

# What Criteria Should Policy-makers Use for Assisting Households with Educational Expenditure? The Case of Urban Bangladesh

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## Abstract

Low household expenditure on education compromises the learning and future labour market prospects of children. This study provides an empirical framework for determining the criteria that South Asian policy-makers can use for assisting households with educational expenditure. A case study of urban Bangladesh using tobit and hurdle regression models indicate that households in the bottom two per capita quartiles should receive priority as recipients of policy assistance. Other criteria include households with parents who have not completed primary schooling and households with boys, older children and multiple children of school-going age.

**JEL: I21, I22, I28, O53**

## Keywords

Economics of education, hurdle model, Bangladesh

## Introduction

Unlike in industrialized countries, tax systems in South Asia are not well developed, and property and income taxes are not systematically collected or available to finance education. Consequently, households directly finance their children's education by paying schools for tuition, fees, supplies, uniforms and transportation (Tsang, 1994). Because low household educational expenditure may compromise children's educational outcomes, policy-makers have begun

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assisting low-spending households using a range of interventions, such as cash stipends, tuition waivers and fee reduction initiatives (Das, 2005). The enthusiasm in policy circles about such interventions is partly attributable to the success of programmes such as Mexico Oportunidades cash transfer programme (which paid cash to households for enrolling children in school) in raising educational attainment and has provided optimism on the impact of policy assistance towards household educational expenditure (Schultz, 2004).

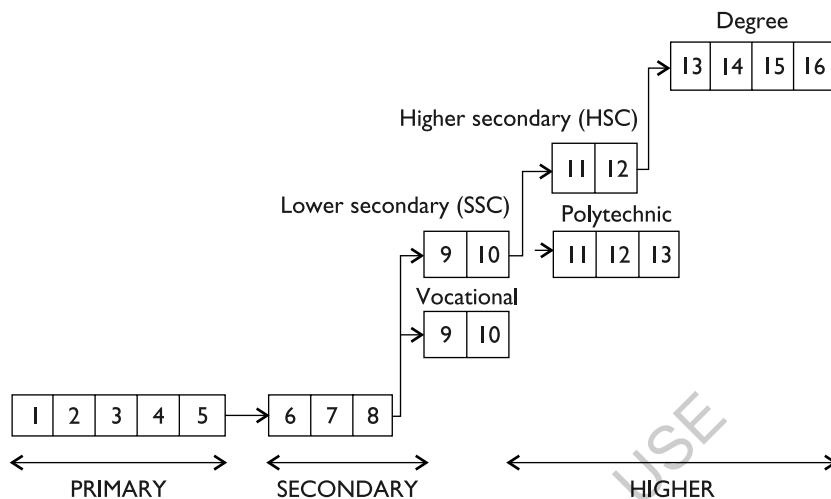
There are challenges with assisting households with educational expenditure, however. In particular, there are efficiency concerns because of targeting households who do not require assistance, or not targeting household who do require assistance; such efficiency losses from ineffective targeting are especially problematic in developing countries facing severe resource constraints. Following recent advances in the empirical methods for analyzing household educational expenditure (Aslam & Kingdon, 2008; Kingdon, 2005), this article examines the determinants of household educational expenditure in urban Bangladesh, and proposes the criteria for efficiently providing policy assistance with educational expenditure. The analysis serves as a model for other South Asian countries that are seeking to improve educational outcomes by assisting households with educational expenditure.

The rest of the article is structured as follows. The second section provides a brief background of the Bangladesh economy and education system. The following section presents the conceptual model of household educational expenditure, and a description of the empirical methodology. The fourth section describes the data and the fifth section presents the summary statistics and estimation results. The last section concludes with a discussion of policy implications.

## Country Background

In the year 2000 (the year the data was collected), the population of Bangladesh was approximately 140 million, with purchasing power parity-adjusted annual gross domestic product (GDP) per capita of US\$ 1,851 and unadjusted annual GDP per capita of US\$ 370. Annual growth rates in per capita income accelerated from about 1.6 per cent per annum in the first half of the 1980s to 3.6 per cent by the later half of the 1990s, and to 5 per cent from the late 1990s to the early 2000s (The World Bank & Asian Development Bank, 2003a). A booming export-oriented ready-made garments industry and a slowdown in population growth were credited with the improvements in economic growth rates. Poverty, however, remained a major concern in Bangladesh as 54 million were categorized as poor. Over 9.3 million of the residents of urban Bangladesh (or 36.6 per cent of all urban residents) were categorized as poor (*ibid.*, p. 4).

The education structure of Bangladesh, as illustrated in Figure 1, involves five years of primary school, five years of secondary school, two years of upper



**Figure 1.** Structure of the System of Education and Training in Bangladesh

**Source:** The World Bank (2000).

**Note:** The numbers in boxes denote the year of education.

secondary school and three or four years of higher education. There are national-level examinations at the end of secondary and higher secondary levels. Those who complete 10 years of schooling and the secondary-level examinations receive a Secondary School Certificate, and those who successfully complete twelve years of schooling and the higher secondary examinations receive the Higher Secondary School Certificate. Of the national school-going population in 2000, 85 per cent of school-going children attended government-run primary, secondary and higher secondary schools. The remaining 15 per cent of school-going children attended private schools (7 per cent), Islamic schools (4 per cent) and non-governmental organization (NGO)-run schools (4 per cent).

Education in Bangladesh at the primary, secondary and higher secondary levels is highly centralized in policy and planning. Public spending on education as percentage of GDP steadily increased from 0.9 per cent in 1973 to 2.21 per cent in 2000. By educational level, public expenditure per student in 2000 was \$13 for primary school, \$27 for secondary school and \$155 for higher education (The World Bank & Asian Development Bank, 2003b).

Table 1 presents the percentage of out-of-school population in the 11 to 19 years of age group that has completed primary schooling. From 1991–1992 to 2000, the national proportion with primary education jumped from 44 per cent to 56 per cent. This rise reflected the broad emphasis on educational expansion by the Government of Bangladesh and NGO community. Critics argue, however, that the expansion came at the cost of quality such as the deterioration of school facilities and quality of teachers (CAMPE, 1999).

**Table 1.** Percentage of Out-of-School Population in the Age Group of 11–19 Years that Has Completed Primary School, 2000

	1991–1992			2000		
	All Regions (%)	Rural (%)	Urban (%)	All Regions (%)	Rural (%)	Urban (%)
All genders	44	41	62	56	54	63
Boys	46	42	65	53	51	61
Girls	42	39	59	59	57	64

**Source:** The World Bank and Asian Development Bank (2003a).

Table 1 also reflects the disparity in gains made by rural and urban areas. From 1991–1992 to 2000, the rate increased from 41 per cent to 54 per cent in rural areas. In contrast, the rate in urban Bangladesh increased from 62 per cent to just 63 per cent. While the more modest change in urban areas may be attributed to higher rural–urban migration, there are policy factors at play. In particular, the substantial rise in rural attainment reflects a series of interventions that assisted rural households with educational expenditure. At the primary level, the Food for Education Programme provided wheat grants to the poorest 80 per cent of the rural population in exchange for school attendance. At the secondary level, the Female Secondary School Assistance Program provided rural females of school-going age a cash stipend. Both interventions have been found to increase educational attainment in rural areas (Arends-Kuenning & Amin, 2004; Ravallion & Wodon, 2000). The remainder of this article addresses a specific policy intervention, that is, assisting household educational expenditure, for increasing *urban* educational attainment.

## Conceptual Model and Methodology

The seminal contributions of Gary Becker on human capital investment in children suggest that household educational expenditure is determined by utility maximization framework (Becker, 1991). The large body of empirical research on household demand for education typically considers several child, household and community characteristics.<sup>1</sup>

Relevant child characteristics that determine household educational expenditure include age and gender. A child's age matters because educational expenditure increases gradually because of greater costs associated with educational attainment, such as tuition, fees, transportation and private tutoring. The gender of a child matters because of differences in anticipated labour market returns to education by gender, which in turn affects the household's willingness to spend on education by gender. Since labour market discrimination against females persists in Bangladesh, the monetary returns for households from educating males are greater than the returns from educating females. Furthermore, households retain a

smaller proportion of girls' future earnings (relative to boys' future earnings) because girls, typically, contribute to their husband's household. Despite the lower monetary benefits of investment in girls' education, the educational attainment of girls exceeds the educational attainment of boys in urban Bangladesh (Shafiq, 2009). The analysis in this study addresses a potential explanation for this pro-female decision: Households spend less for girls than boys and are, therefore, able to offset the lower monetary benefits.<sup>2</sup>

Among household characteristics, a consistent finding is that income or socio-economic status is a major determinant of household investment in children's education. Assuming that parents are altruistic, higher income should facilitate greater educational expenditure. Parental education is acknowledged as another key determinant of household investment in children's education. Holding all else constant, paternal and maternal education are positively associated with larger spending on education. Possible reason for this relationship is that more educated parents have a greater appreciation for children's education. A demographic factor that affects the households' decisions is the presence of other school-age children in the household. In general, a larger number of boys and girls makes it harder for households to support the education of all children; therefore, the presence of other children in the household is likely to have a negative effect on educational expenditure. The last household characteristic considered is whether the household is Muslim. In general, there are differences in household behaviour towards education across religious orientation in most societies.

In terms of empirical methodology, this study adopts the tobit model and hurdle model (for a discussion of methodologies for analyzing household expenditure on non-educational items, see Cameron & Trivedi, 2009, pp. 521–551; Deaton, 1997, p. 282). According to a tobit model of educational expenditure, zero educational expenditure is interpreted as a left-censored variable that equals zero. In other words, the dependent variable,  $educexpend_i$ , is only observed when  $educexpend_i > 0$ . The validity of the tobit model of household educational expenditure depends on whether its two key assumptions hold: normality and homoscedasticity. If these assumptions do not hold, then the tobit model makes nonsensical predictions such as negative educational expenditure.

A better alternative is the hurdle model (sometimes referred to as the two-part model). Unlike the tobit model, the hurdle model does not require the assumptions of homoscedasticity and normality for consistency. The hurdle model of household educational expenditure has two parts (Kingdon, 2005). The first part is a binary outcome equation that models the probability of positive expenditure or  $\Pr(educexpend_i > 0)$  using a probit model;  $educexpend_i = 0$  implies that educational expenditure on child  $i$  is zero and that the child is not enrolled in school. In contrast,  $educexpend_i > 1$  implies that educational expenditure on child  $i$  is greater than zero and that the child is enrolled in school. The second part of the hurdle model involves linear regression to model  $E(\ln educexpend_i | educexpend_i > 0)$ , which is regressing educational expenditure conditional on positive educational expenditure. Because there are no obvious exclusion restrictions, the two parts are

assumed to be independent and estimated separately. It is further assumed in this study that the same set of explanatory variables affect both parts.<sup>3</sup> Since the distribution of educational expenditure is non-normal, the dependent variable for the tobit model and second part of the hurdle model is the natural log of educational expenditure on child  $i$ .<sup>4</sup>

## Data

The data for this study comes from the Bangladesh Household Income and Expenditure Survey 2000, henceforth referred to as HIES 2000. The HIES 2000, conducted in the year 2000, was a joint project of the Bangladesh Bureau of Statistics and the World Bank. The nationally representative HIES 2000 is based on the traditional World Bank Living Standards Measurement Surveys, with detailed person and household-level information for urban areas.

The HIES includes child-level data on annual expenditure on the following educational items: tuition, fees, books and supplies, uniforms, private tutoring, transportation, donations and miscellaneous items; in recent years, a growing share of national household surveys includes such information. The dependent variable of interest is annual household expenditure for child  $i$ , and is calculated as the sum of annual expenditure on tuition, fees, books, supplies, uniforms, private tutoring, transportation, donations and miscellaneous items for child  $i$ . These expenditure values have been converted from 2000 Bangladeshi takas to US dollars (such that 1 US dollar = 52.40 takas). For any given child  $i$ , the value for educational expenditure varies from zero to some positive amount. As mentioned earlier, the distribution of educational expenditure is non-normal, and therefore converted to natural logs. The sample consists of children in the 6 to 17 years of age group because 6 is the age when children are socially encouraged to begin primary schooling, and 17 is the age when children are expected to finish upper secondary school. Educational expenditure on higher education is not considered because those over the age of 17 years leave home to attend colleges and universities, and the HIES does not collect educational expenditure on members no longer residing in the household.

The child-level explanatory variables include *male* (dummy variable which is 1 if child is male, 0 if female), *age* (in years) and *agesquared*. The household-level explanatory variables include *incquartile1* (dummy variable which is 1 if child belongs to the poorest per capita income quartile, 0 otherwise), *incquartile2* (dummy variable which is 1 if child belongs to the lower middle-income per capita income quartile, 0 otherwise), *incquartile3* (dummy variable which is 1 if child belongs to the upper middle-income per capita income quartile, 0 otherwise), *incquartile4* (dummy variable which is the reference category, 1 if child belongs to the poorest per capita income quartile, 0 otherwise), *fatheredu* (dummy variable which is 1 if the father completed primary education or more, 0 otherwise),

*motheredu* (dummy variable which is 1 if the mother completed primary education or more, 0 otherwise), *otherboys* (the number of other school-age boys in the household other than child *i*), *othergirls* (the number of other school-age girls in the household other than child *i*) and *muslim* (dummy variable which is 1 if the household is Muslim, 0 if some other religion such as Hindu, Christian, Buddhist or animist). Finally, a series of regional controls are included signifying the household's divisional location (divisions in Bangladesh are comparable to states in the US).

Several determinants of household educational expenditure cannot be included because of data limitations. Expected labour market rates of returns and discount rates were not elicited and therefore cannot be considered in the analysis. Finally, foregone child labour earnings cannot be considered in the analysis because data on prevailing child wage rates in urban areas were not collected.

## Results

Table 2 presents the descriptive statistics—means and standard deviations—of the dependent and explanatory variables for a sample of children in the 6 to 17 years of age group. The descriptive statistics in Column 1 are computed using the sample of all children (regardless of household's educational expenditure). The descriptive statistics in Column 2 are computed using the sample of children on whom households spend nothing (suggesting that the children are not enrolled in school). Lastly, the Column 3 statistics are obtained using the sample of children on whom households spend a positive amount (indicating that the children are enrolled in school). The Column 1 figures serve as the baseline for comparing the figures in Columns 2 and 3. According to the sample of all children (that is, children on whom parents spend zero or positive amounts), the school enrolment rate in urban Bangladesh is 69.2 per cent.

Table 2 indicates that there are substantial differences between children on whom households spend nothing on education (Column 2) and children on whom households spend a positive amount (Column 3). Boys (*male*) comprise a larger share of unenrolled children (55.1 per cent) than girls among children on whom households spend zero; this reflects pro-female school enrolment gaps in urban Bangladesh. Among households spending a positive amount, about half (49 per cent) of the children are boys. The average age (*age*) among children on whom households spend zero is higher (12.2 years) than children on whom households spend a positive amount (11 years), which is consistent with the phenomenon that school enrolment rates fall with age because of greater direct costs and opportunity costs.

According to the descriptive statistics of household characteristics in Table 2, a large share (39.4 per cent) of children on whom zero is spent belong to a household in the poorest quartile (*incquartile1*). Regarding parental education, children

**Table 2.** Descriptive Statistics for Sample of Children in the 6–17 Years of Age Group in Urban Bangladesh, 2000

	Column 1	Column 2	Column 3
	All Children	Zero Expenditure (or Unenrolled) Children	Positive Expenditure (or Enrolled) Children
<i>enroll</i>	0.692 (0.462)	0.000 (0.000)	1.000 (0.000)
<i>expenditure</i> (takas)	39.61 (83.54)	0.00 (0.00)	57.22 (95.27)
<i>Ln expenditure</i>	0.418 (4.069)	-5.100 (0.000)	2.870 (2.080)
<i>male</i> (dummy)	0.509 (0.499)	0.551 (0.497)	0.490 (0.500)
<i>age</i> (in years)	11.35 (3.30)	12.17 (3.59)	10.99 (3.10)
<i>age2</i>	139.93 (75.95)	160.97 (83.00)	130.56 (70.62)
<i>incquartile1</i> (dummy)	0.248 (0.432)	0.394 (0.488)	0.183 (0.387)
<i>incquartile2</i> (dummy)	0.250 (0.433)	0.275 (0.446)	0.239 (0.426)
<i>incquartile3</i> (dummy)	0.249 (0.433)	0.166 (0.372)	0.287 (0.452)
<i>incquartile4</i> (dummy)	0.251 (0.433)	0.163 (0.370)	0.289 (0.453)
<i>fatheredu</i> (dummy)	0.442 (0.496)	0.194 (0.396)	0.552 (0.497)
<i>motheredu</i> (dummy)	0.365 (0.481)	0.116 (0.321)	0.475 (0.499)
<i>otherboys</i>	0.844 (0.875)	0.909 (0.915)	0.815 (0.855)
<i>othergirls</i>	0.836 (0.937)	0.837 (0.910)	0.836 (0.949)
<i>muslim</i> (dummy)	0.931 (0.252)	0.956 (0.203)	0.920 (0.270)
Number of observations	3,749	1,154	2,595

**Source:** Bangladesh Bureau of Statistics (2000).

**Notes:** (i) Standard deviations are in parentheses.

(ii) *incquartile1* refers to the poorest per capita income quartile; *incquartile2* refers to those in the lower middle-income quartile; *incquartile3* belong to the upper middle-income quartile; *incquartile4* refers to the richest per capita income quartile.

(iii) *fatheredu* is 1 if the child's father completed primary education, and 0 otherwise; *motheredu* is 1 if the child's mother completed primary education, and 0 otherwise.

on whom a positive amount is spent have significantly more educated parents (*fatheredu* and *motheredu*) than children on whom nothing is spent. As for demographic factors and competition for households' funds, the number of boys (*otherboys*) that reside with child *i* is slightly higher for children on whom parents



spend zero (0.9 boys per household) than for children on whom parents spend a positive amount (0.8 boys per household). In contrast, there is no difference in the number of other girls (*othergirls*) between children on whom households spend zero and on whom households spend a positive amount. Finally, children from Muslim households (*muslim*) are slightly over-represented in zero expenditure group (95.6 per cent) compared to the positive expenditure group (92.0 per cent).

Table 3 presents the tobit and hurdle model estimation results using the sample of children in the 6 to 17 years of age group in urban Bangladesh. Where relevant, brief discussions of the differences in the tobit and hurdle model results are provided to illustrate the nuances in policy implications.

The negative and statistically significant *male* (dummy) coefficient in the tobit model indicates that households are less likely to spend on boys' education, holding all else constant. The hurdle model reveals that households are less likely to spend a positive amount on boys (or enrol boys), but once the decision has been made to spend on boys (or enrol boys), households do not discriminate between boys and girls with respect to educational expenditure. The findings suggest that households may need additional encouragement from campaigns to enrol boys in schools. The positive and statistically significant *age* coefficients in the tobit model and both stages of the hurdle model indicate that household educational expenditure increases with a child's age. A comparison of coefficient sizes across the models reveals that the tobit model coefficient for age is considerably higher than the hurdle model coefficients. Nonetheless, both models suggest that households with older children require greater support with educational expenditure.

With regard to income quartiles, the omitted group, and therefore reference group, is *incquartile4* or the richest group. The negative, statistically significant and larger coefficients on lower per capita quartiles in Table 3 indicate that poorer households are likely to spend less on children's education than the richest households in urban Bangladesh. The statistically significant *incquartile1* and *incquartile2* coefficients for tobit model show that the poorest households and lower middle-income households spend less on their children's education than the richest households, holding all else constant. The hurdle model's *incquartile3* coefficient reveals that upper middle-income households spend less than the richest households. Moreover, the hurdle model results for *incquartile3* reveal that upper middle-income households are more likely to enrol their children than the richest households, but once enrolled, spend less than the richest households. The statistically insignificant coefficient for *incquartile3* from the tobit model indicates that the two opposing effects cancel each other out. Thus, the tobit model would miss the fact that upper middle-income households may need assistance with educational expenditure.

The *fatheredu* and *motheredu* coefficients in the tobit and hurdle models in Table 3 show that having educated fathers and mothers increases household educational expenditure in urban Bangladesh, holding all else constant. Consistent with the worldwide literature, having an educated mother matters more than

**Table 3.** Tobit and Hurdle Model Estimation Results of Household Educational Expenditure in Urban Bangladesh for Children in the 6–17 Years of Age Group, 2000

	Tobit Model	Hurdle Model	
		Part 1 (Probability of Positive Expenditure)	Part 2 (Linear Regression Conditional on Positive Educational Expenditure)
<i>male</i> (dummy)	-0.487** (0.157)	-0.163** (0.048)	0.016 (0.065)
<i>age</i> (in years)	2.292** (0.181)	0.597** (0.054)	0.513** (0.077)
<i>age2</i>	-0.108** (0.007)	-0.030** (0.002)	-0.014** (0.003)
<i>incquartile1</i> (dummy)	-3.263** (0.262)	-0.475** (0.077)	-2.284** (0.115)
<i>incquartile2</i> (dummy)	-1.479** (0.238)	-0.098 (0.074)	-1.554** (0.100)
<i>incquartile3</i> (dummy)	-0.108 (0.222)	0.135* (0.075)	-0.715** (0.088)
<i>fatheredu</i> (dummy)	1.897** (0.196)	0.549** (0.060)	0.217** (0.080)
<i>motheredu</i> (dummy)	2.583** (0.207)	0.815** (0.068)	0.317** (0.083)
<i>otherboys</i>	-0.018 (0.092)	0.001 (0.027)	-0.093** (0.039)
<i>othergirls</i>	0.043 (0.084)	0.026 (0.026)	-0.071** (0.034)
<i>muslim</i> (dummy)	-0.824** (0.307)	-0.269** (0.104)	-0.059 (0.121)
Regional dummies	Yes	Yes	Yes
Constant	-11.266** 1.059	-2.247 0.319	0.363 0.450
Pseudo R-squared/ R-squared	0.068	0.215	0.373
Number of observations	3,749	3,749	2,595

**Source:** Bangladesh Bureau of Statistics (2000).

**Notes:** (i) Standard errors in parentheses.

(ii) \*indicates statistical significance at the 5% level and \*\*indicates statistical significance at the 1% level.

(iii) *incquartile1* refers to the poorest per capita income quartile, *incquartile2* refers to those in the lower middle-income quartile, *incquartile3* belongs to the upper middle-income quartile and *incquartile4* is the omitted category and refers to the richest per capita income quartile.

(iv) *fatheredu* is 1 if the child's father completed primary education, and 0 otherwise; *motheredu* is 1 if the child's mother completed primary education, and 0 otherwise.

having an educated father (Glewwe & Kremer, 2006). The hurdle model shows that having educated parents improves the likelihood of enrolment and expenditure. The tobit and hurdle model coefficients for *otherboys* and *othergirls* in Table 3 provide contrasting results on the effects of other school-age boys and girls. The

statistically insignificant coefficients from the tobit model suggest that the presence of other children does not affect household educational expenditure decisions. The negative and statistically significant coefficients in the second part of the hurdle model, however, indicate that the presence of more girls, and especially more boys, takes away from the spending towards a particular child.

Finally, holding all else constant, both the tobit and hurdle models in Table 3 show that children from Muslim households are disadvantaged, holding all else constant. The negative and statistically significant *muslim* coefficient from the tobit model indicates that Muslim households spend less on education. The statistically insignificant coefficient from the first part of the hurdle model suggests that there are no differences between Muslim and non-Muslim households while making the enrolment decision. In contrast, the negative and statistically significant coefficient from the second part indicates that Muslim households spend less than non-Muslim households, conditional on positive expenditure.

## Policy Implications

This study used tobit and hurdle models as a part of an empirical framework for determining the criteria that policy-makers should use for assisting households with assistance such as cash transfers, tuition waivers and fee reductions in urban Bangladesh. The sizes of the coefficients in the tobit and hurdle models suggest that the main criteria for policy assistance in urban Bangladesh should be per capita income, especially for households in the bottom two per capita quartiles and to a lesser extent, those in upper middle-income quartile. The second most important criterion is households where parents have not completed primary schooling. The results further suggest assisting households with boys, older children and several children of school-going age. In addition, policy-makers should consider informational campaigns encouraging Muslim households to spend more on their children's education; for example, informational campaigns can emphasize the value placed on education by the Quran (Halstead, 2004). Using these criteria to target policy assistance for household expenditure is likely to be an efficient approach for increasing children's educational attainment and future labour market outcomes. Future studies of other South Asian regions can aid policy-makers with identifying households most in need of assistance with educational expenditure.

Lastly, it is worth noting that the focus on assisting households should not take away the efforts on improving educational quality. By assisting households with educational expenditure, policy-makers indirectly support school quality because money received by households is then transferred to schools. In other words, the additional household educational expenditure can help improve school quality because schools receive a share of that household expenditure in the form of tuition, fees and other funds; schools will then use the additional funds for

improving facilities and staff compensation. Therefore, the methodology of this study can provide insight into achieving the twin policy objectives of increasing educational attainment and school quality in South Asia.<sup>5</sup>

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### Notes

1. For a recent survey on the determinants of household demand for schooling in developing countries, see Glewwe and Kremer (2006).
2. Asadullah (2006), for example, reports that the rate of return for an additional year of education is higher for females (13.2 per cent) than males (6.2 per cent). These estimates only imply that there are returns from being a more educated female than a less educated female; the estimates do not imply that educated females earn more than educated males.
3. The formulation changes slightly if the two parts involve different regressors; see Cameron and Trivedi (2009) for a discussion. The hurdle model assumes that after holding all regressors constant, households with positive educational expenditure are randomly selected from the population. It can be argued, however, that households who spend positive amounts on education have unique characteristics from households who do not enrol. Consequently, there is sample selection bias from the use of a hurdle model, similar to the sample selection bias recognized by Heckman (1979) in female labour force participation decisions. The selection model assumes that the first part of the decision on whether to spend on education (that is, probability of positive expenditure) is independent from the second part of actual amount of educational expenditure. In the case of household educational expenditure, there is no intuitive possibility for a variable, particularly a variable that would have a significant impact on the probability of selection. Since the selection model of household educational expenditure is impractical for most cases, it is not considered in this study.
4. Since there is no value for  $\ln$  expenditure when expenditure = 0, it is necessary to value the lower limit expenditure at a small non-zero value. An acceptable lower-level expenditure value such as US\$ 0.01 yields a  $\ln$  expenditure value of  $-4.61$ .
5. The caveat is that the government must not take away funds from schools to fund interventions that help households with educational expenditure.

### References

- Arends-Kuenning, M. & Amin, S. (2004). School incentive programs and children's activities: The case of Bangladesh. *Comparative Education Review*, 48(3), 295–317.
- Asadullah, M.N. (2006). Returns to education in Bangladesh. *Education Economics*, 14(4), 453–468.
- Aslam, M. & Kingdon, G. (2008). Gender and household education expenditure in Pakistan. *Applied Economics*, 40(20), 2573–2591.

- Bangladesh Bureau of Statistics (2000). *Household Income and Expenditure Survey 2000*. Dhaka, Bangladesh: Bangladesh Bureau of Statistics in association with The World Bank. CD-ROM.
- Becker, G. (1991). *The demand for children, in treatise on the family*. Cambridge, MA: Harvard University Press.
- Cameron, A. Colin & Trivedi, Pravin (2009). *Microeconometrics using Stata*. College Station, TX: Stata Press.
- CAMPE (1999). *Hope not complacency: State of primary education in Bangladesh*. Dhaka, Bangladesh: The University Press Limited.
- Das, J. (2005). Reassessing conditional cash transfer programs. *World Bank Research Observer*, 20(1), 57–80.
- Deaton, A. (1997). *The analysis of household surveys: A microeconomic approach to development policy*. Baltimore, MD: Johns Hopkins University Press.
- Glewwe, P. & Kremer, M. (2006). Schools, teachers, and education outcomes in developing countries. In Eric Hanushek & Finis Welch (Eds), *Handbook of the economics of education* (Vol. 2, pp. 945–1017). Amsterdam: North Holland.
- Halstead, J. Mark (2004). An Islamic concept of education. *Comparative Education*, 40(4), 517–529.
- Heckman, J. (1979). Sample selection bias as a specification error. *Econometrica*, 47(1), 153–161.
- Kingdon, G. (2005). Where has all the bias gone? Detecting gender bias in the intrahousehold allocation of educational expenditure. *Economic Development and Cultural Change*, 53(2), 409–451.
- Ravallion, M. & Wodon, Q. (2000). Does child labor displace schooling? Evidence on behavioral responses to an enrollment subsidy. *Economic Journal*, 110(462), C158–C175.
- Schultz, T.P. (2004). School subsidies for the poor: Evaluating the Mexican Progresa Poverty Program. *Journal of Development Economics*, 74(1), 199–250.
- Shafiq, M. Najeeb (2009). A reversal of educational fortune? Educational gender gaps in Bangladesh. *Journal of International Development*, 21(1), 137–155.
- The World Bank (2000). *Bangladesh education sector review*. Dhaka, Bangladesh: The University Press Limited.
- The World Bank & Asian Development Bank (2003a). *Poverty in Bangladesh: Building on progress*. Dhaka, Bangladesh: The World Bank & Asian Development Bank.
- (2003b). *Bangladesh: Public expenditure review*. Dhaka, Bangladesh: World Bank & Asian Development Bank.
- Tsang, M. (1994). *Cost analysis of educational inclusion of marginalized populations*. Paris: IIEP, UNESCO.