School Quality, School Cost, and the Public/Private School Choices of Low-Income Households in Pakistan

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Abstract

Variation in school attributes, proximity, and fees across neighborhoods is used to identify factors which affect whether poor households send their children to government school, private school, or no school. Analysis shows that even the poorest households use private schools extensively, and that utilization increases with income. Lowering private school fees or distance or raising measured quality raises private school enrollments, partly by transfers from government schools and partly from enrollments of children who otherwise would not have gone to school. The strong demand for private schools is consistent with evidence of greater mathematics and language achievement in private schools than in government schools. These results strongly support an increased role for private delivery of schooling services to poor households in developing countries.

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I. INTRODUCTION

Illiteracy remains a major impediment to economic development in many countries. Expanding access to primary schooling is a widely accepted priority in the fight against poverty. Nevertheless, developing countries face a daunting task in their efforts to expand the delivery of educational services due to rapidly expanding populations and tight government budgets. Moreover, public educational expenditures are often used inefficiently, providing school buildings where they are unneeded, paying teachers that are unqualified or who do not perform, and providing school supplies that are inadequate and ill-timed.

Increasingly, parents are responding to perceived inadequate public education by enrolling their children in private schools. As Kingdon (1996a) illustrates, the extent of this phenomenon in developing countries may be under-appreciated. Governments occasionally prohibit, often regulate, and frequently ignore private schooling. Thus, data on the extent and distribution of such schooling is seldom collected by statistical agencies. Yet, as Hammer (1997) argues in the case of health investments, the impact of public investments can only be fully assessed in light of an understanding of private alternatives.

A principal reason for the reluctance of governments to recognize private education as contributing to its overall educational policy is a concern for equity; equality of access to schooling may reduce earnings inequality without the necessity of controversial asset or income transfers. It is not clear that poor households are able to pay enough to support the alternative of high-quality private schools. Conversely, private schools that can deliver services at fees sufficiently low to attract poor families may not deliver services of adequate quality. Some contend that private schools which cater to the poor are exploiting low income, often illiterate, parents who are not capable of assessing if their children are learning or not.

The consensus from studies of the relative effectiveness of public versus private schools in developing countries is that the predicted performance of children in private schools is higher than predicted performance in government schools (Cox and Jimenez (1991), Jimenez, Lockheed and Paqueo (1991), Kingdon (1996b)). However, before one can advocate policies to expand private delivery of education one needs to know how fees, quality or distance affect education or learning of the children not currently in school. Unfortunately, most existing studies of public-private choice do not include the option of not attending school and thus do not shed light on this key group of children.

Conversely, studies that examine how fees, distance or school quality affect the likelihood of the no school option do not address public versus private delivery. Moreover, most do not have a direct measure of costs.[1] For example, Gertler and Glewwe (1990) ask how distance to local schools as well as the quality of local teachers influence the choice of going to no school, local secondary school, or boarding school. However, in the absence of direct information on fees, this rests on the assumption that parents treat the travel time of their children exactly how they treat out-of-pocket fees.

To understand how fees charged by private schools affect the choice of such schools as well as of government schools and of enrollment in general, the current study explores the potential impact on enrollments and achievement of expanding delivery of private school services to low-income neighborhoods in Lahore, Pakistan. 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 secular (often English medium) private schools has accelerated in recent years; between 1991 and 1996 the percentage of children enrolled in private schools in the urban Punjab (where Lahore is located) increased by 8 percentage points. It increased by 18 percentage points in the Sind province (World Bank, 1997). These changes are based on household

survey data. The provincial governments, however, do not record private schools or enrolments in their databases.

Yet, the analysis requires that we have measures of schooling opportunities available to households. To accomplish this, we design a unique area frame strategy that yields information on 1,650 households in 50 different sampling clusters. The choices of government and private schools made by households in each cluster are used to define the universe of available schooling choices of households in each neighborhood. This provides sufficient variation in school distances, prices, and quality indicators across neighborhoods to identify impacts on household decisions. First, we examine whether private schools charge fees low enough, or locate schools close enough, to induce low-income students to attend. Finding that even very poor households send their children to private schools, we estimate how household income as well as the fees, proximity, and measured quality attributes of public and private schools in the neighborhood influence the choice among school options. Finally, we examine how home and school attributes affect child achievement.

Our results show that schooling choices of poor households are sensitive to government and private school fees, distance to school, and school quality. In particular, lowering private school fees or distance will increase private school enrollments of poor children. The increased enrollments are partly from transfers from government school, but also come from increased enrollments of children who would not have gone to school otherwise. Furthermore, private schools raise measured math and language achievement relative to government schools, holding observed and unobserved child and home attributes fixed. These outcomes suggest a substantial public return from increasing private sector delivery of schooling services to poor families.

II. MODEL AND EMPIRICAL SPECIFICATION

Parents are assumed to derive utility from their own consumption of goods (C) and from the human capital of their children (H). The utility function has the form $U = U(C, H[A])$, where the child's human capital is assumed to depend upon the attributes of the school which the child attends (A). Sending children to school requires that the household sacrifice current consumption by investing in fees and schooling supplies.

We consider three choices parents face: to keep a child out of school, to send the child to private school, or to send the child to a government school. These choices involve different schooling costs, and consequently, different levels of commodity consumption. Let Y be household income available for all purposes. If the household sends a child to government school, it pays P_G in fees, supplies, and lost child labor, so household consumption is $C_G = Y - P_G$. A year in a government school generates human capital equal to H_G. If instead, the household sends the child to a private school, household consumption is $C_P = Y - P_P$ and learning in private school is equal to H_P. Finally, if the household opts not to send the child to school, consumption is $C_0 = Y$ and learning is H_0. In this case, the child's human capital is produced only with household inputs. The household selects the option with the highest expected utility, so that

(1) $$U^* = \max (U_0, U_G, U_P)$$

where U* is maximum expected utility across the three possible choices.

To operationalize the model, we need two further steps. First, we specify how consumption enters the utility across alternatives. Following Gertler and Glewwe (1990), we use a specification which satisfies the requirements that income enters the utility function non-linearly. This is necessary to allow income to affect comparisons between choices. This

specification also assures that at equal levels of consumption, marginal utility of consumption is equal across alternatives. Thus, we specify:

$$\textbf{(2)} \qquad \begin{aligned} U_{ij} &= \alpha_0 H_{ij} + \alpha_1 C_{ij} + \alpha_2 C_{ij}^2 + \varepsilon_{ij} \\ C_{ij} &= Y_i - P_j ; \; j = O, G, P \end{aligned}$$

where i^{th} household income Y_i, net of the cost of the j^{th} schooling alternative, is assumed to equal household consumption of goods. For the no-school option, $P_j = 0$ and $C_{i0} = Y_i$.

Second, we assume a general form for the human capital production function embedded in the model:

$$\textbf{(3)} \qquad \alpha_0 H_{ij} = \gamma_j S_j + \beta_j F_i + \delta_j ; \quad j = 0, G, P$$

where S_j is a vector of j^{th} school attributes available to the household and F_i is a vector of family attributes which contribute to learning in school.[2] These are discussed further in section V. For the no-school choice, the vector of school attributes is a null vector. By allowing the coefficients to vary by alternative, we allow schooling inputs to have different productivities in different school types. This is of particular importance in assessing parental choices between government and private school. Government schools have much higher per-pupil expenditures, but these expenditures may not translate into higher human capital production in government schools if these resources are used inefficiently.

The schooling choices are analyzed within the framework of a weighted nested multinomial logit specification. The schooling decision is broken down into two parts. In the first, parents decide whether to send the child to school.[3] Conditional on choosing the schooling option, parents decide between public or private school. The error terms in the school versus no-school choice are

independent, but the error terms in the government and private school alternatives are allowed to be correlated.

The probability of choosing the no-schooling option is

$$\textbf{(4)}\quad \Pr(U^* = U_0) = \frac{\exp(U_0 - \varepsilon_0)}{\exp(U_0 - \varepsilon_0) + \{\exp[(U_G - \varepsilon_G)/\sigma] + \exp[(U_P - \varepsilon_P)/\sigma]\}^{\sigma}}.$$

The probabilities of choosing one of the schooling alternatives are

$$\textbf{(5)}\quad \Pr(U^* = U_j) = [1 - \Pr(U^* = U_0)] \frac{\exp[(U_j - \varepsilon_j)/\sigma]}{\{\exp[U_G - \varepsilon_G)/\sigma] + \exp[(U_P - \varepsilon_P)/\sigma]\}^{\sigma}}$$

where σ is equal to one minus the correlation between ε_G and ε_P. The reasonable assumption that public and government school options are closer substitutes than are either school alternative and the no-school option can be tested. This assumption requires that $0 < \sigma < 1$. A finding that $\sigma \geq 1$ would reject the nested specification we have imposed.

Estimation involves inserting (2) and (3) into (4) and (5) and then specifying the empirical counterparts to the vectors P_j, S_j and F_i. The measures of P_j, the price of attending a school of type j, include the school fees and other materials expenditures (books, uniforms, supplies, transportation and tutorial services) required to attend a type j school. In addition, the time a child spends in school has an opportunity cost to the household in the form of lost potential household production or market work.

These opportunity costs in terms of lost home or market production are likely to differ between boys and girls. In particular, it is widely believed that girls are more likely than boys to help their mothers in housework and child care and may therefore have a higher opportunity cost for

schooling. On the other hand, there may be more market opportunities for boys, especially since boys are more likely to be allowed to venture alone outside the home. Income net of schooling costs is assumed to be $(Y - P_j)$ for boys and $(Y - P_j - \mu_F)$ for girls, where μ_F is the difference in opportunity cost of schooling between boys and girls. A different opportunity cost for girls implies that constant terms and the coefficients on consumption differ between boys and girls.[4] Gender disparities in education may also be due to differences in expected earnings or propensity to remit from these earnings as well as differences in parental empathy. The inclusion of a gender specific intercept will also address these possibilities even if it will not distinguish among them.

The vector of school attributes includes distance to school, instructional expenditures per pupil, and pupil-teacher ratios. School distance may affect learning in school to the extent that travel to and from school is not productive.[5] More important is the disutility associated with having a child farther from home. This disutility may be particularly important in the case of girls because of cultural prohibitions against girls being out in public and/or outside the protection of male household members.

Per-pupil instructional expenditures are a measure of teacher resources available to students. Instructional expenditures are primarily teacher salaries. Because salaries rise with teacher education and experience, the measure should reflect teacher quality. Higher expenditures per-pupil can indicate both higher salaries per teacher and lower numbers of pupils per teacher. Because of the interest in distinguishing teacher quality from school crowding effects, we also control for the number of pupils per teacher, so the coefficient on per-pupil instructional expenditures can be interpreted as a teacher quality effect, holding class size constant. The impacts of instructional expenditures and pupil-teacher ratios are allowed to vary across government and private schools, reflecting likely differences in marginal productivities of inputs across school types.

If family attributes, F_i, have similar effects on child human capital production across the schooling alternatives, then they would affect utility equally in all alternatives. Thus, they would

not affect schooling choice. In this case they could be excluded from the empirical model. However, parental education is likely to be complementary with schooling in human capital production. As a consequence, the level of parental education can influence school inputs choices for their children.

The school choice decision assumes that parents know the human capital production process described by (3). Assuming child human capital raises parent utility ($\alpha_0 > 0$ in (3)), this implies an agreement in sign between the parameters of the human capital production process and the corresponding effects of F_i and S_j on school choice. This required correspondence can be confirmed by direct estimation of (3), as is reported below.

III. DATA SAMPLING AND VARIABLE DEFINITION

To capture the effects of school quality and cost on school choices of low-income households, we require measured variation in schooling opportunities available to a representative sample of low-income households. Available data sets fell short of these requirements in two ways. First, a representative sample of low-income households requires knowledge of the universe of households. Because political in-fighting has prevented a completed census of population in Pakistan since 1981, knowledge of the universe is incomplete at best. Rapid natural population growth and urbanization have greatly altered the distribution and location of low-income households since then. While nationally representative surveys have been conducted in Pakistan, more recently these do not have sufficient detail on available school choices to identify the parameters in equations (2-3).

An alternative might be to base a sample on the universe of schools. Unfortunately, existing listings of schools are believed to be incomplete. Particularly under-represented are unregistered private schools which may serve poorer households. Registration means that a school's grades will be accepted by other schools, but it also means that the school is subject to taxation and other

regulation. Because students in unregistered schools can quality for higher-level education through an examination, lack of registration may not serve as an impediment to students.

To finesse the joint problems of incomplete knowledge of the universe of poor households and the universe of schools catering to poor households, we utilized an area frame sampling methodology. Low and middle income areas of Lahore, the second largest city in Pakistan, were identified on a map. Low-income areas were initially identified on the basis of housing quality. Fifty points on the map were randomly selected in these poor areas, and initial screening verified that households were of low or middle incomes.

In each of the fifty locations, a 250 meter square "neighborhood" was defined. To identify the schools that service each area, information on school choice was elicited from twenty households with at least one child aged 6-10 in school. All schools chosen by the twenty randomly selected households were taken to be the set of schooling choices available to that neighborhood.

The 1,000 households in the initial survey identified 273 different schools. These schools were then surveyed to obtain detailed information on fees, facilities, teachers, and costs. As argued by Deaton (1988) in another context, quality must be considered endogenous. Thus, the fees and characteristics of the specific school that the child attends are chosen jointly with the type of school. Consequently, we require measures of school fee, cost, distance, and school input options available to parents in the neighborhood which do not reflect the specific school selected. Our solution was to characterize expected values of P_j and S_j within a neighborhood, using information on the schools used by households in the neighborhood.

The use of a weighted average is preferable to using a simple average or—as is common in similar studies using rural data—using the price of the nearest school. Weighted averages of private and government school fees and school quality measures were generated for each neighborhood using each school's share of the neighborhood enrolled children as weights. The expected neighborhood private school price is

$$P_j = \sum_{i=1}^{N} a_{ij} P_i$$

where P_j is the private school price in neighborhood j, a_{ij} is the proportion of children in neighborhood j in school i, P_i is tuition and fees in school i, and N is the total number of private schools across the 50 neighborhoods. If no one in neighborhood j attends school z, then $a_{zj} = 0$. In most neighborhoods, a_{ij} is greater than zero for only 3-4 schools. Similar methods were used to compute quality measures in private school and for price and quality in government school. It is possible that the cluster sample excludes some of the schools used by households in the neighborhood. However, the excluded schools would invariably have a low weight were the complete universe of schools rather than a sample available.[6, 7]

By design, the initial 1,000 households surveyed had children in school. However, we also want to model how available school choices affect decisions to withhold children from school. For this reason, a second survey was conducted in 26 of the 50 neighborhoods. In each of these neighborhoods, twenty-five additional households with children aged 6-10 were surveyed, irrespective of whether or not the children were in school. This second survey was used to generate estimates of the proportion of children not enrolled in school. This second sample was also used to establish sample weights. Because the combined samples overrepresent children in school, our sample weights allow us to translate the choice-based sample into population equivalents. In this way, our area frame allows us to generate enrollment rates that are representative of the 50 low-income neighborhoods as a whole.

It is possible that the correspondence of residency and schooling options is endogenous. That is, individuals may have moved to certain neighborhoods to be closer to desirable schools. While we cannot directly test this hypothesis, data from the 1991 Pakistan Integrated Household Survey (PIHS) provides some evidence that schooling and residency are not jointly determined. Only 12% of the poorest quintile of urban Punjab households reported having moved in the

previous 5 years for any purpose. Of all households in any income bracket that had moved between 1986 and 1991, only 1.3% claimed that the main reason for moving was due to schooling including for secondary and higher education. In addition, the school choice set can be quite fluid with entry and exit of both registered and unregistered schools, making it more difficult to project schooling opportunities in a given poor neighborhood when making a housing choice.

While it is clear that selective migration may often affect program evaluation (Rosenzweig and Wolpin, 1988) this is not automatically the case. Recent studies have indicated that sample attrition may not affect coefficients in OLS or probit equations even when attrition rates differ significantly by family background and are appreciably larger than the percentage of Punjabi households which migrate in a five year period (Fitzgerald, Gottschalk, and Moffitt, 1998; Alderman et al. 2000). We are not aware, however, of any studies which provide an estimate of the bias in schooling demand parameters or in the choice between types of schools if migration is not considered. Such a study would be a fruitful area for research and –unlike the issue of out migration in the literature on sample attrition – may not require panel data. Nevertheless, the data set used in this study does not contain migration histories and thus does not allow for the type of tests in the attrition literature.

The weighted choice-based sample generates the distributions of schooling decisions reported in Table 1. Given the deliberate concentration on low income neighborhoods, the sample strategy identified a large number of low income households. Fifty-five percent of the sampled children are in households earning less than 3,500 rupees ($100) per month, corresponding to below $1 per person per day. Despite the low incomes, a surprisingly large proportion of children is in school. Only 11 percent of the boys and 8 percent of the girls aged 6-10 were not enrolled. However, the probability of withholding a child from school drops rapidly as income rises. The lowest income households withheld 25 percent of their boys and 21

percent of their girls from school. In contrast, almost all children in households earning above Rs 3500 are in school.

Not only is enrollment high, a high share of children is enrolled in private schools, even children from the poorest families. Only in the poorest category in table 1 is the share of children in government schools greater than in private schools, and then only barely so. As household income increases, the share of children in private school increases dramatically. Similar findings of extensive use of private schools by poor families in Karachi (Kardar 1995).

The high proportion of children in private schools is even more surprising, given the share of household income that must be sacrificed. Even though the amount spent per child rises with income, the share of income spent declines. In addition, for the lowest income households, the difference in expenses between private and government schools is not large. While the fees for private schools exceed that for public (indeed, most public schools are free) government schools charge for uniforms, books and supplies. Operating costs of private schools are relatively low, despite relatively higher teacher pupil ratios, due to lower salary structures. Overall, many private schools can compete with government schools on total schooling costs. The survey verified these costs by interviewing staff and managers.

The sample means of the regressors used to explain the enrollment choices are included in Table 2. Comparisons across choices reveal several important points. Household income and parental education are lowest for children who are not in school and highest for children in private school. In these poor neighborhoods, average distance to schools suggests that private schools are as conveniently located as are government schools. Despite paying much lower salaries to their teachers, private schools have instructional salaries per-pupil that are 55 percent higher than in government schools. Part of the reason is the 69 percent larger class-size in government school, and part is due to greater expenditures per pupil on educational materials in the private schools.

IV. ESTIMATES OF SCHOOL CHOICE

A. Logit Regressions.

The results of the nested logit maximum likelihood estimation are reported in Table 3. Parameters that are held constant across all three choices are presented in the first stage with signs indicating the relative utility from selecting the no schooling option versus the schooling option. Results which allow differential utility across the private and government school alternatives are presented in the second stage. The estimate of σ is between 0 and 1, supporting the use of the nested specification which assumes that private and government schools are closer substitutes for each other than for the no school option.[8]

The first-stage outcomes imply that utility of consumption rises at a decreasing rate. The quadratic shape implies that the relative marginal utility of the no schooling option decreases as income increases.

Interestingly, girls are no less likely than boys to be withheld from school, other things equal, and the results in Table 1 indicate only modest differences in enrollment probabilities between poor boys and girls. In their study of rural Pakistan Alderman et al. (1996) found that the primary explanation for gender differences for enrollment was differences in access to suitable schools. However, this is not as much a concern in urban areas.

Parents' education significantly reduces the relative utility of the no-schooling option. This is consistent with a presumption that school inputs and parental education are complementary inputs in educational production. Our reported estimates restrict the effect of parents' education on schooling choice to be the same across the government and private school options. A model which allowed separate effects of parents' schooling on government versus private school choices yielded coefficients of identical signs and similar magnitudes across the two schooling options, suggesting that parental education has similar productivity effects across public and private schools. Glick and Sahn (2000) also found that coefficients for parents'

education were of like signs and magnitudes across public and private school choices in Madagascar. Gertler and Glewwe (1990) report similar coefficients for parents' education across "near" and "faraway" school choices in Peru.

School attributes affect school choices in a manner consistent with their presumed impacts on parental utility and human capital production. Increasing distance to a school type lowers the relative utility of choosing that option. The effect is more significant for government schools than for private schools. After controlling for the effect of fees on total consumption, instructional expenditures per pupil raise the relative utility of both private and government schools, indicating that parents attach some value to the quality of instructional resources available in a school.

The second column of table 3 indicates that the number of schools in the neighborhood provides no additional information about school choice. The variable is not statistically significant nor does its addition change any of the other coefficients. Indeed, the number of schools in the neighborhood does not appear to correlate with any other household characteristics. For example, the average number of schools available to households with incomes greater than or equal to 12,500 rupees was 2.78 schools, while the average for households with incomes less than or equal to 1,500 rupees was 2.76 schools.

The results suggest that higher pupil-teacher ratios lower utility in the government schools, but raise utility in private schools. This difference in parental response across school types may be related to the much higher average pupil-teacher ratios in government than in private schools. With an average class size of 42.5, government schools are very crowded. Adding additional students would clearly tax the ability of a teacher to teach. On the other hand, the average class size of 25 in private schools is within the manageable range for effective teaching. Unusually small private school class sizes may signal low quality to parents. In other words, parents may view a private school with low class sizes as having failed to validate the

school's quality in the eyes of other parents in the neighborhood.

Table 3 also presents separate estimates for boys and girls. The test of equality of the school choice coefficients across boys and girls strongly rejects the null hypothesis of equality. The main differences are that girls are more sensitive to distance while boys are more sensitive to parental education. The only sign differences are that pupil-teacher ratios lower utility of sending girls to a government school and longer distance lowers utility of sending girls to private school. The corresponding coefficients in the boys' schooling choice equation are positive but numerically small and statistically insignificant.

B. Elasticities and Willingness to Pay for Quality Improvement

The results in Table 3 are difficult to interpret directly because the coefficients refer to relative differences between choices rather than probabilities. In addition, the nonlinearities in income and fees make it difficult to establish how enrollment is affected by variation in price and income. For these reasons, we computed elasticities showing how the probability of choosing each of the three choices responds to changes in income, fees, distance, and school quality indicators. These elasticities are reported in Table 4. All elasticities are computed for each individual and then averaged.

The income elasticities show that as income increases, demand for private school rises more than proportionally. On the other hand, government schools are inferior goods, with an elasticity of almost identical magnitude. The no- school option is also clearly an inferior good, with the probability of withholding children declining 9.5 percent with every 10 percent increase in income. These elasticities imply that as household income increases, schooling choices move very rapidly away from government school and no school options and toward private school.

The responses to costs and fees are price inelastic for both private and government schools. The cross-price effects between government and private schools are both positive, so the two school types are viewed as substitutes. However, the cross price elasticities are quite small; government

and private schools are not particularly close substitutes. Increases in private and government school fees also cause an increase in the no school option.

School distance affects schooling choice in much the same way as school fees. Private school choice is less sensitive than government school choice to distance. The cross-effects indicate that increased distance to one school type increases enrollment in the other school type and also increases use of the no school option.

Increasing per-pupil instructional expenditures in one school type increases use of that school type as well as reduces use of the alternatives. The effect is stronger for private schools, presumably because variation in instructional expenditures is more directly related to perceived output in private than in government schools.

The parameters in Table 3 may also be used to generate measures of parental willingness to pay for school improvements or closer proximity to schools. The calculations involve estimating rupee equivalent measures for the change in utility associated with a change in school attributes.[9] The willingness-to-pay estimates for households with monthly incomes of 1500 and 3000 rupees are reported in Table 5.

The poorer households are willing to pay 7 rupees per month for a reduction of .5 kilometers in the distance to a private school from a mean of 1.2. They would pay 10 rupees for a similar reduction in distance to a government school. If we use 40 students as a standard class-size, this suggests that poor parents would pay 280-400 rupees for closer proximity to a classroom. This would hardly pay the salary of a teacher, so the cost of further increasing proximity to schools in these poor urban communities cannot be borne by the community. Although willingness to pay increases with income, it does not increase by enough to suggest that poor households could provide enough revenue to induce additional school entry into their neighborhoods.

The poorest households are willing to pay about one-tenth of the cost of increased private school instructional expenditures per pupil. Households earning 3000 rupees per month would be

willing to pay 20 percent of the cost. Households would only be willing to pay 1.8 to 3.5 percent of the cost of increased per pupil instructional expenditures in the government schools.

As discussed above, parents would not pay to decrease class sizes in private schools. However, they would pay a modest amount to decrease class sizes in government schools. If we set up a hypothetical school with 300 students and 6 teachers, reducing average class size by five (from 50 to 45) would be equivalent to adding .67 teachers to the school. Parents earning 1500 rupees would pay an aggregate of 549 rupees (300 x 1.83) to attain that reduction. Parents earning 3000 rupees monthly would pay 1053 rupees (300 x 3.51), about half the cost of a full time instructor.[10]

C. Simulations

Because of the nonlinearity in income and fees, elasticities vary as income varies. We use simulations to illustrate how these responses change with income. In Figure 1, we show how estimated probabilities of selecting the three alternatives change as income changes, holding all other variables at their sample means. The patterns are also shown separately for boys and girls. As income rises, the probability of the no-school option drops rapidly. All three simulations show that the probability of being out of school rises toward 90 percent as household income approaches zero. However, even when we extrapolate income toward zero, the probability of attending private school exceeds the probability of attending government school. At household incomes above 4000 rupees per month, the probability of the no-school option is virtually zero for boys and girls, and the private school probability is 70 percent for boys and 60 percent for girls. In fact, the simulations show that over half of boys and girls would be in private school with household incomes as low as 2000 rupees. Clearly, private schools are the dominant choice for even very poor households.

Figure 2 repeats the simulation in response to private and government school fees. The simulations fix income first at 1500 and then at 3000 rupees. At lower incomes, the simulations show that if private schools were free (equivalent to the issuance of a voucher for the cost of private school), over 50 percent of children would attend private school. As private school fees rise, the

probability of attending private school falls. Not all children switch to government schools -- some opt for the no school option as private school fees rise. Households with incomes of 3000 rupees are less sensitive to the level of private school fees than are poorer households. For households with incomes of 3000 rupees, the drop in probability of private enrollment is smaller as the level of fees rises, and the increase in the no school option is smaller.

Similar impacts occur as government school fees increase. For the lower income households, fee increases for government schools raise the probability of both the no-school option and the private school option. At higher incomes, the drop in government school enrollment is almost entirely absorbed by increases in private school enrollments.

Figure 3 shows how enrollment probabilities change as proximity to private and government schools change. Because average distance was just over one kilometer, the smaller distances can be viewed as the impact of increased proximity to schools on school choice. For the lower income group, increased proximity to a private school causes a small increase in private enrollment and an even smaller decrease in probability of the no-school option. As income rises, the no-school option becomes insensitive to proximity to private schools, but private school enrollments rise due to switching from government schools. Schooling choices respond similarly to changes in proximity to government schools. The no-schooling option falls more in response to proximity to government school than to proximity to private school. As income rises, the sensitivity of the no-schooling option to distance decreases.

Enrollment choices also respond to school quality. As instructional expenditures in private schools rise holding fees constant, the no schooling option decreases. The effect is largest for the poorer households. At the same time, increases in private school instructional expenditures cause a shift toward private school. The effect is partly a move from the no school to the private school option, but it is primarily a shift from government schools. Increases in instructional expenditures in government school have only a minor impact on schooling choices.

V. DISCUSSION

The estimated school choice equation shows that parents respond to school quality. It is reasonable to assume that the response to quality measures is due to presumptions of improved educational outcomes. This has been verified using a study of subset of the children who were in the third grade was given a test of Urdu language and mathematics (Alderman, Orazem, Paterno, 1996).[11] In general, it has proven difficult to measure the impact of school inputs on performance in either developed (Hanushek 1996) or developing countries (Hanushek, 1993; Kremer, 1993). While there are many reasons for this, one is the potential importance of intangibles embodied in the management of the school. Another is the importance of inputs provided at home. Thus, in estimating the impact of school attributes on achievement, we control for parental inputs and private school status. Finally, there is a need to control for nonrandom assignment into private schools. This was done using the estimated predicted probability of private school enrollment.

School quality was found to have mixed effects on student achievement. However, in keeping with the estimates of school choice reported in this paper, high pupil-teacher ratios were found to have a uniform negative effect on student achievement, with the effect being particularly pronounced on language skills. This is also consistent with the large negative effect of pupil-teacher ratios on probability of selecting government schools. Finally, private schools were found to have better outcomes than government schools. This observation is consistent with the apparent revealed preference for private schools over government schools, even by low income households facing higher costs for private schooling.

To conclude, this study demonstrates that schooling choices of poor households are very sensitive to school fees, proximity, and quality. Rather than being exploited by private schools, evidence suggests that strong demand for private schools is in response to better quality and learning opportunities offered by private schools. The lower cost of operation and higher achievement tests for private schools suggest that public subsidy of private schools are a viable

option for increased delivery of schooling services to poor households. This possibility of achieving a cost effective increase in primary enrolment by means of assistance to private schools has recently been verified with an experiment in another city in Pakistan (Kim, Alderman, and Orazem, 2000). Thus, while not a panacea for poor school performance nor a guarantee of access for low income households, the importance of private schools for low income households should be acknowledged as a facet of overall educational policy.

Table 1A: Proportion of Children Enrolled in Lahore, by Income, Gender, and School Type

Income Group (rupees)	No School			Private School			Government School			Share of All Households in Group
	Boys	Girls	All	Boys	Girls	All	Boys	Girls	All	
< 2000	.25	.21	.23	.35	.37	.37	.40	.41	.40	.143
2000 to 3500	.05	.04	.04	.59	.52	.56	.36	.45	.40	.407
3500 to 5000	.01	.01	.01	.78	.66	.72	.21	.33	.26	.215
5000 to 7000	.00	.00	.00	.84	.65	.73	.17	.35	.27	.110
7000 to 10000	.00	.00	.00	.88	.72	.79	.13	.28	.21	.080
> 10000	.00	.00	.00	.88	.81	.84	.12	.19	.16	.045
All	.11	.08	.10	.61	.55	.58	.28	.37	.32	1.000

Table 1B: Average Monthly Rupee Expenditure and Percent of Income (in parentheses) Spent on a Child's Education, by Income Group, Gender, and School Type

Income Group (rupees)	Average Monthly Expenditure (Percent of income)							
	Boys		Girls		Private		Government	
< 2000	162.4	(10.8)	156.4	(10.4)	178.7	(11.9)	142.0	(9.5)
2000 to 3500	215.8	(7.8)	199.1	(7.2)	227.2	(8.3)	181.3	(6.6)
3500 to 5000	304.1	(7.2)	262.4	(6.2)	317.5	(7.5)	198.8	(4.7)
5000 to 7000	355.6	(5.9)	344.9	(5.7)	395.1	(6.6)	225.8	(3.8)
7000 to 10000	584.2	(6.9)	434.5	(5.1)	544.8	(6.4)	346.6	(4.1)
> 10000	735.1	(5.9)	625.1	(5.0)	740.2	(5.9)	377.3	(3.0)
All	291.5	(7.8)	263.9	(7.0)	326.3	(7.9)	191.2	(6.5)

Table 2: Descriptive Statistics

Variable	Mean	Standard Deviation
No school alternative (N=107)		
Income (rupees)	1834.1	620.1
Female child	0.4	0.5
Father's education (years)	3.2	3.9
Mother's education (years)	1.6	3.0
Private school alternative (N=1078)		
Income (rupees)	4531.5	2784.3
School costs (rupees)	85.6	25.9
School fees (rupees)	79.1	53.2
School distance (kilometers)	1.1	0.3
Instructional expenditure (rupees per pupil)	306.0	157.4
Pupil-teacher ratio	25.2	6.7
Female child	0.4	0.5
Father's education (years)	8.0	5.0
Mother's education (years)	6.0	4.9
Public school alternative (N=583)		
Income (rupees)	3431.8	2065.3
School costs (rupees)	75.9	22.3
School fees (rupees)	16.0	13.5
School distance (kilometers)	1.2	0.4
Instructional expenditure (rupees per pupil)	197.8	330.1
Pupil-teacher ratio	42.5	13.5
Female child	0.5	0.5
Father's education (years)	6.6	5.1
Mother's education (years)	4.4	4.6

Table 3: Nested Multinomial Logit of Demand for Schooling Choice

	All Children		Girls	Boys
Stage 1: No School versus School Option				
Consumption (α_1)[a]	35.42	35.3	40.11	43.33
	(9.69)	(9.78)	(15.70)	(13.30)
Consumption squared (α_2)[b]	-24.59	-24.52	-27.46	-31.14
	(7.87)	(7.95)	(13.28)	(10.60)
Female child	-0.27	-0.26		
	(0.19)	(0.19)		
Father's education	-0.07	-0.07	-0.03	-0.09
	(0.03)	(0.03)	(0.04)	(0.03)
Mother's education	-0.12	-0.12	-0.11	-0.13
	(0.03)	(0.03)	(0.05)	(0.04)
Sigma (σ)	0.55	0.55	0.48	0.45
	(0.17)	(0.17)	(0.22)	(0.16)
Stage 2: Private versus Government School				
Private School alternative:				
Constant	-4.77	-3.36	-3.74	-5.89
	(0.91)	(1.33)	(1.15)	(1.18)
School distance	-0.18	-0.17	-0.39	0.05
	(0.20)	(0.21)	(0.29)	(0.39)
Instructional expenditure[c]	0.13	0.13	0.11	0.12
	(0.04)	(0.04)	(0.05)	(0.05)
Pupil-Teacher Ratio[d]	0.26	0.26	0.09	0.41
	(0.09)	(0.09)	(0.13)	(0.13)
Number of Schools		-0.51		
		(0.42)		
Government School alternative				
Constant	-3.87	-2.50	-2.64	-5.35
	(0.87)	(1.33)	(1.08)	(1.12)
School distance	-0.42	-0.41	-0.54	-0.25
	(0.13)	(0.14)	(0.22)	(0.17)
Instructional expenditure[c]	0.04	0.04	0.01	0.06
	(0.02)	(0.02)	(0.03)	(0.03)
Pupil-teacher ratio[d]	-0.08	-0.08	-0.19	0.03
	(0.04)	(0.04)	(0.06)	(0.06)
Number of Schools		-0.49		
		(0.41)		
- Log Likelihood	1403.3	1402.5	661.1	720.8
Sample size	1768	1768	828	940

Standard errors in parentheses

[a]Variable divided by 10000 for estimation

[b]Variable divided by $(10000)^2$ for estimation

[c]Variable divided by 100 for estimation

[d]Variable divided by 10 for estimation

Table 4: Average of Analytical School Choice Elasticities[a] with Respect to School Price and Quality

	Alternative		
	Private school	**Government school**	**No school**
Household income	1.25	-1.28	-0.95
Costs and fees			
Private school	-0.159	0.097	0.294
Government school	0.048	-0.096	0.025
School distance			
Private school	-0.078	0.118	0.061
Government school	0.171	-0.359	0.088
Instructional expenditure			
Private school	0.141	-0.233	-0.123
Government school	-0.026	0.042	-0.013
Pupil-teacher ratio			
Private school	0.241	-0.398	-0.206
Government school	0.112	-0.234	0.057

[a]The elasticity was estimated at each data point and then averaged using sample weights.

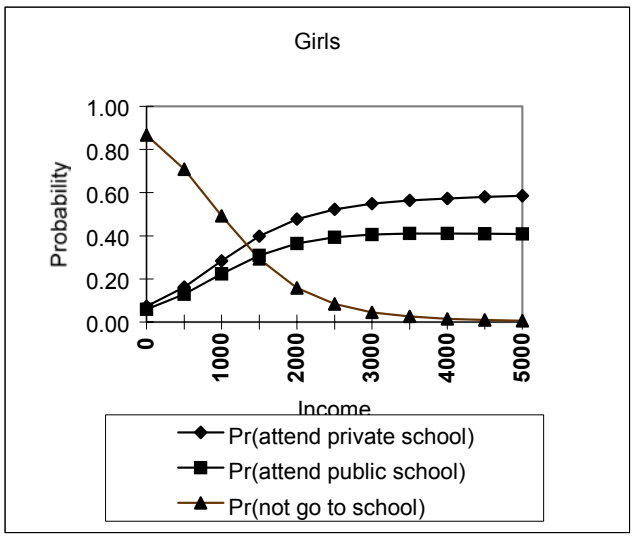
Table 5: Estimated Willingness to Pay for Changes in School Quality

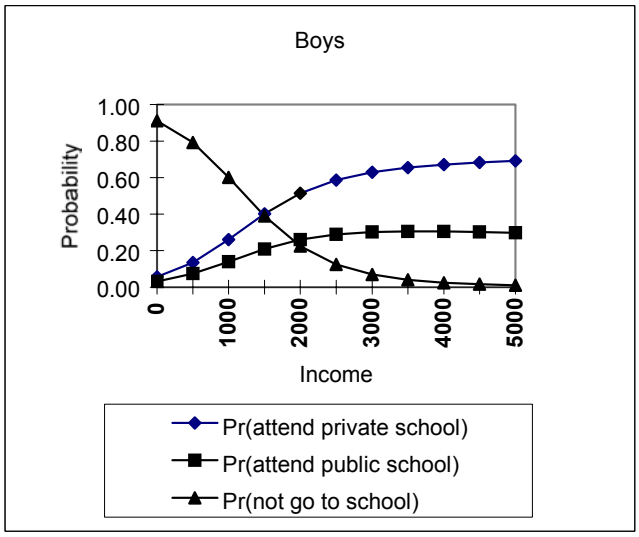
Household income:	Private school				Government school			
	Rp. 1500		Rp. 3000		Rp. 1500		Rp. 3000	
	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)
School distance								
0.5 km. decrease	7.06	0.47%	14.15	0.47%	10.44	0.70%	19.91	0.66%
1 km. decrease	14.44	0.96%	28.78	0.96%	22.40	1.49%	42.45	1.41%
Instructional expenditure								
Rp. 100 increase	9.87	0.66%	19.74	0.66%	1.82	0.12%	3.48	0.12%
Rp. 200 increase	20.36	1.36%	40.41	1.35%	3.69	0.25%	7.05	0.24%
Pupil-teacher ratio								
5-student decrease	-9.34	-0.62%	-18.94	-0.63%	1.83	0.12%	3.51	0.12%
10-student decrease	-18.06	-1.20%	-36.89	-1.23%	3.71	0.25%	7.10	0.24%

(1) - Willingness to pay in Rupees

(2) - Willingness to pay as percentage of household income.

Figure 1: Simulated Response to Changes in Income





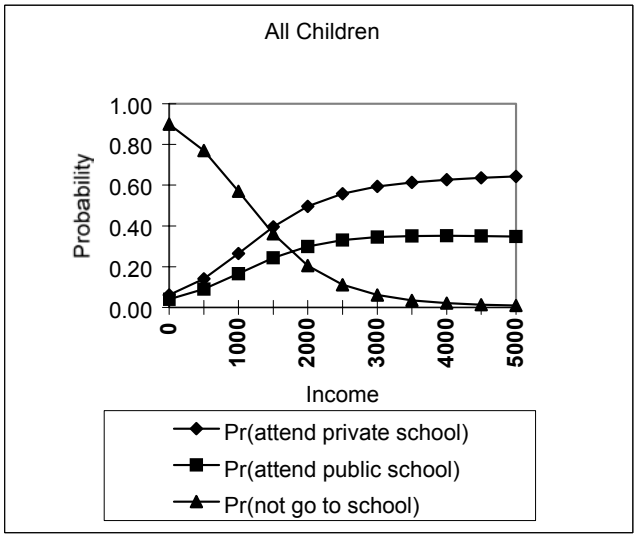
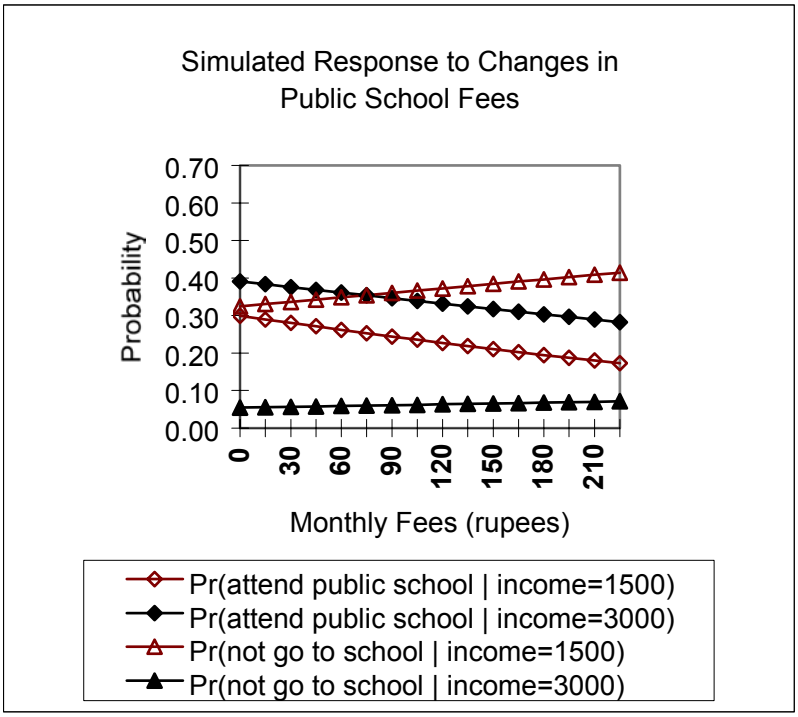


Figure 2: Simulated Response to Changes in Fees



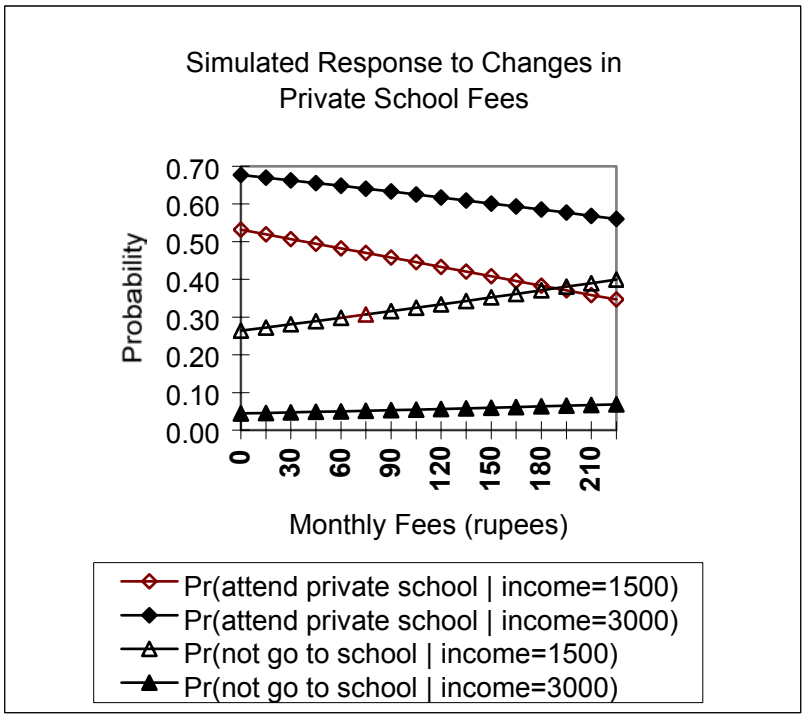
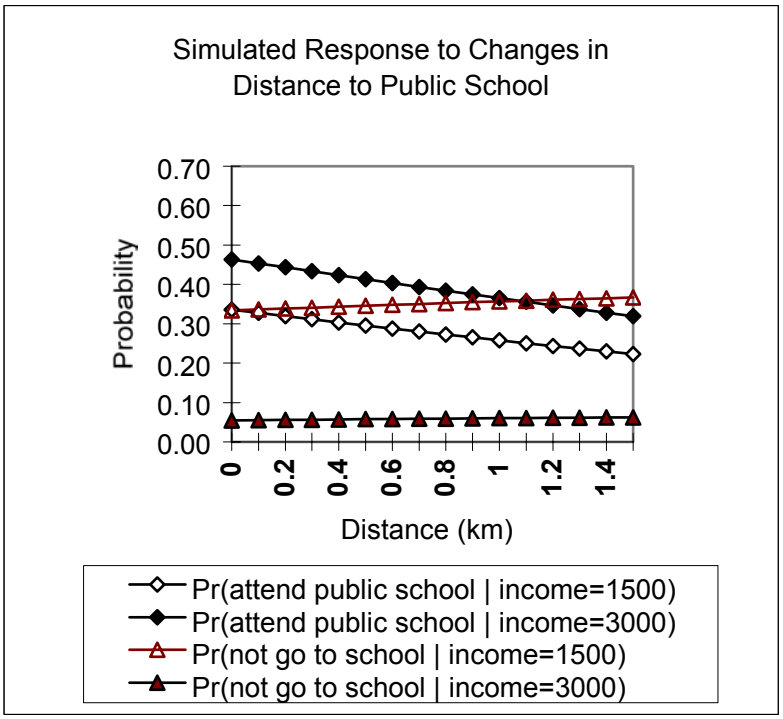


Figure 3: Simulated Response to Changes in School Distance



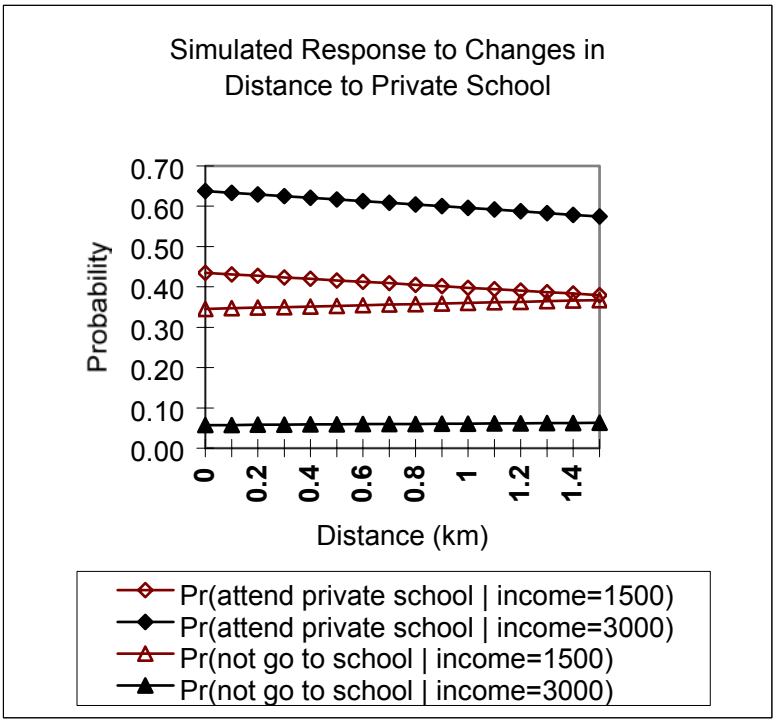
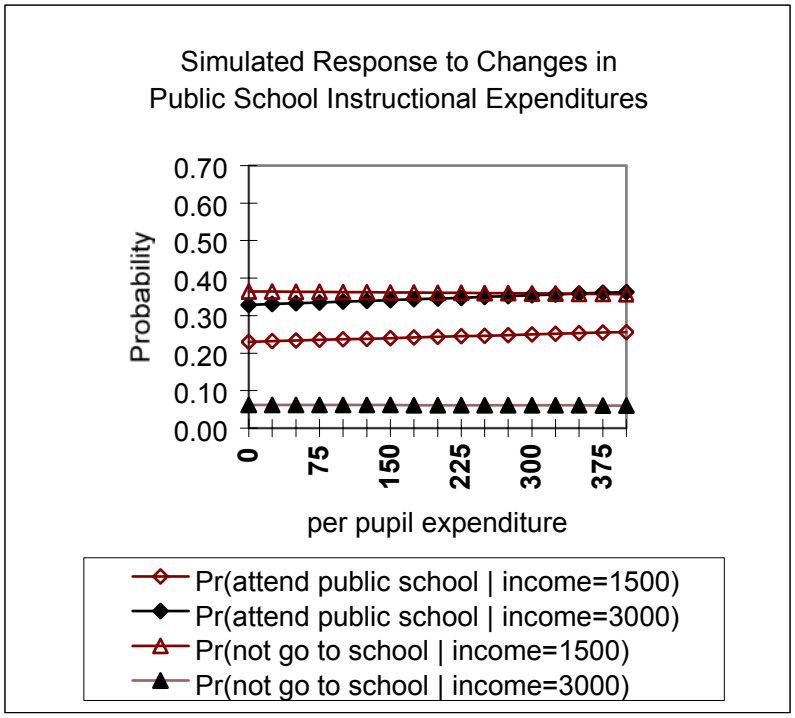
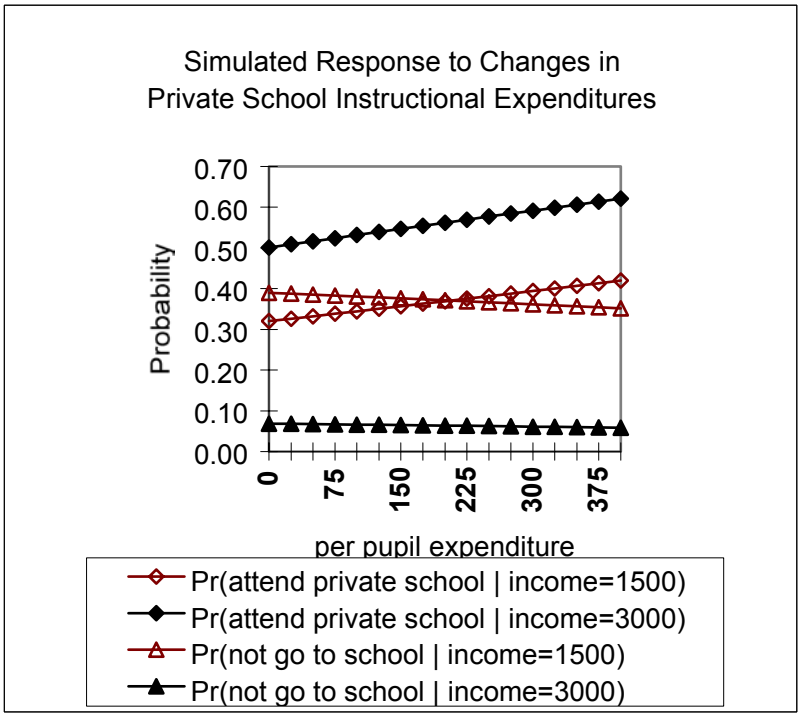


Figure 4: Simulated Response to Changes in Instructional Expenditures





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Endnotes

1. King (1995) and Glick and Sahn (2000) do include fees as well as distance in their studies of schooling choices.

2. The impact of school and household attributes on human capital production will be assessed empirically in Section V below.

3. While the wording here suggests a sequential choice, the NMNL does not necessarily imply a temporal process.

4. An alternative would be to employ wages as the value of time, but the thin market for wage labor in this age group precludes a meaningful wage measure. A data set from Northwest Frontier Province found urban wages for both boys and girls varying between 2-3 rupees per hour (or 6-8 cents). Age-wage profiles were very flat, with a .5 rupee increase for boys between ages 5 and 11, and a .2 rupee reduction for girls between ages 5-11. While jobs for younger children existed, it was uncommon for children under 10 to work for wages.

5. Note that the rupee cost of transportation is included in the fees.

6. For example, there is only a 1 percent chance that a school with a 20 percent neighborhood market share ($a_{ij} = .2$) would not have been mentioned by any of the 20 surveyed households. There is a 12 percent chance of missing a school with a 10 percent market share. The probability of missing a school does not rise above 50 percent until market share falls to 3 percent or less, but those schools would enter the true price index with $a_{ij} \leq .03$ were the universe of school information available.

7. An alternative specification would posit a third stage of the nested logit in which the household would select a specific private or government school, and all the price and quality measures of each of the schools in the neighborhood would enter as regressors. The model would be complicated by the unequal number of schools across neighborhoods. More importantly, there would have to be considerable within-neighborhood variation in school price and quality or else the covariance matrix would approach singularity. We are not aware of any attempts to apply such a model to schooling choice. In this application, across cluster variance accounts for two-thirds of the variance in fees for both government and private schools, suggesting that price variation across neighborhoods rather than within neighborhoods is of primary importance to identify price effects.

8. We also estimated the model using household income per capita in place of total household income. While it is common in the literature to use per capita income, theoretical arguments suggest that total household income should enter the reduced form schooling demand specification. In addition, the per-capita income specification adds a potentially endogenous choice on family size as an explanatory variable. Specifications using per capita income yielded similar parameter estimates to those reported herein with the unreasonable exception that σ exceeded one.

9. The derivation is based on Small and Rosen (1981). McFadden (1996) has shown that the Small and Rosen derivation only applies for linear-in-income utility, and that nonlinear income requires a laborious bootstrapping methodology. However, Herriges and Kling (1999) have shown that the bias from using the Small and Rosen approximation is small.

10. Lockheed and Verspoor (1991) review evidence on the increase of learning attributable to smaller classrooms and conclude that, although beneficial, changes within a wide range do not justify the costs.

11. The exam was developed and piloted by the late Sar Khan. The exam was based on the official curriculum which all schools, public or private, are expected to follow. The curriculum sets minimum objectives for each grade level.