of the Pakistani educational system make the study of school choice interesting. In Pakistan, not only parents are allowed to

[1] A good example is the Chilean education voucher system

[2] Their approach is similar to the approach presented in this paper. However, it does not take into account random coefficients and the choice set includes only public and voucher schools (private schools accounts for more than 10 per cent of total enrollment)

[3] Gallego and Hernando (2009) allows more choice than the public schools considering also the choice of voucher schools. However, they do not take into account the non-free private schools, which account for more than 10 per cent of total enrollment.

choose freely the school without any restriction as the "creation" of a private school is relatively simple. These schools are usually familiar enterprises purely driven by their own revenues and facing little government regulation (Andrabi et al 2007). They offer Western education type in a coeducational environment, in particular at the primary level. Another important characteristic of these schools is that the typical rural private school is very affordable what explains the recent trend in the number of private schools. In 2000, a national level census of private school shows that the median fee charged by a private school is about 60 rupees per month (around a day's unskilled wage). Public schools charge no fees. These characteristics play all in favour of expansion of school choice in Pakistan, which is shown in our sample. In Punjab, the largest province in the country, the educational marketplace seems reasonably competitive. A tipical village is serviced, on average, by 7 different schools (public and private).

We model school choice of a household as a discrete choice model of a single school. The utility function specification is based on the random utility model developed by McFadden (1974) and the specification of Berry, Levinsohn, and Pakes (BLP) (2004), which includes choice-specific unobservables characteristics combining macro and micro data. In our model, the allocation of students to schools is allowed to vary with household's own characteristics.
A central empirical issue is whether the sources of consumer heterogeneity, typically available in micro data sets (income, household demographics, location of residence), are rich enough to account for the heterogeneity in tastes for different characteristics. Our model allows tastes for characteristics to vary as a function of both observed and unobserved consumer attributes.

The results suggest that the most relevant determinants of parents' choices among different schools are price, distance and basic infrastructure. We find that a one-standard deviation increase in the quality of basic facilities is valued at about 210 rupees, which corresponds to an increase of the average school fee by around 45 per cent. In terms of distance, a one standard deviation decrease (on average an 800 meter decrease) is valued at about 180 rupees. Other quality characteristics, like test scores, seem not to be as important for the parents decision as it is in other countries like in the US [4]. There is some evidence that the determinants of school choice change with household and student characteristics, like gender and parents education, in particular in terms of price and distance.

[4] In Chile there is also some evidence of the importance of test scores on parents' school decision

The remaining of this paper is organised as follows. Section 2 presents the Data. Section 3 describes the econometric model used to study the determinants of parents choices among different schools. Section 4 presents the results. Finally Section 5 concludes.

2 Data

This paper uses the Learning and Education Achievement in Punjab School (LEAPS) project data set[5]. The LEAPS data is collected from 112 villages in the Punjab province, the largest state in Pakistan, located in the three districts of Attock (North), Faisalabad (Center), and Rahim Yar Khan (South). Villages were randomly chosen from a list of villages with at least one private school according to the 2000 census of private schools. This allows us to look at differences between private and public schools in the same village. The baseline survey in 2004 covered 823 schools (government and private) and around 1800 households (with almost 6000 children).

We use school characteristics, students background, their educational outcomes and parent preferences data. Table 1 presents the variables used and a brief description of each variable.
We use Math average test scores to measure academic outcomes. To measure other characteristics of school, we use school fees payed by the students and infrastructure facilities (basic and extra)[6] We consider teacher absenteeism and teacher test scores as measures of teacher quality.
In addition, we include information on the distance from the place where the student lives and all schools in the village. At the student level we use parents education, age and gender. As a proxy measure of household income per capita we use expenditure per capita .

Table 2 presents summary statistics for the attributes we use at the school level. In our sample, almost 40 per cent of the schools are private and the

[5]The project details are available at www.leapsproject.org

[6]School basic facilities: number of permanent classrooms, semi-permanent classrooms, staffrooms, stores, toilets(combined), toilets(boys), toilets(girls), and blackboards per student (including nursery students).
School extra facilities: whether school has library, computers, sports equipment, meeting hall, surrounding wall or fence, fans, and electricity.

average private school fee paid by the parents is around 1120 rupees per year. Overall, there is a considerable variance of school characteristics.
Table 3 illustrates descriptive statistics at the household and student level. Around 75 per cent of the children attend school and around 16 per cent never attended school. The average age of the children is 10 years old. In terms of distance to school, it is interesting to notice that boys travel, on average, more than girls. The total monthly household expenditure per capita is around 950 rupees, almost the same amount parents spent on average per year to keep a child in a private school.
Table 4 describes data of the school attributes divided by parents education and income. As expected, more educated parents have a higher percentage of children in private schools and thus pay more (around two times on average) for school fees. In addition, more educated parents have children in schools with better infrastructures, lower teacher absenteeism and slightly higher average test scores. In terms of income, the results are in general similar and as expected. Wealthier parents have more children in private schools (paying higher fees) and children tend to travel less. Moreover, wealthier households have their children in schools with better infrastructures, higher average test scores (despite relatively small) and lower teacher absenteeism.

3 Model

Several methods have been used to estimate models of demand for differentiated products in the presence of endogenous explanatory variables. In this paper, we describe the most often used procedure in the literature, developed by Berry, Levishon and Pakes (BLP) 2004, which includes choice-specific unobservable characteristics combining macro and micro data.

3.1 BLP approach

The indirect utility of household i get from its child (of gender g) attending school j in village t is given by

$$u_{ijtg} = \sum_{k=1}^{K} x_{jktg}\beta_{ik} + \gamma_i d_{ijtg} + \lambda_{jtg} + \varepsilon_{ijtg} \tag{1}$$

where

$j = \{0, ..., J\}$ index schools competing in the market tg; $j = 0$ is the "outside" good such that u_{i0tg} is the utility the individual derives if he does not go to any of the J schools.

$i = \{1, ..., N\}$ index indviduals,

$t = \{1, ...T\}$ index mauzas (villages),

$g = \{male, female\}$,

k index the observed school characteristics and

r index the observed individual characterisitcs.

Let $X_{jk} = \{x_{j1,}x_{j2,}...,x_K\}$ be observed school characteristics,

λ_j unobserved school attributes valued equally by everyone,

$d_{ij}-$ distance from the house of the household i to school j.

$Z_i = \{z_{i1,}z_{i2,}...,z_{iR}\}$ observable individual characteristics,

v_i unobservable characteristics of household i and

ε_{ijtg} individual-specific preference for school j in market tg assumed to have an extreme value type I distribution.

The value of school's characteristics is allowed to vary with household's own characteristics according to:

$$\beta_{ik} = \overline{\beta}_k + \sum_{r=1}^{R} z_{irtg}\beta^o_{rk} + \beta^u_k v_{itg} \tag{2}$$

and

$$\gamma_i = \overline{\gamma} + \sum_{r=1}^{R} z_{irtg}\gamma_r + \gamma^u v_{itg} \tag{3}$$

substituting (2) and (3) in (1) we get

$$u_{ijtg} = \sum_{k=1}^{K} x_{jktg}\overline{\beta}_k + \lambda_{jtg} + \sum_{k=1}^{K}\sum_{r=1}^{R} x_{jktg} z_{irtg}\beta^o_{rk} + \sum_{k=1}^{K} x_{jktg} v_{itg}\beta^u_k + \overline{\gamma} d_{ijtg} + \sum_{r=1}^{R} d_{ijtg} z_{irtg}\gamma_r + \gamma^u d_{ijtg} v_{itg} + \varepsilon_{ijtg} \tag{4}$$

Household i choose the school that maximizes (4). The market is the combination of mauza t and gender g.

3.1.1 Model I - MLE and IV: $\beta^u_k = 0$, $\gamma^u = 0$ and $\lambda_{jtg} \neq 0$

$$u_{ijtg} = \delta_{jtg} + \sum_{k=1}^{K}\sum_{r=1}^{R} x_{jktg} z_{irtg}\beta^o_{rk} + \overline{\gamma} d_{ijtg} + \sum_{r=1}^{R} d_{ijtg} z_{irtg}\gamma_r + \varepsilon_{ijtg} \tag{5}$$

with

$$\delta_{jtg} = \sum_{k=1}^{K} x_{jktg}\overline{\beta}_k + \lambda_{jtg} \tag{6}$$

First Step - MLE

a) estimate $\delta_j, \beta^o_{rk}, \overline{\gamma}, \gamma_r$ including contraction mapping to obtain δ_j

Under the assumption that ε_{ijtg} has an extreme value Type I distribution, the probability of household i choose school j (i.e. the probability of $u_{ijtg} > u_{iqtg}, \forall j \neq q$) is

$$\begin{aligned} P_{ijtg} &= \Pr(y_i = j | z_{itg}, x_{jtg}, \beta, \gamma) \\ &= \frac{\exp(\delta_{jtg} + \sum_{k=1}^{K}\sum_{r=1}^{R} x_{jktg} z_{irtg}\beta^o_{rk} + \overline{\gamma} d_{ijtg} + \sum_{r=1}^{R} d_{ijtg} z_{irtg}\gamma_r)}{1 + \sum_{q=1}^{J} \exp(\delta_{qtg} + \sum_{k=1}^{K}\sum_{r=1}^{R} x_{qktg} z_{irtg}\beta^o_{rk} + \overline{\gamma} d_{iqtg} + \sum_{r=1}^{R} d_{iqtg} z_{irtg}\gamma_r)} \end{aligned} \tag{7}$$

and the likelihood function is given by:

$$L(\beta,\gamma) = \prod_{j=1}^{J} \prod_{i \in A_j} P_{ijtg}$$

and the log-likelihood by:

$LL(\beta,\gamma) = \sum_{j=1}^{J} \sum_{i \in A_j} \ln(P_{ijtg})$

where, the set of households that choose school j is given by

$A_{jtg}(x_{jtg}, d_{ijtg}; \delta_{jtg}, \beta^o_{rk}, \overline{\gamma}, \gamma_r) = \{(\varepsilon_{i0tg}, ..., \varepsilon_{iJtg}) | u_{ijtg} > u_{iltg}, \forall j \neq l\}$

Partially differentiating (7) with respect to δ_{qtg} we get

$$\frac{\partial LL}{\partial \delta_{qtg}} = \sum_{\substack{j=1 \\ j \neq q}}^{J} \sum_{i \in A_j} \frac{1}{P_{ijtg}} \frac{\partial P_{ijtg}}{\partial \delta_{qtg}} + \sum_{i \in A_q} \frac{1}{P_{iqtg}} \frac{\partial P_{iqtg}}{\partial \delta_{qtg}} \tag{8}$$

Given that

$$\frac{\partial P_{iqtg}}{\partial \delta_{qtg}} = P_{iqtg}(1 - P_{iqtg}) \tag{9}$$

$$\frac{\partial P_{ijtg}}{\partial \delta_{qtg}} = -P_{iqtg} P_{ijtg}, j \neq q \tag{10}$$

the FOC with respect to δ_{qtg} of the Maximum Likelihood (ML) problem becomes:

$$\begin{aligned} \frac{\partial LL}{\partial \delta_{qtg}} &= \sum_{i \in A_q} 1 - \sum_{j=1}^{J} \sum_{i \in A_j} P_{iqtg} \\ &= N_q - \sum_{i=1}^{N} P_{iqtg} = 0 \end{aligned}$$

Dividing by N we get:

$$sh_q - \frac{1}{N}\sum_{i=1}^{N} P_{iqtg} = 0 \tag{11}$$

where sh_q is the share of students that attend school q and N is the total number of students.

This condition implies that the estimated δ_{jtg} has to guarantee that the empirical share of student attending school j has to be equal to the average probability that a student attends this school.

In order to find estimates for the parameters of interest we need to iterate over

$$\delta_{qtg}^{t+1} = \delta_{qtg}^{t} - \left[\log(sh_q) - \log(\frac{1}{N}\sum_{i=1}^{N} P_{iqtg})\right] \tag{12}$$

Each iteration over (12) requires a new calculation of the probabilities in (7)

Second Step - IV

b) estimate $\overline{\beta}_k$

The second step is the estimation of the school fixed effect (δ_{jtg}) on the observed school characteristics as in equation (6).

School fees and test score variables may be correlated with the unobserved quality characteristics of the school, which lead OLS estimation to be biased. At this stage, a natural issue arises to define which variables to use as instruments. BLP proposed to use the observed non-price attributes of other schools. The idea is that each firm will price its products taking into account the substitution with other firms products. We assume that the price charged by one school is correlated with the observable characteristics of other schools in the same market. Following BLP, and assuming that the unobservable attributes of school j (λ_j) are not dependent of its non-price and non-test score characteristics ($X_j \diagdown \{price_j, test\ score_j\}$) , the non-price and non-test scores attributes of other schools in the same market ($X_{-j} \diagdown \{price_{-j}, test\ score_{-j}\}$) are used as instruments.

3.1.2 Model II - Maximum Simulation Likelihood (MSL) and IV:

$\beta_k^u \neq 0$, $\gamma^u \neq 0$ **and** $\lambda_{jtg} \neq 0$

$$u_{ijtg} = \delta_{jtg} + \sum_{k=1}^{K}\sum_{r=1}^{R} x_{jktg} z_{irtg} \beta_{rk}^o + \sum_{k=1}^{K} x_{jktg} v_{itg} \beta_k^u + \overline{\gamma} d_{ijtg} + \sum_{r=1}^{R} d_{ijtg} z_{irtg} \gamma_r + d_{ijtg} v_{itg} \gamma^u + \varepsilon_{ijtg} \tag{13}$$

with

$$\delta_{jtg} = \sum_{k=1}^{K} x_{jktg} \overline{\beta}_k + \lambda_{jtg} \tag{14}$$

First Step - MSL

a) estimate $\delta_j, \beta_{rk}^o, \beta_k^u, \overline{\gamma}, \gamma_r, \gamma^u$ including contraction mapping to obtain δ_j.

Let $\widetilde{P}_{iqtg}$ be a simulated approximation to P_{iqtg}. The simulated choice probability is given by

$$\widetilde{P}_{ijtg} = \sum_{n=1}^{ND} \frac{\exp(\delta_{jtg} + \sum_{k=1}^{K}\sum_{r=1}^{R} x_{jktg} z_{irtg} \beta_{rk}^o + \overline{\gamma} d_{ijtg} + \sum_{r=1}^{R} d_{ijtg} z_{irtg} \gamma_r + \sum_{k=1}^{K} x_{jktg} v_{itgn} \beta_k^u + d_{ijtg} v_{itgn} \gamma^u)}{1 + \sum_{q=1}^{J} \exp(\delta_{qtg} + \sum_{k=1}^{K}\sum_{r=1}^{R} x_{qktg} z_{irtg} \beta_{rk}^o + \overline{\gamma} d_{iqtg} + \sum_{r=1}^{R} d_{iqtg} z_{irtg} \gamma_r + \sum_{k=1}^{K} x_{qktg} v_{itgn} \beta_k^u + d_{iqtg} \gamma^u)}$$

for random draws $v_{itgn}, n = 1, ..., ND$.

The Simulated log-likelihood function is given by

$SLL(\beta, \gamma) = \sum_{j=1}^{J} \sum_{i \in A_j} \ln(\widetilde{P}_{ijtg})$

This procedure is the same as ML except that simulated probabilities are used instead of the exact probabilities.

Second Step - IV

b) estimate $\overline{\beta}_k$

The second step is the estimation of the school fixed effects (δ_{jtg}) on the observed school characteristics as before and in equation (14).

4 Results

BLP approach

Model I - no random coefficients ($\beta_k^u = 0$, $\gamma^u = 0$)

Table 5 panel A presents the estimation results of $\overline{\beta}_k$, the direct effects. The analysis will focus on the OLS and IV estimates in column (3) and (4), which controls for village characteristics. As expected, estimates suggest that schools that charge higher fees and are located at a higher distance tend to be less preferred by parents. In turn, parents tend to prefer schools with more/better basic infrastructures (e.g. toilets). In general, with the expected sign but not statistically significant we have characteristics like average students test scores, extra infrastructures, teacher absenteeism and teacher test scores. In terms of economic significance of these estimates, we get that a one-standard deviation increase in basic facilities is valued at about 210 rupees, which corresponds to an increase of the average school fee by around 45 per cent. In terms of distance, a one standard deviation decrease (on average an 800 meter decrease) is valued at about 180 rupees. In general, the results are similar to the ones presented in column (1) and (2) where there is no controls for village characteristics.

Table 6 panel A presents the interaction results to study the degree of heterogeneity in terms of preferences for school attributes depending on observable student characteristics. More educated parents are willing to pay more school fees and tend to put more weight on extra facilities and Teacher Test scores and less weight on basic facilities. Wealthier families tend to put more weight on extra facilities, less on basic facilities and are willing to pay more for school fees. In addition, although parents are willing to pay less for a girl student, characteristics like extra facilities and average test scores seem to be more important. Also, less distant schools seems to be more relevant if the chidren is a girl. Moreover, if the children is younger, parents are willing to pay more and features like basic infrastructures and test scores seem to be more important. In terms of teacher abseenteeism there seems to be no heterogeneity.

Model II - random coefficients $\beta_k^u \neq 0$, $\gamma^u \neq 0$

Table 5 panel B presents the direct effects results of the model when we include choice-specific unobservables characteristics. These results are in line

with the ones presented by model I. Parents tend to prefer schools i) that charge lower fees, ii) that are located at a smaller distance and iii) with more/better basic infrastuctures.

Table 6 panel B describes the interaction results to study the degree of heterogeneity in terms of preferences for school attributes depending on observable student characteristics. In this model, the degree of heterogeneity is smaller. The remaining effects are the ones regarding price and distance. More educated and richer parents are willing to pay more for children education and less distant schools seems to be more relevant if the chidren is a girl.

Table 7 describes the interaction results to study the degree of heterogeneity in terms of preferences for school attributes depending on unobservable student characteristics. These results indicate that we do not need additional unobserved interactions to explain the data.

School Fee Elasticity

Figure 1 and 2 present two measures of school fee elasticity. Figure 1 considers the impact on private schools market shares when the price increases by 1 per cent. In this case, we have a negative relation between current prices and changes in the market share. Therefore, more expensive private schools present a higher elasticity (highest reduction in their market share due to a 1 per cent increase in prices). The most affected schools would see their market share reduced by 2.3 p.p. (on average the market share per private school is reduced by around 0.4 p.p.). In Figure 2 we look at the effect of an increase in prices by 100 rupees on the school market share in percentage points (p.p), including public schools in the analyses. In this figure we have a positive relation between current prices and changes in the market share. In fact, public schools and private schools charging lower prices have a bigger impact on their share compared with more expensive private schools. Market share decreases on average 5 p.p, reaching a maximum of almost 12.5 p.p in some public schools.

5 Conclusion

School choice is one of the most debated topic and one of the most important in the educational economics field. In fact, the quality of educational institutions

become a worldwide concern, including the developing countries. Our study of the demand side of the Pakistani education system can help us understand the effects of choice (in particular the widespread supply of affordable private institutions) on educational outcomes and household/student welfare. This paper presents estimates of the demand side of school choice allowing the allocation of students to vary with household own characteristics (observable and unobservable). These estimates are essential to understand the effects of increased choice and potential responses from the supply side. In addition, they allow the study of different implications in terms of education policy. Our results suggest that the most relevant determinants of parents' choices among different schools are price, distance and basic infrastructure. There is some evidence that the determinants of school choice change with household/student characteristics, like gender and parents education, in particular regarding price and distance. These estimates will allow us to study the effects of school choice on consumer(student) welfare through policy simulations. Using compensation variation to measure changes in student welfare related to changes in the design of the school choice system. This particular effect is the aim of future and ongoing research.

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Table 1 - Variable Description

Variables	Description
School Variables	
School Fees	Tuition/School Funds annual fees (rupees)
Average Test Score	Average Student test scores for the 3rd grade in Math
Infrastucture Facilities	
Basic Facilities Index	School Basic Facilities index: number of permanent classrooms, semi-permanent classrooms, staffrooms, stores, toilets(combined), toilets(boys), toilets(girls), and blackboards per student (including nursery students).
Extra Facilities Index	School Extra facilities index: whether school has library, computers, sports equipment, meeting hall, surrounding wall or fence, fans, and electricity
Number of Toilets	Number of toilets available in the school
Wall Boundary/Fence (%)	Dichotomous variable indicating whether schools have a fence/wall boundary.
No. of permanent class rooms	Number of permanent class rooms in the school.
No. of semi-permanent class rooms	Number of semi-permanent class rooms in the school.
Teacher Quality	
Absentism	Number of days teachers in that school are absent
Test Scores	Teacher test scores in Math (similar test given to the student)

Table 1 (cont.) - Variable Description

Variables	Description
Individual/household characteristics	
Girl	Dichotomous variable indicating whether a student is a girl.
Age of the child	Reports the child's age in years.
School Attendance	Dichotomous variable indicating whether a children is attending school.
Distance to school (Kms)	Reports the distance in Kms from the house to any school available in the village.
Parents Education	
Father Education	Reports the students's father years of education.
Mother Education	Reports the students's mother years of education.
Highest Parent Education	Reports the highest level of students's parents years of education.
Proxy of Income	
Total Expenditure	Total monthly expenditure
Household size	Number of people living in the household
Expenditure per "capita"	Total monthly expenditure divided by household size

Table 2 - Summary Statistics

School Characteristics

Variables	Obs	Mean	St. Dev	Min	Max
School Type					
Private	307	37.3			
Government School	496	60.3			
NGO/Trust	16	1.9			
Islami Madrassa	4	0.5			
School Fees	821	435.2	723.3	0	6000
Average Test Score					
English	804	0.31	0.14	0.040	0.790
Math	804	0.39	0.13	0.114	0.823
Urdu	804	0.30	0.14	0.053	0.819
Infrastucture Facilities					
Basic Facilities Index	812	0.04	1.44	-1.864	9.680
Extra Facilities Index	814	-0.18	1.56	-2.570	3.779
Number of Toilets (combined)	822	0.4	0.8	0	6
Number of Toilets (boys)	822	0.6	1.0	0	9
Number of Toilets (girls)	820	0.5	0.9	0	6
Wall Boundary/Fence (%)	823	78.9			
No. of permanent class rooms	819	4.0	3.5	0	20
Teacher Quality					
Absentism	816	2.0	3.3	0	30
Test Scores					
English	812	0.83	0.13	0.14	0.96
Math	812	0.86	0.11	0.11	0.99
Urdu	812	0.91	0.09	0.06	0.99

Table 3 - Summary Statistics

Individual and Household Characteristics

Variables	Obs	Mean	St. Dev	Min	Max
Girls (%)	5834	47.8			
Age of the child	5834	9.9	3.0	4	16
School Attendance	5667				
Currently Attending	4296	75.8			
Used to, but no longer	475	8.4			
Never Attended	896	15.8			
Distance to current school (Kms)	3703	0.611	0.799	0	7.3
Girls	1687	0.510	0.633	0	5.9
Boys	2017	0.695	0.907	0	7.3
Distance to all schools (Kms)	13224	1.272	1.376	0	12.9
Parents Education					
Father Education	5097	4.3	4.2	0	16
Mother Education	5570	1.4	2.8	0	12
Highest Parent Education	5718	4.0	4.1	0	16
Proxy of Income					
Expenditure per "capita"	1807	931	1219	41	23574
Household size	1807	7.9	3.0	2	40
Total Expenditure	1807	6947	9297	164	206323

Table 4 - Summary Statistics

School and Individual and Household Characteristics

Variables	Average Test Scores			School Fees	Distance	Infrastucture Facilities		Absentism	Teacher Test Scores			Private
	English	Math	Urdu		(Km)	Basic	Extra	(days)	English	Math	Urdu	(%)
Mother Education												
less than 5 years	0.29	0.38	0.29	281.6	0.609	-0.30	-0.04	2.2	0.85	0.87	0.91	25.3
more than 5 years	0.31	0.38	0.30	411.5	0.621	-0.26	0.20	2.1	0.83	0.86	0.90	40.4
Father Education												
less than 5 years	0.28	0.37	0.27	203.0	0.649	-0.30	-0.11	2.3	0.85	0.87	0.91	20.2
more than 5 years	0.31	0.38	0.30	396.8	0.571	-0.29	0.10	2.1	0.84	0.86	0.91	34.7
Expenditure per "capita"												
< percentile 25	0.30	0.37	0.28	192.3	0.937	-0.35	-0.16	2.3	0.83	0.87	0.91	15.3
between pc25 and pc50	0.29	0.37	0.28	273.5	0.604	-0.37	-0.10	2.3	0.85	0.86	0.91	25.2
between pc50 and pc75	0.28	0.38	0.28	308.7	0.538	-0.27	0.05	2.2	0.85	0.86	0.91	27.9
> percentile75	0.31	0.38	0.30	375.7	0.490	-0.21	0.12	2.0	0.85	0.87	0.91	35.9

Table 5 - Estimates of direct effects

School Characteristics	Panel A - Model I			
	OLS	IV	OLS	IV
	(1)	(2)	(3)	(4)
School fees / 100	0.006	-0.406	0.008	-0.412
	(0.024)	(0.21)**	(0.024)	(0.21)**
Basic Facilities Index	0.04	0.58	0.064	0.616
	(0.13)	(0.32)**	(0.131)	(0.31)**
Extra Facilities Index	-0.33	0.15	-0.30	0.18
	(0.12)***	(0.26)	(0.12)**	(0.25)
Average Stud. Test Score	0.36	-1.14	0.37	-0.34
	(1.17)	(7.43)	(1.17)	(7.54)
Absentism	0.02	-0.03	0.02	-0.03
	(0.03)	(0.05)	(0.03)	(0.05)
Teacher Test Scores	0.39	-0.73	0.54	-0.53
	(1.05)	(1.32)	(1.05)	(1.33)
Distance	-0.90	-0.90	-0.94	-0.94
	(0.15)***	(0.15)***	(0.17)***	(0.17)***
Constant	4.29	7.09	3.95	6.44
	(1.01)***	(3.09)**	(1.01)***	(3.15)***

School Characteristics	Panel B - Model II			
	OLS	IV	OLS	IV
	(1)	(2)	(3)	(4)
School fees / 100	0.001	-0.394	-0.006	-0.401
	(0.024)	(0.21)**	(0.024)	(0.21)**
Basic Facilities Index	0.062	0.586	0.069	0.583
	(0.131)	(0.31)**	(0.133)	(0.31)**
Extra Facilities Index	-0.31	0.15	-0.27	0.18
	(0.12)***	(0.26)	(0.12)**	(0.25)
Average Stud. Test Score	0.27	-1.07	0.38	0.18
	(1.17)	(7.39)	(1.17)	(7.45)
Absentism	0.01	-0.04	0.00	-0.05
	(0.03)	(0.05)	(0.03)	(0.05)
Teacher Test Scores	0.29	-0.78	0.38	-0.58
	(1.06)	(1.32)	(1.06)	(1.31)
Distance	-0.93	-0.93	-0.94	-0.94
	(0.06)***	(0.06)***	(0.06)***	(0.06)***
Constant	4.32	6.96	3.96	6.10
	(1.01)***	(3.07)**	(1.01)***	(3.11)**
Village controls	no	no	yes	yes
First Stage: F-stat				
School fees		15.92		14.17
Test Score		3.51		3.2

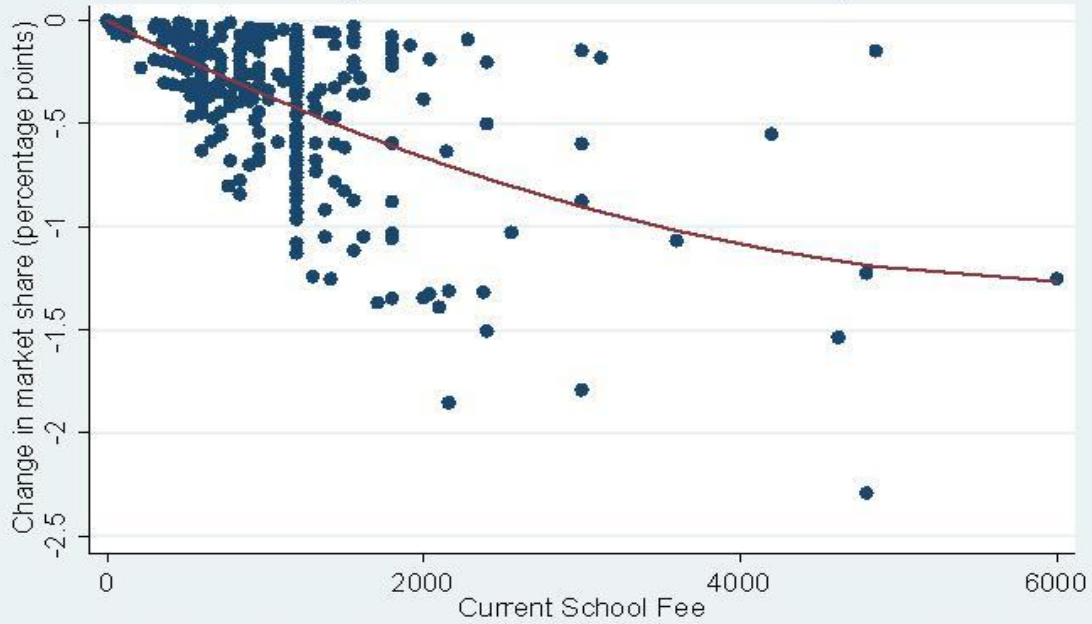
Table 6 - Estimates of Interaction Terms

School Characteristic	Individual/household characteristic	Panel A - Model I		Panel B - Model II	
School Fees / 100	Girl	-0.070	-0.063	-0.050	-0.064
		(0.015)***	(0.015)***	(0.008)***	(0.533)
	Age	-0.007	-0.009	-0.009	-0.008
		(0.002)***	(0.002)***	(0.014)	(0.040)
	Parents Education	0.009	0.010	0.010	0.010
		(0.001)***	(0.001)***	(0.000)***	(0.012)
	Expenditure /100	0.002	0.002	0.002	0.002
		(0.000)***	(0.001)***	(0.001)*	(0.008)
Basic Facilities Index	Girl	0.003	0.007	-0.009	0.006
		(0.033)	(0.049)	(1.261)	(0.151)
	Age	-0.017	-0.017	-0.017	-0.019
		(0.000)***	(0.010)**	(0.035)	(0.254)
	Parents Education	-0.022	-0.024	-0.022	-0.025
		(0.007)***	(0.007)***	(0.029)	(0.064)
	Expenditure /100	-0.003	-0.004	-0.003	-0.003
		(0.003)	(0.003)*	(0.003)	(0.014)
Extra Facilities Index	Girl	0.022	0.119	0.101	0.112
		(0.093)	(0.082)*	(0.420)	(1.471)
	Age	0.017	0.017	0.019	0.015
		(0.003)***	(0.011)*	(0.041)	(0.716)
	Parents Education	0.010	0.011	0.010	0.007
		(0.007)*	(0.005)**	(0.018)	(0.028)
	Expenditure /100	-0.002	-0.003	-0.002	-0.002
		(0.002)	(0.002)*	(0.005)	(0.010)
Average Test Score (Stud.)	Girl	0.564	0.599	0.476	0.606
		(0.573)	(0.270)**	(1.384)	(17.048)
	Age	-0.029	-0.040	-0.033	-0.041
		(0.046)	(0.008)***	(0.428)	(2.390)
	Parents Education	-0.034	-0.038	-0.038	-0.038
		(0.086)	(0.038)	(0.250)	(0.177)
	Expenditure /100	-0.006	-0.016	-0.009	-0.014
		(0.022)	(0.022)	(0.145)	(0.145)
Absentism	Girl	0.007	0.017	0.016	0.022
		(0.030)	(0.029)	(0.071)	(2.420)
	Age	0.001	-0.001	0.000	0.000
		(0.005)	(0.003)	(0.019)	(0.015)
	Parents Education	0.003	0.002	0.003	0.003
		(0.002)*	(0.002)	(0.006)	(0.077)
	Expenditure /100	-0.001	-0.001	-0.001	-0.001
		(0.001)	(0.001)	(0.003)	(0.029)
Teacher Test Scores	Girl	0.245	0.241	0.260	0.245
		(0.419)	(0.419)	(3.242)	(3.242)
	Age	0.010	-0.006	0.019	0.007
		(0.026)	(0.026)	(0.041)	(0.041)
	Parents Education	0.029	0.030	0.027	0.004
		(0.051)	(0.010)***	(0.037)	(0.275)
	Expenditure /100	0.032	0.009	0.007	0.029
		(0.014)**	(0.017)	(0.111)	(0.209)
Distance	Girl	-0.449	-0.434	-0.441	-0.452
		(0.190)***	(0.105)***	(0.403)	(0.158)***
	Age	0.000	0.015	0.013	0.010
		(0.010)	(0.014)	(0.059)	(0.353)
	Parents Education	0.002	0.003	0.005	0.001
		(0.009)	(0.008)	(0.080)	(0.494)
	Expenditure /100	0.004	-0.004	-0.004	-0.002
		(0.004)	(0.005)	(0.004)	(0.041)
Village controls		no	yes	no	yes

Table 7 - Estimates of Interaction Terms
(unobservable household characteristics)

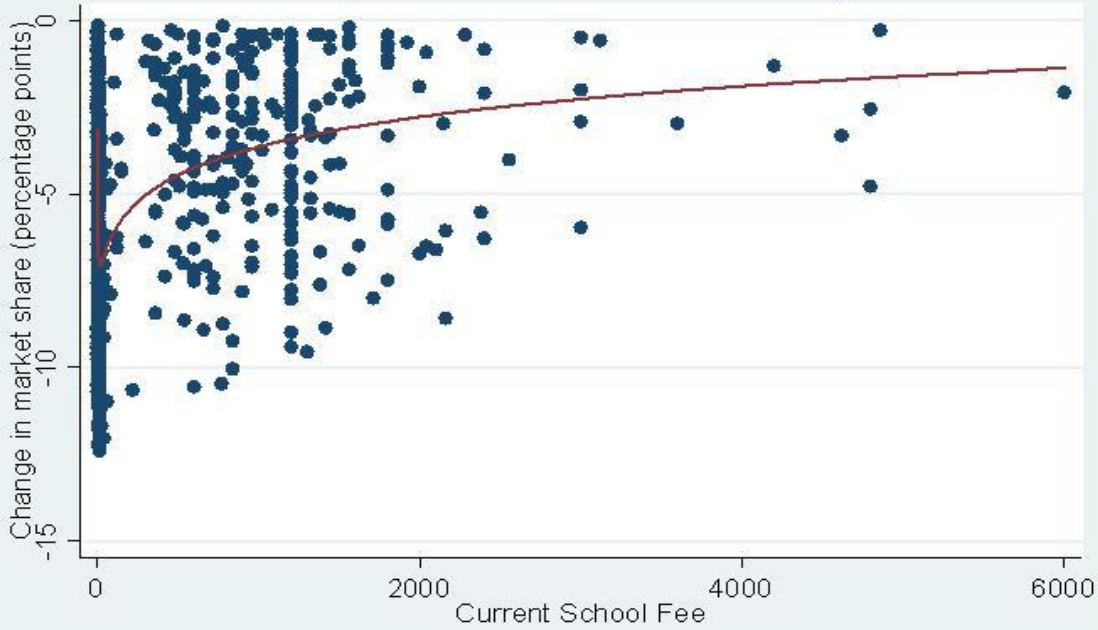
School Characteristic	Model II	
School fees / 100	0.000	-0.002
	(0.019)	(0.016)
Basic Facilities Index	0.001	0.003
	(0.480)	(1.240)
Extra Facilities Index	0.001	-0.008
	(0.682)	(1.053)
Average Stud. Test Score	-0.001	0.000
	(0.095)	(0.515)
Absentism	-0.001	0.011
	(0.248)	(1.699)
Teacher Test Scores	0.000	0.001
	(1.257)	(3.281)
Distance	0.001	-0.002
	(0.172)	(1.209)
Village controls	no	yes

Figure 1 - School Fee Elasticity



Note: Change in school market share (percentage points) when school fee increases by 1%

Figure 2 - School Fee Elasticity



Note: Change in school market share in percentage points with an increase in school fee by 100 rupees