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Determinants of Dropout and Child School Enrollment: A Case Study from Rural Islamabad

Author(s)
Uzma Naz[1]
Zainab Ejaz[2]
Naveed Khan[3]

Affiliations
[1]Higher Education Commission, Islamabad, Pakistan. Email: unaz@hec.gov.pk
[2]Department of Statistics, Quaid-i-Azam University, Islamabad, Pakistan.
[3]Department of Mathematics, University of Swabi, Pakistan.

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Uzma Naz[1]
Zainab Ejaz[2]
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Abstract

Education is an important pillar for the development of any society. Generally, school enrollment in developing countries is observed very low compared to the developed countries and the situation is further worsened by the high dropout rate. The current study investigates the major factors responsible for high dropouts in Islamabad, Pakistan, particularly in rural areas. For this purpose, the primary data have been obtained through a detailed questionnaire collecting information on child socioeconomic, household, cultural, and other characteristics. For modeling purposes, Probit model is used to investigate the effects of various factors on high child dropout rate. The results revealed that besides the distance from school to home, financial constraints are the most important reason for dropping out. Moreover, the education of father, age of the child and the gender of the child are also highly significant variables that determine the probability of a child dropout.

Keywords: school dropouts; probit; determinants modeling; rural Pakistan.

AMS Classification Codes: 65C20, 65C60, 91G70, 62M20, 62N02

1. Introduction

Education is an act that has an impressionable effect on the mind, character or physical ability of an individual. It is a key to industrialization and modernization and without it, one may not develop socially, politically and economically (Obeng-Denteh & Amedeker, 2011). Education is also equally important to improve the status of

[1] Higher Education Commission, Islamabad, Pakistan. Email: unaz@hec.gov.pk
[2] Department of Statistics, Quaid-i-Azam University, Islamabad, Pakistan.
[3] Department of Mathematics, University of Swabi, Pakistan.

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women and to increase her role in basic leadership within the family (Gouda & Sekher, 2014). Education for the beginners can empower human beings to liberate individual mind from the darkness and ignorance and hence, is a key factor determining whether a country is a developed, developing, or underdeveloped *(*Rabbi, 2007).

A number of cross-country studies suggest that aggregated human capital investment in Pakistan is low relative to other countries of similar per capita income levels, the school enrollment is low, school dropouts are widespread, and there is a distinct gender gap in education (Sawada & Lokshin, 1999; Holmes, 2003). If we take a look at the history of human capital investments in our country, there has been an increase in the government expenditures on education, and in the number of educational institutions. The expenditure has been increased from the below 1% during the decade of 50's to 60's, up to 2.50% in the 2017-18, but it is still below the minimum 4% recommended by United Nation (UN) for all developing countries.

Although many other countries were able to achieve much higher literacy levels in a relatively shorter period, the improvement in Pakistan literacy rate of 58% can be best described as modest. The school enrollment ratios also describe a similar situation. This non-correspondence between the educational institutions, and the resultant output implies that the failure to enlist the participation of the population in education may be because of educational system's inability to attract the students and retain them, until they complete at least primary education. Various supply side problems, such as poor quality of teaching, high cost of schooling and lack of availability/access to schools, when combined with the demand side factors such as, parental and social attitudes world schooling, result into lower enrollment and even lower participation rates (Shami & Hussain, 2006; Burney & Irfan, 1991; Obeng-Denteh & Amedeker, 2011; Latif, Choudhary & Hammayun, 2015; Shaheen, 2007; Kakar, Khilji & Khan, 2011).

Some studies showed that dropout rate was generally higher in rural areas than in urban areas. A comparison of dropout rates across provinces showed the largest gender difference existing for Punjab, where the dropout rates were lower for boys in both rural and urban areas (Hussain, 2005; Sajid & Khan, 2016*)*. Mahmood and Zahid (1992) examined the differentials and gaps in enrollments, educational retention and capacity utilizing at primary and secondary level of schooling by estimating the enrollment and continuation rates. With regard to low continuation ratios, results indicated a gender differential in education.

The effect of income of household, occupation, education and gender of household head on the demand for child schooling have been also studied and were found to be highly significant (Behrman, Khan, Ross & Sabot, 1997; Mansuri, 2006; Tas, Selvitopu, Bora & Demirkaya, 2013; Shahidul & Karim, 2015; Zarif, Haider, Ahmed & Bano, 2014). As the identification of these factors is imperative for policy formulation, the objective of this study is to investigate these factors in micro perspective.

The rest of the article is organized as follows. Section 2 provides information about the data and the methodology used. Empirical evidence on the determinants of the dropouts children are presented in Section 3. The predictive models results are also given in this section. Finally a summary of principal findings and policy recommendations are given in Section 4.

2. Data Source and Methodology

2.1. Data

The present study is based on survey data collected from a rural area in the district Islamabad that covered, 550 children in age cohort 5-18 years. To analyze the determinants of dropout and Child school enrollment, children were grouped into two categories, dropout and continuing students. The interviewed unit in the study was the household, which is defined in the literature as "A group of people who live together with a common budget for food and other essentials of life''. The households were selected and interviewed randomly. Since the study is focused on individual child in a family as unit of observation, one child from each of the household was selected. Questionnaire was designed to obtain the information about the child, as well as family characteristics. It is worth mentioning that the study is based on rural area only, as the problem of school dropout is severe in this region compared to the urban region. People from poor financial background are generally living in rural areas and they often are unable to continue their childrens' schooling.

The questionnaire contained questions on child characteristics, such as age of the child, whether the child is a continuing or dropout student, gender, level of schooling, grade repetition etc. Parent characteristics, such as education level and the household characteristics such as income, occupational status of the household head, number of family members, number of school going age children, and number of dropout children etc., were also covered in the survey. Questions relating to community characteristics, such as school availability, distance from school and quality of teaching were also asked.

2.2. Methodology

As the response variable in our model is of binary nature, and takes discrete values "0" or "1", the ordinary least square (OLS) method is inappropriate, because it suffers from number of drawbacks. Firstly, if OLS model is used, the error term will not follow the normal distribution and will be heteroscedastic. In addition, the estimated probabilities, which must lie between 0 and 1, do not necessarily lie between these limits. They can be negative, as well as greater than 1, thus, having no interpretation.

The most commonly used models for examining the behavior of dichotomous variables are the Probit and Logit models. The Probit model has widespread use in econometrics and we can think of it as an underlying normal variable which when a threshold is crossed, turns into a discrete outcome. On the other hand, the Logit model often favored in epidemiology because it is readily transformed to the odds ratio. To determine the factors affecting dropouts, we used Probit model. To this end, consider a sample of N independently and identically distributed observations of the dummy response variable y_i (i = 1,…, N) and a (p+1)-dimensional vector X_i' of regressor variables including an intercept. The probability that the response variable takes value 1 is estimated as

$$P(y_i = 1|X_i) = F(q_i) = F(X_i'\beta) \quad (1)$$

where β is a (p + 1)-dimensional vector of parameters and $q_i = X_i'\beta$ is a single linear index. The function F maps the single index into [0,1] and satisfies in general

$$F(-\infty) = 0 \quad , \quad F(\infty) = 1 \quad , \quad \frac{\partial F(q)}{\partial q} > 0$$

Within the Probit modeling technique, the cumulative density function (cdf) of the standard normal distribution is used as the transformation function F. The response probabilities are then

$$P(y_i = 1|X_i) = \phi(X_i'\beta) = \int_{-\infty}^{X_i'\beta} \phi(z)dz = \int_{-\infty}^{X_i'\beta} \frac{1}{\sqrt{2}} exp\left(-\frac{1}{2}z^2\right) dz \quad (2)$$

where $\phi(z)$ is the probability density function and $\phi(.)$ is the cdf of the standard normal distribution. Further, the Probit model assumes that the errors are normally distributed. The Probit model is generally estimated through maximum likelihood estimation method, which is also used in our case.

In our case, the response variable is the dropout (DRP) which takes a value of 1 if the child is not studying and 0 otherwise. The

resgressors related to child, household, and community characteristics used in our analysis are listed in Table 1. Other explanatory variables included in the model are various incentives for households that can be considered helpful in minimizing the dropout rate are given in Table 2. These variables are included in the form of dummy variables, and take value 1 if the respondent considers those particular incentives to be most effective towards reducing the dropping out of their child, and 0 otherwise. Note that the selection of the resgressors related to child, household, and community characteristics are based on literature review and looking to the descriptive statistics given in the Section 3.

3. Descriptive Statistics

For the current study, the survey covered 550 children in age cohort 5-18, among which 300 were dropout children and 250 regular students. Distribution of dropouts by household income are presented in Table 3.

Table 1: Explanatory Variables

Labels	Definitions
AGE	Age of the child is included in the form of completed years.
GENDER	The effect of gender specific parameters on the decisions to dropout or to continue is captured by including a dummy variable, which takes value of 1, if the child is a male and 0 otherwise.
GRADEREP	Contains the information about the academic performance of a continuing or dropout student. It is given by a dummy variable, which takes value 1, if the child was repeating the grade and 0, otherwise.
LINCOME	Total income per month of the household is included to examine the effect of resource constraints on the decisions to dropout or to continue schooling.
SORC1	When main source of income of the household is government employment. SORC1 takes the value 1, if income source of the respondent is government employment and 0 otherwise.
SORC2	When main source of income of the households is private employment. SORC2 takes the value 1, if income source of the respondent is private employment and 0 otherwise.
SORC3	When main source of income of the respondent is self-employment. SORC3 takes the value 1, if source of the respondent is self-employment and 0 otherwise.
SORC4	When main source of income of the household is tenuership. This variable also takes the values of 1 and 0, in cases, if source of income is tenuership or not.
EDUFIL	Illiterate father. Takes value 1, if father is illiterate and 0 otherwise.
EDUMIL	Illiterate mother. Takes value 1, if father is illiterate and 0otherwise.

The first explanatory variable is total income of the household per month. To analyze the impact of this determinant, we are taking into

the total income of the household and number of households with dropout children falling in the category. The highest percentage of dropouts lies within the income category of 2000-3000, followed by the category 3000-5000. The dropout rate at the income level of above 7000 is very low, i.e., 10%. This relationship owes to the fact that richer households can afford the education expenses, and do not need the child's participation in household or paid work thus, having a direct income effect.

Table 2: Explanatory Variables for Various Incentives

Label	Definition
INCENEDU	Provision of free education
INCENFINAN	Financial support
INCENTEAC	Good quality of teaching
INCENDIST	Availability of school at a reasonable distance
INCENCUST	Changes in social norms and customs

Table 3: Distribution of Dropouts by Household Income

Households income per month (Rs.)	No. of Households	Percentage (%)
< 1000	2	0.6
1000 < 2000	22	7.3
2000 < 3000	131	43.6
3000 < 5000	127	42.3
5000 < 7000	10	3.3
7000 < 9000	6	2.0
9000 < 11000	1	0.3
11000 < 13000	0	0
> 13000	1	0.3

From Table 5 it is noticed that majority, i.e., 32.3% of the households cited educational problems as the main reason for child's leaving the school. Second, the most important reason cited for dropping out was financial problems. As majority of the children in the sample belongs to poor families with household heads working for daily wage, they cannot afford to educate their children even in the government schools where the cost is almost negligible. Rest of the households cited other reasons such as school being so far away (13.67%), social customs not allowing, particularly in the case of girls, (13%), violence in the classroom (7%), the need for children help at home (6.33%) etc.

The distribution of dropouts by parental education is presented in Table 4. Father is generally household head, so the education level of

father can have important bearing on the education profile of the children. From the table, it is clear that the percentage of households with dropout children decreases from 60.6% percent in case of an illiterate father, to 0.6% where the education level of child father is the highest, i.e., University education. Thus, as the educational level of the father increases, children are less likely to dropout from school. Also education level of mother is negatively related to the dropout. It shows that a large percentage, i.e., 93.6% of the mothers is illiterate. 4.6% are educated up to primary level and only 0.67% are educated above the matric level. This may be a key determinant of children's dropping out from the school as uneducated mothers may not have positive incentive of educating children or may not be providing superior home teaching environment.

Table 4: Distribution of Dropouts by Parental Education

Education Level	Father education		Mother education	
	Number	%	Number	%
Illiterate	182	60.6	281	93.6
Literate	13	4.3	-	-
Primary	52	17.3	15	5.0
Middle	15	5.0	1	0.3
Matric	36	12.0	1	0.3
Higher	2	0.6	2	0.6

Table 5: Distribution of Dropouts by the Reasons of Leaving School

Major reasons	No	Percentage
Financial problems	66	22.0
Domestic workload	19	6.3
Educational problems	97	32.3
Health problems	9	3.0
Violence in classrooms	21	7.0
Distance	41	13.6
Social customs	39	13.0
Training for job	8	2.6

4. Empirical Evidence on the Determinants of Dropouts

In order to highlight the impact of different factors on dropout rates, the relationship was first estimated with explanatory variable: age, gender, parental education level and grade repetition. Later on other variables were also included to examine the changes in overall pattern.

The regression results from the first Probit regression are summarized in Table 6. Since, we cannot interpret the coefficients from the output of a Probit regression directly, we have given the marginal effects of the regressors in the same table that describes how much the (conditional) probability of the outcome variable changes when we change the value of a regressor, holding all other regressors constant at some values. From the table we can see that gender has the most significant impact in the reducing dropout rates.

The estimated coefficient for the marginal effect of the gender indicates that male child is 64% less likely to dropout than female indicating female will be expected to obtain less education than the male student. This result points towards the traditional gender bias towards female education. The age coefficient is positive and statistically significant. It shows that with an increase in age, a child is 31% more likely to dropout. This relation between age and dropout can be resulted of two factors. Firstly, with an increase in child's age the opportunity cost also increases thus, resulting in higher dropouts. Secondly, the cost that associated with child schooling also increases as child proceeds to higher grades or in case, repeats the grade thus, the parents find it difficult to continue the child's schooling. As expected, household income is negatively and significantly, related with dropout rate. The results suggest that as income increases, it is 60% less likely that the child will dropout from school. Our descriptive statistics also confirms that the majority of dropout children belongs to lower in-come households, while the lowest percentage, i.e., only 1%, of the dropout lies with the highest income group. Parent's characteristics are critical in determining whether the child will continue schooling or not.

Results suggest that the children whose father has never attended the school are 36% more likely to dropout that the children with educated father. The results also show a positive relationship between dropout rate and illiterate mothers, however this is not statistically significant. These results confirm the important complementary between the educations of the parents and child schooling. It is generally expected that grade repetition enhances the probability of dropping out from school. The result indicates a positive and significant relationship between dropout rates and grade repetition. It shows that the children who are repeating grade are 28% more likely to dropout than the children who are not.

Table 6: Summary Statistics for Probit Regression

Explanatory Variable	Marginal Effect	Std. Error	t-stat
Constant	0.204	1.766	(0.116)
GEND	-0.640	0.196	(-3.252)***
AGE	0.314	0.042	(7.425)***
LINCME	-0.605	0.278	(-2.994)**
EDUFIL	0.367	0.199	(1.834)*
EDUMIL	0.261	0.292	(0.893)
GRADEREP	0.287	0.277	(1.262)*

Note: *p<0.1; **p<0.05; ***p<0.01

The Probit model with additional explanatory variables like fathers employment, provision of free education, financial support, school distance and changes in social norms and customs are reported in Table 7. To see the parabolic effect of age, the squared age (Age2) is also introduced in the model. The parabolic affect turned to be an important variable in this kind of study. Generally, the probability of school dropout is very high in the initial years. It reduced with the increase in age when a child reach to a certain age, however it increases again as the child crossed a certain age. It is evident from the table that inclusion of additional variables has increased the significance of income and education level of the fathers, however as expected the magnitudes of some coefficients, such as gender and mother's education have slightly decreased.

The regression results show that the coefficient of gender is negatively related to dropout rate, and is statistically significant at 5% level of significance. It implies that as income increases, there is 57% less probability that the child will be dropout from the school. It is to be noted that estimated coefficients of age variables imply that with increase in the age, a child is 36% more likely to dropout, but this result is not statistically significant as noticed before. This may be because of the strong effect of the other variables included in the regression. Age2 gives a concave probability profile for the age of the child on the dropping out. It implies that the probability of dropping out increases, at a decreasing rate as age increases.

Household income is negatively and significantly related to probability of dropping out. With an increase in income, a child is 91% less likely to dropout. The overall pattern of the illiteracy of father on dropouts appears to be similar as in the preliminary regression.

Table 7: Summary statistics for extended Probit Regression

Explanatory Variable	Marginal Effect	Std. Error	t-stat
Constant	3.285	4.187	(0.7874)
GEND	-0.576	0.253	(2.270)***
AGE	0.360	0.465	(0.775)
AGE2	0.003	0.015	(0.022)
LINCME	-0.9142	0.276	(-3.309)***
SORC1	-0.2461	0.677	(-0.364)
SORC2	-0.143	0.675	(-0.212)
SORC3	-0.727	0.712	(-1.021)
SORC4	-0.012	0.697	(-0.014)
EDUFIL	0.678	0.253	(2.679)***
EDUMIL	0.069	0.355	(-0.196)
INCENEDU	-2.096	0.430	(-4.871)***
INCENFINAN	-0.780	0.473	(-1.647)
ICENDIST	-1.392	0.429	(-3.239)***
ICENTEAC	-0.070	0.532	(-0.133)
ICENTCUST	0.800	0.569	(1.407)
GRADEREP	0.352	0.295	(1.192)

Note: *p<0.1; **p<0.05; ***p<0.01

The estimated coefficient indicates that children with uneducated fathers, are 67% more likely to dropout as compared to 36% in the earlier model. However, the estimated coefficient of mother's literacy is insignificant. The household employment status is considered to be strongly associated with child schooling. Employment status, such as landowner and self-employed, is expected to increase the dropout rates, perhaps, because it increases the opportunity cost of the schooling, as there is a need for child's work at farm or in the family enterprise. But our results are in sharp contrast to this, as they show a negative relationship with these variables. For example, it shows that employment status of the household head when self-employed will decrease the probability of dropping out by 72%, ceteris paribus. It is also evident from the results that if a household head is a government or private employee, it will lower the probability of dropping out by 24 and 14 percent, respectively, while the other things remaining the same.

In the extended regression we have also included incentives as explanatory variables to capture the impact of policy measures on parent's decision about child schooling. These included free education, financial support and better quality of teaching. These incentives, if

provided to households, can lower the incidence of dropouts, in their opinion. The results suggest provision of free education, and of a school at reasonable distance to be the most significant variables. The strongest effect on reducing the dropout is coming from these two variables. These can decrease the probability of dropping out to 209% and 139%, respectively, thus turning out to be first two most important variables for reducing the dropout rates. The provision of some financial support to parents can help dropouts decrease by 78%, keeping all other things the same. These points towards the crucial importance of the supply side measures to be taken to minimize the dropouts, a step which is consistently highlighted by the development researchers and practitioners. The grades repetition variable is estimated to be positively related to dropout rate as before, but is not significant, may be because of strong impact of other variables on dropouts.

5. Conclusions

The purpose of the study was to investigate the role of the factors predicting the household's decision to continue or discontinue their child's schooling. Supply side factors such as a reduction in school expenditure by the provision of free education and reduction in the distance from school were found to be the most strongly related factor with dropout rates. Various demand side factors such as income of the household, education level of the father and gender of the child, were also found to be significant. Our results suggest that age, and illiteracy of the household head, to be positively related to the dropout rate. With the increase in age, opportunity cost of schooling in the form of forgone income also increases, resulting in higher probability of dropping out. The literacy of the father is related positively with the dropout rate, which suggests an inter-generational transfer of illiteracy. The education of mother however, has no significant impact on dropping out, perhaps because of the fact that households are usually headed by male member in the rural settings of Pakistan.

These findings have several policy implications. It is imperative that the government must ensure the free provision of education in order to reduce the parental expense on education. This would be a step towards increasing the enrollment and lowering the dropout rate because the major obstacle in child education, in most of the cases, is high educational cost. These motivational measures should be combined with improvement in quality of teaching that can help reduce the dropout rates.

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