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Willingness to Pay for Primary Education in Rural Pakistan

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Highly subsidised public schools are the principal provider of education in the rural areas of Pakistan. Steady growth of school age population over time coupled with stagnant public funding has put enormous pressure on this system. The alternative of cost recovery through user charges has its own critics. They argue that introduction of tuition fees would substantially reduce the already small representation of low-income households in primary schools due to high price elasticity of their demand for schooling. Moreover, the revenue-generating potential of this policy may also be limited due to same reason. The present study uses a discrete choice random utility model of household utility maximising behaviour to evaluate feasibility and consequences of introducing user fees in primary schools in rural Pakistan, particularly with reference to above criticisms. The demand function for school enrolment derived from this model allows us to test the hypothesis that price elasticity of demand for schooling varies with income. It also provides estimates of the parameters of the utility function needed for measuring parents' willingness to pay for their childrens' education if money generated from tuition fees is reinvested in education. The estimated demand function takes into account total price of education, including opportunity cost. Estimation results show that price elasticity of demand for school enrolment is higher for lower-income groups. Hence school enrolment of the poorest children would bear the main brunt of user fees policy. Children's gender and age, father's education, presence of T.V. in the household, and community variables like the presence of an elected district council member, electricity, and public transport in the village turn out to be significant influences on the probability of primary school enrolment. Willingness to pay for education is lower for poorer households and can generate revenues to cover only a fraction of the cost of running a school. Hence the need to search for other sources of financing primary education in rural Pakistan.

I. INTRODUCTION

Highly subsidised public schools are the principal provider of education in Pakistan, particularly in its rural areas. Economic woes of the government and a

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steady growth in school age population have landed this system into serious financial problems. Its conformity to the moral principles of equity and social justice has also been disputed on the grounds that free education is financed by regressive taxation and access to most heavily subsidised educational services is positively related to household income.[1] Moreover, it is argued that benefits of free education do not reach the children from the poorest households, as most of them stay away from school due to the high opportunity cost and low perceived benefits of education.

The alternative of charging fees for the educational services of public schools to make them financially viable has its own critics. They claim that the introduction of tuition fees would substantially reduce the already small representation of low-income households in the primary schools because their price elasticity of demand for schooling is quite high. They further argue that given a strong positive relationship between education and earnings, the lower enrolment rate for the poor households today would translate into more income inequality and poverty tomorrow. Doubts have also been raised about the revenue-generating potential of user fees on the presumption of high price elasticity.

A simple though not so rigorous method of assessing the validity of the foregoing critique is to estimate an *ad hoc* demand function for education that allows price elasticity to vary with income, and to look at the estimates of income group-specific price elasticities of demand for school enrolment. This approach, however, suffers from theoretical as well as empirical shortcomings. From the theoretical point of view, it does not ensure compatibility of the estimated demand function with the principle of utility maximisation, which lies at the core of the consumer theory. Empirically, it completely ignores the benefits of investing the revenues generated by cost recovery, through tuition fees going back in the education system, as envisaged by the proponents of this policy.

A full appreciation of the potential and consequences of instituting user fees for education requires broadening the scope of the analysis—to include issues such as how much a household will be willing to pay for education of children *if additional educational services like a new school in the neighbourhood are made available to it.* By estimating parents' willingness to pay for their children's education for different income groups, we can find out the maximum amount of tuition that can be charged without reducing income group-specific enrolment rates. This is a worthwhile measure for devising a scheme of user charges for education as well as for appraising the feasibility of involving private investors and NGOs in this sector; and it is based on the principal of utility maximisation.

[1]The incidence pattern of federal taxes across various income groups is generally regressive in the rural areas of Pakistan. See Malik and Saqib (1985, 1989).

In the following section we present a model of the willingness to pay for education, with a brief background. Data and variables used in this study are discussed in Section III. Section IV consists of estimation results and their analysis. Income class-specific price elasticities, measures of willingness to pay for school enrolment, and their policy implications are the focus of Section V. Some concluding observations are made in the final section.

II. MODELLING WILLINGNESS TO PAY FOR EDUCATION

Background

A quick sampling of the studies of the willingness to pay in the economics literature reveals that they often focus on the commodities which are different in one way or the other from the commonly marketed items.[2] While many aspects of the traditional economic theory carry through to these situations, some adjustments need to be made to take into account the unique characteristics of the goods and services under consideration. Three such characteristics that must be taken into account while formulating a model of the willingness to pay for education in rural Pakistan are the fact that education in most of the rural Pakistan is provided at zero or a small fixed price, discrete nature of the decision to attend school, and the likelihood that the effects of introducing price into the system will vary with income.

When price of a commodity or service exhibits no variation across units of observation, econometric estimation of the coefficient of price variable in its demand function is not possible. Adjusting price variable to incorporate other associated expenses that show considerable variation such as travel and opportunity costs can solve this problem. An excellent application of this approach can be found in the travel cost models of recreation demand.[3] Insights from these models can be readily utilised for modelling willingness to pay for education in rural Pakistan, as attending school there almost always involves some travel. Opportunity cost of time spent in school is also very high in Pakistan, partly due to the presence of child labour. In

[2]Some examples are the studies of the willingness to pay for recreational services of public parks [Abala (1987)], housing characteristics [Gross (1988)], medical care [Gertler and Gaag (1990)], attributes of lamb loin chops [Mullen and Wohlgenant (1991)], air quality [Farber and Rambaldi (1993)], and underground transport safety [Jones-Lee and Loomes (1994)].

[3]The pioneering research that develops or uses the travel cost model includes studies by Wood and Trice (1958), Clawson (1959), Clawson and Knetsch (1966), and Cesario (1976). A discussion of the major issues related to the theory and estimation of this class of models can be found in Bockstael, *et al.* (1991).

fact its omission from the demand function would most likely lead to biased estimates of the coefficients.[4]

Parents' decision to enrol their children in school or not is dichotomous in nature. McFadden's (1974) random utility model (RUM), which is based on consumer's utility maximising behaviour, provides a framework for econometric modelling of this kind of choice. The demand function derived from this model can be estimated by using one of the limited-dependent variable techniques.[5] Resulting parameter estimates can then be used to calculate willingness to pay.

Variability of the price response with income has a strong bearing on the shape of the utility function, which in turn determines functional form of the demand function. This issue will be taken up later.

There are only a few published papers that combine the above-mentioned ingredients of a model of the willingness to pay for education into a finished product and put it to use, though the need for undertaking such an exercise has long been explicitly or implicitly acknowledged.[6] Haveman and Wolfe (1984) propose a procedure for estimating a willingness-to-pay measure for non-market effects of education and offer some illustrative estimates. This, however, is not a promising strategy for measuring willingness-to-pay for education as a whole. Jimenez and Tan's (1985) estimates for Pakistan are based on hypothetical values and informed guesses for various parameters, so that much reliance cannot be placed on them. Two separate papers by Gertler and Glewwe (1990, 1992) successfully synthesise the above-mentioned ingredients into a viable methodology for measuring willingness to pay for education and apply it to rural Peru. Alderman, *et al.* (2001) use a similar methodology for Pakistan, but their data coverage is limited to the low- and middle-income areas of a single city, and their estimates do not take into account opportunity cost as well as several household and community variables that are known to play a significant role in the demand for education.

We present here a slightly modified version of the Gertler-Glewwe model and use it to estimate willingness-to-pay for primary education in rural Pakistan. Wherever necessary, we use our own interpretation of the model.

The Model

Consider a household having a utility function, which depends on a composite good Z_1 and education Z_2. Let us write this utility function as:

[4]See Bockstael, *et al.* (1991), p. 243.

[5]Maddala (1983) discusses these techniques in detail and also provides references to the studies that have used them. Also see Greene (1993).

[6]See, e.g., Psacharopoulos, *et al.* (1986) and Khan, *et al.* (1984, 1986a).

$$U_i = V_i(Z_{1i}, Z_2) + \varepsilon_i \quad i = s,n \qquad \ldots \quad \ldots \quad \ldots \quad \ldots \qquad (1)$$

where subscripts s and n refer to the school and no school options respectively, and ε is an independently and identically distributed stochastic term which can be interpreted as a random taste shifter or as the error that would be made in estimating utility which is known to the decision-maker with certainty. The two interpretations are functionally similar.

The household combines purchased and non-purchased inputs through a household production function to produce the output of educational process, Z_2. In symbols:

$$Z_2 = Z_2(X) \qquad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \qquad (2)$$

where X is a vector of above-mentioned inputs.

The concept of household production function is central to the 'New Theory of Consumption' associated with the names of Becker (1965); Lancaster (1966) and Muth (1966). The basic idea behind this theory is that households do not get direct utility from the goods and services sold in the market. Instead, they convert them into utility-bearing commodities, activities, and characteristics using the household production process.[7] Later work by Bradford, *et al.* (1969); Oates (1977, 1981) and Hamilton (1983) recognises the role of non-purchased inputs like community environment and 'quality' of its residents in the production of local public services such as public safety and education, and hence furnishes theoretical justification for the inclusion of community variables in the production function for education.

Measuring output of the educational process is considered as one of the most troublesome jobs in the applied work on education. Traditionally, scores on various standardised tests are used as proxy, but it is generally agreed that they do not accurately represent the product parents demand.[8] Fortunately, in the present context, there is a way around this problem. By substituting (2) into the utility function (1) it can be rewritten as:

$$U_i = V_i(Z_{1i}, Z_2(X)) + \varepsilon_i \qquad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \qquad (3)$$

Now utility is a function of the composite good Z_1 and the vector of inputs X in the educational production function rather than the output Z_2. The demand function for

[7]For an overview of the home production approach and a survey of related literature see Gronal (1986).

[8]Some of the issues related to the measurement of the output of education are discussed by Griliches (1977); Michael (1982); Haveman and Wolfe (1984) and Jorgenson and Fraumeni (1992).

education derived from (3) would treat education as "whatever parents think it is".[9] This is an advantage over structurally estimating the educational production function.

If parents decide to send their child to school, the utility will be:

$$U_s = V_s(Z_{1s}, Z_2(X)) + \varepsilon_s \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (4)$$

The utility associated with the no schooling option will be:

$$U_n = V_n(Z_{1n}) + \varepsilon_n \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (5)$$

The budget constraint faced by the household may be written as:

$$Z_{1s} + P = Z_{1n} = Y \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (6)$$

where P is the price of education including the price of child's foregone time, and Y is household income. We can use this budget constraint to substitute out Z_{1s} and Z_{1n} from the utility function, hence expressing utility as a function of P, Y, and X.

The household will choose to send a child to school if the utility obtained from this choice is greater than the utility level which would be attained if the child was not enrolled in a school, i.e., when $U_s > U_n$. Hence:

$$\begin{aligned} Pr(Enrolment) &= Pr(U_s \succ U_n) \\ &= Pr(U_s - U_n) \succ 0 \\ &= Pr(\varepsilon_s - \varepsilon_n \succ -(V_s - V_n)) \\ &= Pr(\eta \succ -(V_s - V_n)) \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (7) \end{aligned}$$

Where $\eta = \varepsilon_s - \varepsilon_n$. Assuming that the probability distribution of η is symmetric (like normal or logistic), we may write:

$$Pr(Enrolment) = F(V_s - V_n) \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (8)$$

where F is the cumulative density function of η evaluated at $V_s - V_n$.

A necessary and sufficient condition for η to have the logistic distribution is that ε_s and ε_n are independently and identically distributed with type I extreme value distribution.[10] Thus with this assumption about ε_s and ε_n, a binary logit model can be used to estimate (8).[11] It leads to the following expression for the probability of going to school, denoted here by π_s:

[9]Hamilton and Macauley (1991).

[10]See McFadden (1974) and Pudney (1989), pp.116–118, and Appendix 1.

[11]Logistic distribution provides a close approximation to the normal distribution over much of its range and, unlike normal distribution, has simple closed-form expressions for its c.d.f. and p.d.f. Logit model is widely used in empirical research so that the results obtained by using this model are directly

$$\pi_s = \frac{e^{V_s - V_n}}{1 + e^{V_s - V_n}} \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (9)$$

The probability π_n of not going to school can be determined residually as $1-\pi_s$ using the result that the sum of the probabilities of all possible outcomes is unity.

The expression (9) is interpreted as the demand function for schooling. By comparing it with the general functional form of the logit demand function $e^{X\beta}/1+e^{X\beta}$ (where X is a vector of explanatory variables), it can be seen that in our model, the shape of the demand function depends on utility difference V_s-V_n. This demand function can be estimated using the maximum likelihood technique, and the resulting estimates of the parameters of the utility function can be used to compute willingness to pay for availability of school as measured by compensating variation (CV).[12] For logit model, compensating variation is given by:

$$CV = \frac{1}{\lambda}[ln(e^{V_s} + e^{V_n}) - ln(e^{\bar{V}_s} + e^{\bar{V}_n})] \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (10)$$

where λ is the marginal utility of money and V's and $\bar{V}$'s represent value of V before and after the change respectively.[13]

The functional form of the utility function (3) must be explicitly specified for empirical estimation of the above model because, as noted above, the shape of the demand function for education depends on the utility difference V_s-V_n. Inputs in the educational production function also enter into the demand function through the utility function. A linear utility function is not suitable in this context, because any variable that does not change over the alternatives available to the decision-maker will drop out of the utility difference and hence out of the demand function.[14]

This problem can be fixed for the variables like personal, family, and community characteristics that constitute vector X by simply assuming alternative-specific constants for them. However, this strategy does not work for the composite

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comparable to the findings of earlier researchers.

[12]Compensating variation is defined as "the amount of money an economic unit would be willing to pay in order to receive a benefit" [Moffat (1983)], and can serve as a good monetary measure of parents' willingness to pay for benefits like a nearby school. CV is more appealing as compared to other measures of welfare change for at least two reasons. One, it possesses certain desirable properties [Mohring (1971)], and two, it is conceptually closer to the magnitude (i.e., parents' willingness to pay for certain benefits) in which we are interested.

[13]See Small and Rosen (1981). Other contributors to the literature on welfare measurement in discrete choice models include McFadden (1974) and Hanemann (1984).

[14]For a discussion of this issue, see, e.g., Hanemann (1984); Train (1986) and Hoffman and Duncan (1988).

consumption good Z_1 because it would imply that same amount of consumption would yield different levels of utility, depending on whether parents have enrolled their child in a school or not. This doesn't seem to make a lot of sense.[15]

A utility function that is quadratic in consumption and linear in the components of vector X avoids the above-mentioned problems. Assuming this functional form, making use of the budget constraint (6) to substitute out Z_{1s} and Z_{1n}, and employing the relationship:

$$P = P^* + wH \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (11)$$

where P is total price of education, P^* is out-of-pocket cost of education, w is the wage rate, and H stands for number of hours of work foregone due to schooling, we can rewrite Equation (4) representing utility associated with schooling option and Equation (5) corresponding to the utility from no-schooling option as:

$$U_s = \alpha_1(Y - P^* - wH) + \alpha_2(Y - P^* - wH)^2 + \gamma_0 + \gamma_1 X + \varepsilon_s \quad \ldots \quad (12)$$

and

$$U_n = \alpha_1 Y + \alpha_2 Y^2 + \varepsilon_n \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (13)$$

respectively. The difference between the non-stochastic parts of the above utility expressions may be written as:

$$V_s - V_n = \gamma_0 + \gamma_1 X - \alpha_1(P^* + wH) + \alpha_2[(P^* + wH)^2 - 2Y(P^* + wH)] \quad \ldots (14)$$

A comparison of the utility difference Equation (14) and the logit demand function (9) shows that the demand for schooling in the present model is a function of the price of schooling (including opportunity cost), a complex price-income interaction term, and the variables in vector X.

III. DATA AND VARIABLES

Data used in this study were taken from the 10th round of the multi-purpose longitudinal survey of rural Pakistan conducted by the International Food Policy Research Institute (IFPRI) between December 1988 and February 1989. It covered more than 750 households comprising over 7,000 individuals selected through stratified random sampling from the villages in two districts of the Punjab, namely, Faisalabad and Attock, and one district each in the remaining three provinces, i.e., Dir in the North West Frontier Province, Badin in Sindh, and Kalat in Balochistan.[16]

[15]For more detail on this issue, see Akin, *et al.* (1986); Gertler, *et al.* (1987) and Gertler and Gaag (1990).

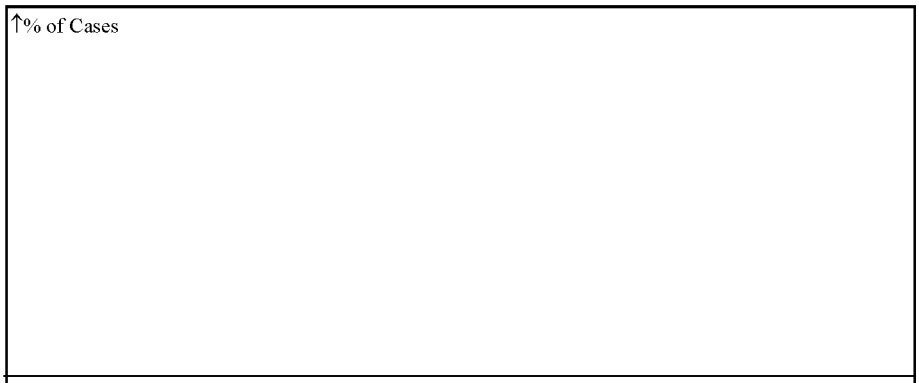
[16]Kalat was later dropped from the survey primarily because of logistic difficulties. The province

Data from the human capital modules of the survey, which were administered only during the 10th round, were extensively used in this study, while additional information from other modules was also added to this core data.[17] Extensive weekly recall information on the work activities of the surveyed individuals is a distinguishing feature of this data set that allows for estimating the opportunity cost of education, and hence makes it particularly suitable for the present study. Most existing data sets for Pakistan do not match the IFPRI survey data in this respect.

Our working sample consists of all the individuals included in the human capital module of the IFPRI survey who were in the 'primary school-going age', whether actually enrolled in a school or not. The term 'primary school-going age' needs elaboration. In Pakistan, official documents consider everyone between the ages of five and nine years a member of this age group, though many believe that given the prevalence of late school entry and grade repetition, these age limits are too narrow.[18]

This issue can be decided by a careful examination of the age profile of the primary school students. Figure 1, which is based on the IFPRI data, presents percentage age distribution of the persons enrolled in primary school. This diagram clearly depicts that while only about half the enrolled students fall in the official age group of five-to-nine years, the interval between five years and fourteen years covers most of them. Hence we treated the age between five years and fourteen years as the primary school-going age. After 13 cases of those who had already graduated from primary schools were deleted, this definition resulted in inclusion of 1201 cases in the working sample on which all the needed information was available.

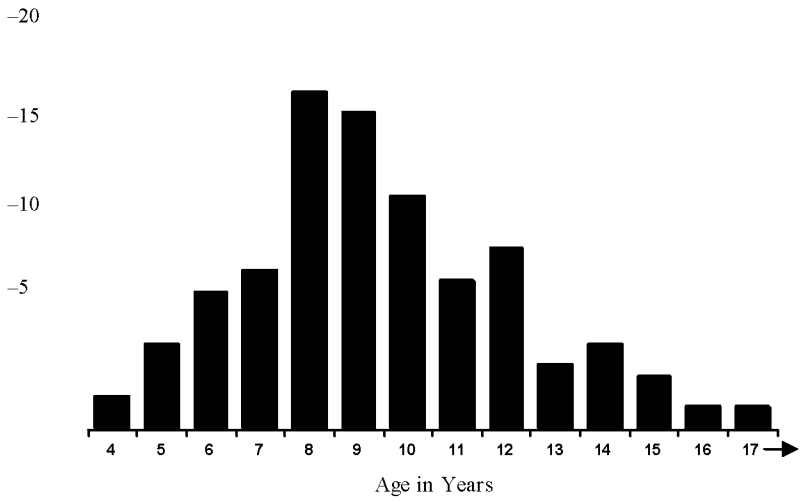
Fig. 1. Age Distribution of Pupils Enrolled in the Primary Schools of Rural Pakistan.



of Balochistan has a small proportion of the rural population.

[17]For further details of the IFPRI survey, see Alderman and Garcia (1993).

[18]See e.g., Khan, *et al.* (1986).



A list of variables used in this study along with summary statistics is given in Table 1. The logit demand function for school enrolment (Equation 9) has a dummy dependent variable which takes a value of one if a child is enrolled in a primary school and equals zero if she is not. The independent variables in this function are discussed below.

Table 1

Descriptive Statistics

Variable	Unit of Measurement	Mean	Standard Deviation
Enrolled in School?	Yes=1 No=0	0.48	0.50
Out-of-Pocket Price of Schooling	Rupees per year	324.29	384.48
Opportunity Cost of Schooling*	Rupees per year	2691.51	595.03
Total Price of Schooling*	Rupees per year	3015.80	724.14
Current Consumption Expenditure	Rupees per year	24817.89	12604.79
Sex	Male=1 Female=0	0.51	0.50

Age	Years	9.23	2.55
TV in the Household?	Yes=1 Otherwise=0	0.11	0.31
Father's Education (Primary School)	Yes=1 Otherwise=0	0.16	0.37
Father's Education (Middle School or More)	Yes=1 Otherwise=0	0.16	0.37
Electricity Available in the Village?	Yes=1 Otherwise=0	0.60	0.49
District Council Member in the Village?	Yes=1 Otherwise=0	0.11	0.31
Village Served by Public Transport?	Yes=1 Otherwise=0	0.17	0.38
Distance to School	Kilometres	1.48	2.54

Number of Observations=1201.

* Figures based on hours worked equation (see Section IV).

As discussed earlier, the price of education consists of two parts, namely, out-of-pocket or direct costs, and opportunity cost. Out-of-pocket costs can readily be computed for the school-going children by adding various components such as expenditures on books and supplies, tuition, school uniform, and transport. As the cost of education for those not enrolled in a school cannot be observed directly, we used gender-specific village average cost of schooling for the enrolled children as a proxy.[19]

To estimate the opportunity cost component of the price variable, data on the monetary value of the hours worked by the sampled persons is needed. The IFPRI survey provides detailed weekly recall information on main activities of the surveyed individuals. Data on the number of hours worked are directly available for various non-farm activities such as government, private sector, or self-employment, work as a labourer or an artisan, and household work. For other activities such as work on own or someone else's farm, visiting officials, and going to market—which once started would normally consume part of the day, any information available on any of them was the main activity of the interviewed person, in the morning (a.m. hours) and in the afternoon (p.m. hours). Assuming a seven-hour working day, we assigned 4.5 work hours whenever such an activity was reported as the main activity during the a.m. hours. The same was done for the p.m. hour activities. Hours worked per week were computed by adding hours spent in all the activities during the week.

[19]In some of the villages, no female in the sample was enrolled in a primary school. In such cases, we had to use overall village averages rather than gender-specific village averages.

The village average hourly wage rate was used to calculate the monetary value of these hours.

Explanatory variables in the hours worked equation, which was used to calculate opportunity cost, include the enrolment status dummy, which equals one for those attending a school and is zero for non-students, hourly wage rate, non-labour income, sex, age; and, for those attending school, distance to school as it is likely to be negatively related to the number of hours worked. Most of the agriculture in the district of Attock depends on rain for irrigation. This feature affects almost all aspects of this region's agriculture. To take care of the possible differences in work practices arising from this special condition, a dummy variable for Attock was also included. Computation of wage rate has been discussed above. A measure of non-labour income was obtained by subtracting farm wage income and income from non-farm activities from total income.[20] Data on other independent variables are directly available.

Like price, income enters the demand for schooling through the budget constraint (Equation 6) as a measure of purchasing power. Current income is not a good measure of the long-term purchasing power of a household as it fluctuates significantly from period to period. Current consumption expenditure is considered a better proxy for the permanent income of the household. Hence we used it in our estimation as a measure of household income.

Other independent variables of demand function for school enrolment enter the logit model (Equation 9) through educational production function as components of vector X (Equation 2). These include personal characteristics of the school-age population as well as characteristics of the household and community in which they live.

To take care of the age and gender profile of the primary school-going age population, we included a quadratic for age and a binary variable for sex which valued one for males and zero for females. Impact of parents' education on various educational outcomes of their children is well-established in the literature. The IFPRI data classify parents' education into six different levels from not-educated to post-secondary. In the logit regressions, a dummy variable for each of these categories was tried for both the parents separately, with 'not-educated' as the base category.

Using the presence of certain items in a household as a proxy for the existence of an environment conducive to education is not uncommon in the literature on

[20]While the case of farm wage income is straightforward, income from non-farm activities is a mixed bag. As most of the non-farm activities involve extensive use of household labour combined with relatively small amount of capital, it seems preferable to exclude income from these activities from non-labour income.

educational production function. In Pakistan's small and relatively isolated village communities, TV can potentially influence educational outcomes both by helping children through educational programmes and by influencing their parents' views about education.[21] Hence a dummy variable for the presence of a TV set in the household was added to the list of explanatory variables.

Variables used in this study to control for community environment and for quality of its residents are the presence of public transport, electricity, and a District Council member in the village. Availability of public transport has a direct bearing on the quality of life in a village as it makes towns, markets, and schools more accessible. Electricity saves students from the hassle of literally burning the midnight oil and makes possible the use of electric devices. Presence of a district council member, an elected local government official, is an indicator of the quality of residents in terms of their political awareness and influence as expressed by getting a person from their village elected to the local government. Moreover, he is likely to get more funds allocated to the schools attended by the children living in his village, hence increasing the availability of purchased inputs.

IV. ESTIMATION RESULTS

Opportunity Cost

As noted earlier, opportunity cost of education plays a crucial role in the unbiased estimation of the coefficients of the demand function for schooling. Still, most of the studies of school enrolment decision of households in developing countries either do not include any opportunity cost variables or rely on proxies.[22] In fact, to the best of our knowledge, the present study is the first serious attempt to estimate the opportunity cost of education for Pakistan and to analyse its role in the demand for education, hence filling a major gap in previous research.

The importance of this subject calls for a separate study. However, in the present context, our objective is limited to estimating the hours worked by the students and non-students with a reasonable degree of accuracy and to use these estimates in the calculation of the opportunity cost of education. The simple average of the hours worked by students and non-students across various

[21]It may be noted that at the time of the survey only a single channel of public television was available in most of Pakistan. The programmes shown on this channel strictly avoided adult content and most forms of violence. Hence the possibility of a negative effect of TV on the young mind was virtually non-existent.

[22]See review by Birdsall (1982). Also see more recent work by Ilon and Moock (1991); Knodel and Wongsith (1991); Lloyd and Blanc (1996) and for Pakistan, Alderman, *et al.* (2001).

localities and age groups is found to serve this purpose pretty well.[23] Nonetheless, we opt for a little more sophisticated approach, and estimate a regression for hours worked both by students and non-students with enrolment status dummy as one of the independent variables. This equation is then used to predict the number of hours worked by each individual in the sample in two different states, namely, when she is enrolled in a school and when she is not. The difference between the number of hours worked in the two states measures hours of work foregone due to schooling. This difference is multiplied with wage rate to get the opportunity cost of schooling.

Table 2 presents OLS regression of hours worked per week by students and non-students for which relevant data were available.[24] Most of the variables are

Table 2

OLS Regression of Hours Worked per Week, by Students and Non-students

Variable	Coefficient	*t*-statistic
Constant	2.213	0.268
Age	2.543009	9.668**
Sex (Male=1)	–16.906002	–14.769**
Log Wage	6.217824	1.219
Non-labour Income (Per-capita)	-6.00329×10^{-4}	–3.327**
Enrolment Status (Enrolled=1)	–10.585178	–8.287**
Distance×Enrolment Status		
District (Attock=1)	–0.636960	–1.630*
	–6.428624	–4.051**
R-squared= 0.44		
Number of Observations= 816		

** Significant at 1 percent level. *Significant at 10 percent level.

[23]See Gertler and Glewwe (1990).

[24]Since the sample sizes used for estimating hours worked regression and school enrolment regression are different, means of the variables common to the two samples were compared to see how similar the two samples were. While most of the figures hence obtained were reasonably close to each other, the sample used for estimating the hours worked regression had a significantly higher percentage of the individuals who were enrolled in school (56 percent as compared to 48 percent in the sample for school enrolment regression). To see how this would affect the results of our analysis, the OLS regression was re-estimated with appropriate weights and the entire analysis was done all over again on the basis of these results. Many of the coefficients of the school enrolment regression hence obtained remained the same, while others showed only a slight change. The resulting estimates of the willingness to pay changed just by paisas (pennies). The results of this exercise are available with the author.

significant at 1 percent level of significance. Female children and children of older age work more hours per week, and those who are enrolled in school work fewer hours. Higher non-labour income results in fewer hours worked by the children. The dummy variable for the district of Attock is also significant.[25]

Distance to school interacted with enrolment status dummy in our regression shows that longer distance to school results in fewer hours worked by those enrolled in school. It is obvious that distance to school is not relevant for the hours worked by non-students. Estimated coefficient of local wage rate has the right sign, though it is not as precise as estimates of other coefficients. The reason for this appears to be our use of village-level average wage rates in the absence of individual-level data.[26]

The hours worked regression reported in Table 2 was used to calculate the opportunity cost of schooling as described earlier. The resulting opportunity cost variable was used in the computation of total price of education, a variable used as an independent variable in the demand function for schooling.

Demand for Schooling

Several studies of demand for schooling exist for Pakistan that use widely diverse data sets and methodologies. Although some of these studies allude to an underlying utility function, none of them explicitly derives the demand function for schooling from the utility maximisation problem of the decision-maker, Alderman, *et al.* (2001) being the only exception so far. Treatment of the opportunity cost of schooling in all these studies is also limited to the use of proxies at best.

Chishti and Lodhi (1988) study demand for education in the city of Karachi. According to their logit analysis, the decision to attend school depends on the gender of the potential student, household income, parents' education, and ethnic background. Using data from Pakistan Integrated Household Survey of 1991, Sathar and Lloyd (1994) find that boys, children with educated parents, and higher household consumption level, and those living in the province of Punjab are more likely to attend a primary school. Burney and Irfan (1991,1995) use data from Population, Labour Force, and Migration Survey of 1979. In their work, household income, father's education above primary level, his land-tenure status of owner, and village literacy rate emerge as significant positive influences on school enrolment of

[25]Dummies for other districts were dropped from the final regression due to multicolinearity.

[26]The role of wage rate here is somewhat indirect, as all children may not work for wage. Still, a higher wage rate is likely to induce parents to shift more work from hired labour to their children, or to shift some of their own work to the children so that they themselves can work more hours at the marketplace.

children. They justify their village literacy variable on the basis of Duesenberry (imitation) effect rather than as a community variable.

Alderman, *et al.* (1996) use the same data set as ours to decompose the gender gap in cognitive skills into components attributable to various factors underlying this gap. In this process they also estimate probit functions for probability of starting school. They consider individuals between the ages of 10 and 25 for whom a school was locally available when they were of age to start school. As pointed out earlier, most of the students attending primary school fall in the age group of 5 to 14 years. Thus the choice of age group is bound to exclude a significant proportion of primary school age population. Moreover, many respondents in their sample must have made a decision regarding school attendance long ago. Hence explanatory variables such as household income and book costs may not necessarily reflect the values of these magnitudes at the time of decision. They find out that travel time to school and book costs (as a proxy for all out-of-pocket-costs) are important factors that affect the decision to start schooling. Other variables that figure in their school attendance probits include a measure of household permanent income, father's attendance of middle school, a quadratic in age, and square of a measure of pre-school ability.[27] The study by Alderman, *et al.* (2001) has been discussed in an earlier section.

In Table 3 we present estimation results of our logit demand function for primary school enrolment. All the variables are significant at 1 percent, 5 percent, or 10 percent level with expected signs, most of them at 1 percent level of significance. Price and price-income interaction are highly significant, implying that decision-makers respond to changes in price and that their response varies with household income. Boys are more likely to attend a primary school than girls. As children grow older, their probability of enrolment in a primary school first increases, reaches a maximum, and then starts declining. Children of educated fathers have a higher chance of school attendance. Presence of a television set in the household is positively related to school enrolment. Availability of public transport, electricity, and presence of a District Council member in a village enhances chances of school attendance for the children living in that village.

Table 3

Logit Regression of Demand for Primary School Enrolment

Variable	Coefficient	Wald Statistic
Constant	–8.681	66.272***
Price	–0.0004866	14.995***

[27]The measure of pre-school ability used in their study gave rise to some controversy. For competing arguments in this debate, see Khan (1993) and Alderman, *et al.* (1996). Alderman, *et al.* ran their regressions without this measure as well and concluded that the results "do not change qualitatively if we eliminate this variable from our analysis".

Price-income Interaction	-3.386×10^{-9}	11.925***
Sex (Male=1)	1.105	64.041***
Age	1.838	76.043***
Age Squared	–0.096	78.017***
TV in the Household? (Yes=1)	0.493	3.691*
Father Educated/Primary School? (Yes=1)	0.417	5.299***
Father Educated/Middle School or More? (Yes=1)	0.976	21.991***
District Council Member in Village? (Yes=1)	0.403	3.243*
Village Served by Public Transport? (Yes=1)	0.532	7.143***
Electricity Available in Village? (Yes=1)	0.699	17.239***
– 2 Log Likelihood= 1327.03		
Chi-square= 335.75		
Number of Observations= 1201		

*** Significant at 1 percent level or less.

* Significant at 10 percent level or less.

The rationale for inclusion of these variables in the demand function for schooling was discussed earlier. However, some of the results reported above need more elaboration. In the initial regressions, all levels of father's education turned out to be significant. A likelihood ratio test could not reject at 1 percent level of significance the hypothesis that the coefficients of the dummy variables for higher than primary levels of father's education were equal. Hence, in the final regression, these coefficients were constrained to be equal. This amounts to including a single dummy variable for father's higher than primary education.

The number of educated mothers is very small in our sample, reflecting an extremely low level of female education in rural Pakistan about two decades ago, when these women were school-going age.[28] Most of them were married to educated men, hence confounding the influence of father and mother's education. In addition, children of most of the educated women were attending school. These factors made it impossible to obtain a reliable measure of the effect of mother's education on child's school enrolment.[29]

The dummy variable for the presence of a Union Council member in the village, an elected local government official, was found to be significant. It is interesting to note that when a similar dummy variable for a non-elected government official was included in the regression, it was not significant at conventional levels of significance. This adds some weight to the view that the role of elected representatives in public decision-making should be strengthened. A detailed analysis of this issue, however, is beyond the scope of this study.

[28]96 percent women in our sample are illiterate.

[29]Similar reasoning led Alderman, *et al.* (1996), who used the same data as ours, to exclude mother's education from their school attendance equations.

V. PRICE ELASTICITIES AND WILLINGNESS TO PAY

A few words about the method used for calculating price elasticities and willingness to pay are in order here. The average value of a non-linear function over a range of data is generally not equal to the value of that function evaluated at the average of the data. In case of logistic regression, elasticity and willingness to pay are non-linear functions of the independent variables. Hence, if these functions are evaluated at the average values of the independent variables, the resulting estimates may not truly represent their average value. Train's (1986) sample enumeration method was employed to overcome this problem. This method amounts to calculating value of the function for each individual separately for the relevant values of the variable under consideration (such as price in case of price elasticity) while keeping all other variables at their observed value for that individual, and then averaging the resulting estimates of the function over all individuals.

Income Group-specific Price Elasticities

Table 4 reports estimates of price elasticity of demand for primary school enrolment across income quintiles and over a price range that varies from Rs 150 to Rs 400 with the increments of Rs 50. This price range covers most of the cases in our sample.[30] We also report average price elasticity for each price range over all values of income to give an idea how a single estimate of elasticity would conceal its actual variation with income.

Table 4

Price Elasticity of Demand for School Enrolment across Income Quintiles

	Price Range				
Income Quintiles	Rs 150 to Rs 200	Rs 200 to Rs 250	Rs 250 to Rs 300	Rs 300 to Rs 350	Rs 350 to Rs 400
1 (Poorest 20%)	0.41	0.60	0.81	1.04	1.29
2	0.34	0.50	0.67	0.87	1.09
3	0.30	0.43	0.59	0.77	0.96
4	0.21	0.30	0.41	0.54	0.68
5 (Richest 20%)	0.11	0.16	0.22	0.29	0.36
Mean	**0.27**	**0.40**	**0.54**	**0.70**	**0.88**

[30]Only 1.7 percent cases lie outside these limits and are scattered over a wide range.

The general outlook that emerges from Table 4 is that the price elasticity of demand for primary school enrolment in rural Pakistan is high; yet it is less than unity in most of the cases. A glance across the rows and columns of the table shows that it is the highest for the poorest people and for the highest range of price. As we move from the higher to the lower income quintiles, price elasticity increases. This pattern indicates that making education more expensive by introducing user charges is likely to result in a significant decline in primary school enrolment, particularly for the poorest segment of the population. The absolute value of price elasticity is greater than unity for the poorest 40 percent people in the highest range of price and for the poorest 20 percent people in the second-highest price range. This implies that an increase in the price of schooling for these groups will result in a reduction both in revenues and enrolment.

Nonetheless, a closer look at these elasticities reveals that opportunity for revenue generation without drastically reducing school enrolment still exists. At least for the richest 20 percent of the population, and especially for the lower ranges of price, elasticities are quite moderate. Keeping in mind that children belonging to richer households face relatively lower opportunity cost of education as they are expected to work fewer hours, one can safely conclude that charging tuition fees from the students coming from the richest of the households would not result in substantial reduction in school enrolment.[31] Developing an administrative mechanism for such a policy of 'reverse discrimination', though, may not be an easy task.

The Willingness to Pay for Education

Income group-specific price elasticities give important insights into the implications of replacing a school system based on free education with a price-based regime. However, as was observed earlier, this approach does not take into account the possibility of investing the revenues generated by tuition fees back into education, a vital component of virtually every proposal for a user fee programme. This shortcoming can be taken care of by estimating the willingness to pay for education.

The estimates of willingness to pay reported in Table 5 are obtained by applying the methodology developed in Section II. These estimates measure the amount of money a child's household would be willing to pay if a primary school is made available next door for her education. We consider three scenarios for these calculations, namely, when the school is initially one kilometre, two kilometres, and three kilometres away from the household, and find out how much money would be paid if this distance were eliminated.

[31]See our estimated regression of hours worked by school-age children reported in Table 2 and discussed in the previous section.

Table 5

Willingness to Pay for Primary School Education in Rural Pakistan (Rs per Month)

Income Quintile	Distance to School		
	1 Kilometre	2 Kilometres	3 Kilometres
1 (Poorest 20%)	4.36	8.56	12.60
2	5.24	10.33	15.28
3	5.66	11.19	16.58
4	6.94	13.78	20.50
5 (Richest 20%)	8.44	16.76	24.97
Mean	**6.13**	**12.12**	**17.98**

It is clear from Table 5 that richer people and those who live farther away from an existing school are willing to pay more for having a nearby school. The figures are relatively small and apparently there is no way this money can pay for the fixed costs of building a school, which is normally of the order of at least tens of thousands of rupees. However, it would be interesting to find out if this amount would be enough to cover running costs of a primary school.

Let us assume for illustrative purposes that, as reported by Khan, *et al.* (1986a), an average monthly tuition fee of Rs 20 per student was needed to recover all the recurring expenditure of primary education. Then it can be seen from Table 5 that only the richest 40 percent people living three kilometres or farther away from a school would be willing to pay enough to recover all current expenditures on their schooling. Those living closer to a school, whether rich or poor, would not pay enough for this purpose. These figures tell us that if there are enough students in a locality to warrant construction of a new school, if the nearest school available at present is three or more kilometres away, if all these students belong to the richest 40 percent of the households, and finally, if a school is constructed in the vicinity, all the running expenditures of that school will be recovered by charging every student a tuition fee equal to the willingness of her household to pay for her education.

According to Table 5, the smallest amount of money is offered by the poorest 20 percent households located at a distance of one kilometre from school. Undoubtedly, Rs 4.36 is a meagre sum of money. Nevertheless, if every student is required to pay this money as tuition, it would still be enough to cover more than 20 percent of recurrent expenditure of primary education according to the estimate of per-student primary school current expenditures cited above. Using this same estimate and the last row of Table 5, it can be shown that if tuition is charged in accordance with parents' willingness to pay, the resulting resources

will be enough to cover 31 percent of running expenditures of a primary school from those who live one kilometre away from school, 61 percent from those living two kilometres away, and 90 percent from those who are three kilometres away from a school.

In addition to the simulations for different values of school distance reported in Table 5, we also calculated willingness to pay for a school just next door if the initial distance was that observed in our sample. This takes into account the fact that many people already have a school in close proximity to their homes, and for many others, the school is less than one kilometre away. The resulting estimate of the average willingness to pay was Rs 6.48. If this amount is charged from every student as tuition, according to the criterion used in the above analysis it would cover more than 32 percent of running expenditures of a school. If we keep in mind that current primary school system in most of rural Pakistan is almost 100 percent subsidised and severely resource-deficient, and if we also appreciate the fact that charging tuition according to the willingness to pay would not reduce school enrolment, this would look like an achievement.

VI. CONCLUSIONS

The detailed estimates of the willingness to pay for primary education in rural Pakistan presented in this study are based on a rigorously defined theoretical model of the utility-maximising behaviour of the consumer. Unlike the previous studies, the demand function for primary school enrolment estimated for this purpose incorporates total price of education, including opportunity cost. The empirical specification of the utility function, from which this demand function has been derived, allows for estimating income group-specific price elasticities for school enrolment.

At an empirical level, the role of community variables in the demand for education has been explored in far more detail than the previous studies. Moreover, since we have estimated an 'hours worked' equation for the school-age population to estimate the opportunity cost of education, we have been able to find a significant negative relationship between non-labour income and hours worked. This finding provides empirical support to a previously untested though commonly held belief that children from poorer households face a higher opportunity cost of education.

Our estimates of income group-specific price elasticities show that reduction in school enrolment resulting from the introduction of user fees for education at primary level will be most pronounced for the poorest segments of population. These results also indicate the income classes for which this effect will be relatively mild, making it possible to generate at least some revenue through user charges while leaving school enrolment virtually unaffected.

The estimates of willingness to pay for primary education reported in this study demonstrate that this willingness is generally very low in rural Pakistan as compared to the cost of building and operating a school. However, a fraction of the expenditures necessary to run a school can be covered by adopting carefully conceived and planned policies of tapping into this paying potential. Such a policy shift would be an improvement over the system of free education in terms of cost recovery. Nevertheless, the resources hence generated would be far from enough to run a self-sufficient school system.

The main result that emerges from these estimates of price elasticities and willingness-to-pay is that parents in rural Pakistan, where the majority of Pakistan's population lives, can be made to contribute only a small fraction of the cost of their children's education. Most of the resources needed for this purpose will have to be generated from other sources, such as government and donors. A detailed exploration of these possibilities, however, is beyond the scope of this study.

Certain caveats should also be kept in mind while interpreting our estimates of willingness to pay. These estimates do not take into account certain factors that can possibly motivate people to pay for a school even though they may not have school-age children. For example, there might have been some people in the sample who did not have school-age children at the time of the survey but would be willing to pay for a nearby school to ensure its existence at a future time when they would need it. Some people might have been willing to pay for just having the pleasure of a neighbourhood school, while still others would pay to have a school built for the coming generations.[32] Hence it would be more realistic to consider the figures reported in this study as providing a lower bound to the actual willingness to pay for education.

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[32]In the literature, the monetary value attributable to these motives is referred to as option value, existence value, and bequest value, respectively.

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