# Household Schooling and Child Labor Decisions in Rural Bangladesh

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Abstract: Using empirical methods, this paper examines household schooling and child labor decisions in rural Bangladesh. The results suggest the following: poverty and low parental education are associated with lower schooling and greater child labor; asset-owning households are more likely to have children combine child labor with schooling; households choose the same activity for all children within the household, regardless of gender; there is a weak association between direct costs and household decisions; finally, higher child wages encourage households to practice child labor.

JEL codes: C35, D19, I29, J13

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## 1. INTRODUCTION

A household's schooling and child labor decisions have several implications for the household itself and society. By not enrolling children in school, a household prevents itself and its children from benefiting from higher earnings (associated with educational attainment) in the future; for a poor household, this diminishes its chances of escaping the vicious cycle of poverty (Ljungqvist, 1993). Not enrolling children in school also inhibits a household and its children from enjoying the non-pecuniary benefits of schooling, such as improvements in patience, risk management skills, and health (Becker and Mulligan, 1997; Sander, 1995). From a society's perspective, lower school enrollment undermine social cohesion, diminish political participation, encourage crime, and lessen numerous other social benefits from having an educated populace (Behrman and Stacey, 1997). A household's decision to practice child labor may expose its child laborers to physical injury and other health problems (Beegle, Dehejia, and Gatti, 2004; O'Donnell, Rosati, and Doorslaer, 2002). Consequently, household decisions to practice child labor eventually deprive society of healthy and productive adult workers. Nonetheless, many households in the developing world (especially in rural areas) practice child labor for reasons of survival or saving the costs of outside labor (Edmonds, 2007).

The troubling household- and social-level implications arising from household schooling and child labor decisions are likely to be substantial in rural Bangladesh. Among the 27.4 million rural children in the 5 to 14 age-group, at least 4.8 million children are not enrolled in school (most of whom are engaging in child labor) and a further 5.6 million children combine schooling with child labor (refers to 2002-03 figures; Bangladesh Bureau of Statistics, 2003). This persistence of household

underinvestment in schooling and practice of child labor continues despite respectable private returns to schooling (7.1% for each year of schooling; Asadullah, 2006), government and non-government initiatives at building schools and keeping costs low, and nation-wide laws requiring compulsory primary school attendance and banning child labor (for details on educational initiatives, see World Bank, 2000). Given the household- and social-level consequences of not enrolling children in school and practicing child labor, the purposes of this study are to understand the child-, household-, and village-level characteristics associated with the schooling and child labor decisions of households in rural Bangladesh, and addressing the implications of the results for educational and child labor policies.[1]

## 2. LITERATURE REVIEW

This section reviews some of the existing theoretical and empirical literature on household schooling and child labor decisions from the developing world(for reviews, see Basu, 1999; Brown *et al.*, 2002; Dar *et al*., 2002; Edmonds, 2007; Edmonds and Pavcnik, 2005; Glewwe, 2002; Hannum and Buchman, 2004; Udry 2003).

Much theoretical and empirical research shows that household poverty either prevents investment in schooling, or forces the practice of child labor (for survival), or both (Basu and Van, 1998; Edmonds, 2005; Edmonds and Pavcnik, 2005). Regarding poverty and schooling in South Asia, Maitra (2003), Dreze and Kingdon (2002) and Holmes (2003) present evidence on the negative association between poverty and

[1] The following are some additional regional characteristics (for details, see World Bank and Asian Development Bank, 2003): Bangladesh is small and densely populated country in South Asia. The population in 2000 was 140 million; of this, 54 million were categorized as poor; of the total poor, 85.2% resided in rural areas; the average annual GDP per capita in Bangladesh in 2000 was $370.

schooling in rural areas of Bangladesh (the Matlab area), India, and Pakistan. As for poverty and child labor in South Asia, Swaminathan (1998) and Rossi and Rosati (2003) find associations between poverty and child labor in India and Pakistan; however, Bhatty (1998) finds no association between poverty and child labor in rural India, and Bhalotra and Heady (2003) reach the same conclusion with girls in rural Pakistan.

Arguably, the most consistent finding in theoretical and empirical research is that underinvestment in schooling and the practice of child labor is a consequence of low parental educational attainment (Dessy, 2000; Dar *et al*., 2002). There are at least three possible reasons for greater parental education resulting in more schooling and less child labor. First, there may be a positive correlation between parental education and children's ability, which reduces the likelihood of a child failing out of school. Second, educated parents raise the likelihood of a child remaining in school by providing an environment conducive to learning (such as directly helping with schoolwork) and being knowledgeable about children's nutritional and health needs. Third, during income shocks (such as unemployment and natural disasters), a household with educated parents is less likely to pull a child out of school, practice child labor, or both because educated workers have safety nets (such as insurance).

An objective of economic development is to enable poor households to acquire income-generating assets. There is, however, curious evidence on the association between asset-ownership and child labor. Bhalotra and Heady (2003) find that farm-owning households are more likely to practice child labor in rural Ghana and rural Pakistan; Edmonds and Turk (2004) find evidence from rural Vietnam that business-owning households are more likely to practice child labor. This Wealth Paradox (as

labeled by Bhalotra and Heady) is open to misinterpretation unless the schooling activities of these children are also considered. That is, a household with a farm or business assets may ask a child to help operate those assets (or supervise outside laborers work on the assets), but that household is also more likely to send the child to school; it follows that an asset-less household would be less likely to send its child to school. There remains cause for concern because asset-ownership can encourage both more child labor and less schooling, as Wydick (1999) finds among rural Guatemalan households.

There is substantial research on the intra-household resource allocation in developing countries. There is, however, no research to my knowledge on the effect of other children's schooling and child labor activities (within the household) on a particular child (Strauss and Thomas, 1995).

Existing research suggests that the direct and indirect costs of schooling affect household schooling and child labor decisions. In the developing world, households face direct costs of schooling, such as tuition, fees, donations, books, supplies, uniform, transportation, private tutoring, and miscellaneous costs. In a survey, Tsang (1994) reports that direct costs are often a heavy financial burden for households in developing countries. In response, major international education initiatives such as the United Nations' "Education for All" strongly consider reducing or eliminating the direct costs of schooling in order to raise school enrolment and attainment rates in developing countries (UNESCO, 2005). Deininger (2003) and Hazarika (2001) present evidence from Uganda and Pakistan on direct costs discouraging household investment in schooling., Grootaert (1999a), however, finds no association between direct costs and household schooling and child labor decisions in rural Côte d'Ivoire. Regarding indirect costs of schooling, Schultz

(1960) and Rosenzweig and Evenson (1977) were among the first to discuss the possibility of children's opportunity costs discouraging household schooling decisions. More recently, Duryea and Arends-Kuenning (2003) and Binder and Scrogin (1999) find evidence that the rates of child labor are higher at times when children receive better pay in urban child labor markets of Brazil and Mexico.

Accordingly, this study contributes by examining the following issues for households in rural Bangladesh: whether poverty is associated with less schooling and more child labor; whether asset-ownership is associated with less schooling and more child labor; whether the composition and activities of other children within a household are associated with the schooling and child labor decision towards a particular child; whether direct and indirect costs of schooling are associated with less schooling and more child labor; and finally, whether households behave differently towards boys and girls.

## 3. DATA AND DEFINITIONS

The data for this study comes from a typical multipurpose household survey: 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, and followed a stratified and clustered survey strategy (i.e., allowing each household in the population to have an equal probability of inclusion), and therefore nationally representative. The survey questionnaire is based on the popular World Bank Living Standards Measurement Surveys, with detailed person, household, and community level data. Survey staffs collected information on household composition, education, health, employment, asset

ownership, consumption, and expenditure from urban and rural communities. The staffs also collected community-level information for rural areas, such as commodity prices, location, infrastructure, and wage rates. The rural sample of the HIES 2000 consists of 5,040 households and 26,231 people.

For children, the HIES 2000 includes basic information on household members over the age of five, such as school enrolment status, educational attainment, and work status. I use the sample of children in the 6 to 15 age-group because six is the age when children are socially encouraged to begin primary schooling (and therefore the start of the potential trade-offs between schooling and child labor), and fifteen is the age when children are expected to finish secondary school.[2]

I define schooling as children being enrolled in school, and define child labor as all forms of work performed by children (i.e., within the child's household or in the child labor market). To determine whether a child engages in schooling, a binary value 1 is assigned if the child is enrolled in school and zero is assigned otherwise. To determine a child laborer, a binary value 1 is assigned to a child laborer, and 0 to a child who reportedly does not engage in child labor. Following the HIES 2000 questionnaire, one is assigned for a child reported as having worked in the past week, being available for work in the past week, or looking for work in the past week. Along with all children in self-employment and wage work, some children who were not working during the survey period are still assigned one if survey respondents claimed one of the following reasons for the child not working: already have enough work (domestic or occupational), temporarily sick, waiting to start a new job, or no work available. However, I am unable

[2] The education structure of Bangladesh involves five years of primary school, five years of secondary school, two years of upper secondary school, and at least three years of higher education.

to distinguish between domestic work (e.g., cooking and taking care of dependents) versus fieldwork (e.g., working on a farm or business), and between own-household work versus market work.[3] All other children who are reportedly idle or only engage in schooling are assigned zero, implying that they reportedly do not practice any form of child labor.

Using these definitions of schooling and child labor, I produce three household decisions on schooling and child labor: SCHOOLONLY, COMBINE, and OS. The SCHOOLONLY category consists of children who attend school and avoid child labor. Children in the COMBINE category are those that combine schooling with child labor. Finally, the OS category includes children whose only activity is child labor, or idle (i.e., reportedly involved in neither schooling nor child labor). Any child can be categorized in one of the three child activity categories.

## 4. METHODOLOGY

Much of the theoretical research on a household's child activity decision originates from the seminal pieces on fertility by Becker (1960) and Becker and Lewis (1973). In the original models, the household's child activity decision involves a constrained (indirect) utility maximization problem, where a household faces tradeoffs between the number of children, investment in children's human capital, and current consumption of goods. Testing these and subsequent models using econometric analysis has traditionally been difficult because of the dearth of child labor data in multipurpose household surveys. Indeed, early econometric approaches were limited to binomial logit

[3] The HIES 2000 also has also patchy information on time-use, and no information on school-outcomes and physical injuries sustained from child labor, thereby limiting inquiry into trade-offs between child labor and education and health.

or probit specifications that assumed child labor as the inverse of schooling—which is problematic because it ignores the possibility of a child combining child labor and schooling, or the possibility of a child being idle. Efforts at collecting basic child labor data in multipurpose household surveys increased in the 1990s largely because of International Labour Organisation led efforts (Asgharie, 1993), and the MNL emerged as a popular specification in response to the basic data on child labor and schooling (Edmonds, 2007).

The foundation for the estimation methodology in this study comes from Maitra and Ray (2002). The following latent variable model describes the household's decision to enroll a child in school:

(1) $$S_i^* = X_{2i}\beta + \varepsilon_{2i}$$

where $S_i^*$ is the utility attained by the household from having child i engage in schooling, $X_i$ is a vector of child-, household-, and community-level characteristics that determine $S_i^*$, and $\varepsilon_{2i}$ is a random error with zero mean and unit variance. For schooling, the researcher observes the following binary variable:

(2) $S_i =$ 1 if the household enrolls the child in school ($S_i^*$ >0); 0, otherwise

Similarly, the following latent variable model describes the household's decision to choose child labor as the child's activity:

(3) $$L_i^* = X_{1i}\beta + \varepsilon_{1i}$$

where $L_i^*$ is the utility attained by the household by having child *i* in engage in child labor, $X_i$ is a vector of child-, household-, and community-level characteristics that determine $L_i^*$, and $\varepsilon_{1i}$ is a random error, with zero mean and unit variance. In practice,

however, the researcher observes neither the decision-making process nor $L_i^*$. Rather, the researcher only observes the following binary variable:

(4) $L_i = 1$ if the households makes the child work ($L_i^*$>0); 0, otherwise

Given this study's emphasis on SCHOOLONLY, COMBINE, and OS, the two-equation system (given by equations (1) and (3)) into an observable form *Y*, involving the three child activity decisions:

SCHOOLONLY $\Rightarrow$ $Y_i = 1 : L_i^* \leq 0, S_i^* > 0$

COMBINE $\Rightarrow$ $Y_i = 2 : L_i^* > 0, S_i^* > 0$

OS $\Rightarrow$ $Y_i = 3 : S_i^* \leq 0$ (with $L_i^* > 0$ implying 'only child labor', and $L_i^* \leq 0$ implying 'idle')

The estimated equation is given by:

(5) $$Y_i = X_i\beta + \varepsilon_i$$

where $Y_i$ is the utility attained by the household from having child *i* engage in a particular child labor and schooling decision, $X_i$ is a vector of child-, household-, and community-level characteristics that determine $Y_i$, and $\varepsilon_i$ is a random error with zero mean and unit variance.

The MNL specification assumes that a household simultaneously compares the expected utilities from SCHOOLONLY, COMBINE, and OS. The unordered nature of the categorical variables in a MNL specification indicate that a household makes its child activity decision in a single step. The key characteristic of the MNL approach is that it makes no assumptions about the household's child activity preferences, so any of the

three child activities can be a particular household's most preferred activity. The equation of the MNL specification is:

$$\Pr(Y_i) = \frac{e^{\sum_{k=1}^{K} \beta_{jk} X_k}}{1 + \sum_{j=1}^{3} e^{\sum_{k=1}^{K} \beta_{jk} X_k}}, Y_i = 1,2,3 \quad (6)$$

where parameters $\beta$ have two subscripts in the model, $k$ for distinguishing $X$ explanatory variables. The subscript $j$ indicates how there are three sets of $\beta$ estimates, implying that the total number of parameter estimates will be (3x$K$). There is a single estimation process, using the entire sample of children. A weakness of the MNL specification is that it requires the independence of irrelevant alternatives (IIA) assumption, where the odds ratios derived from the model remain the same, irrespective of the number of choices offered (Maddala, 1983). That is, the IIA requires that the relative probability of choosing between two alternatives is unaffected by the presence of a third alternative. In practice, this assumption is incorrect if the choices are close substitutes, as are schooling and child labor alternatives. Consequently, the MNL model can overestimate the selection probabilities of the child activity decisions.[4] The appropriateness of the MNL specification can be tested using the Hausman-McFadden specification test for the presence of IIA (Hausman and McFadden, 1984).

## 5. RESULTS

*Descriptive Statistics*

[4] Grootaert and Patrinos (1999) note that using a multinomial probit model (in which the residuals have a multivariate normal distribution and which is not subject to the IIA) to get around this problem is not practical because computational difficulties only allow a small number of alternatives.

The sample of analysis refers to the number of children, but can also refer to the number of household child labor and schooling decisions. Figures 1 and 2 illustrate the activities of boys and girls by age. Most households decide on SCHOOLONLY, and this decision peaks around the ages of 8 and 9. The COMBINE decision remains small and steady across the age groups. The increasing proportion of OS children from age of 10 indicates that many households break the compulsory primary school attendance law by pulling children out of school before primary school completion. Overall, the proportion of child laborers (i.e., those in the COMBINE and OS categories) may be underreported because households do not consider domestic work as child labor, or because households are hesitant to report child labor practices to survey collectors (as discussed earlier, child labor is illegal in Bangladesh; Biggeri *et al*., 2003).

Table 1 describes the explanatory variables ($X$) by grouping them according to child, household, or village characteristics. Table 1 also presents the means and standard deviations of each variable for the samples of boys and girls. The variables for child and household characteristics are constructed using household-level data; the variables for village characteristics are constructed using the community-level survey component of the HIES 2000. Child-level characteristics include dummies for the child's ages ; there is no gender dummy because all the analysis are conducted separately for boys and girls.

The variables for household-level characteristics consider household composition, such as the number of infants and elders, and the number of other children by activity and gender. Household-level variables also include dummies for poverty, asset-ownership, parental education, and religion.[5]

[5] For parental education, additional dummy variables for post-primary levels of educational attainment are not included because of the small sample size associated with post-primary levels of education among

Village-level characteristics include the daily wage rate for child, the ratio between child and adult labor daily wage rates, direct costs of schooling, dummies for infrastructure, cost of living, and the village's recent experiences with natural disasters (i.e. flood, drought, or cyclone).[6] It is revealing to find that indirect costs are substantially greater than direct costs. The low direct costs in part reflect the multitude of educational policies and interventions, such as low tuition and fee primary schooling, and conditional cash transfers for secondary school-going girls (for program details, see World Bank, 2000).[7] All monetary values are expressed Bangladeshi Takas (Tk.); in the year 2000, US$ 1= Tk. 51.00.

A number of explanatory variables are not included. Credit constraints are difficult to include because all rural Bangladeshi households have nearby microfinance facilities.[8] The employment status of parents is also excluded as an explanatory variable

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adults in rural Bangladesh. To examine poverty, I construct the poverty variable as a dummy variable using a regional price index, a Cost of Basic Needs method (World Bank and Asian Development Bank 2003a, p. 95) and HIES 2000 data on household-level per-capita expenditure. Grootaert (1999a) recognizes the endogeneity problem that the household's income includes the contributions of children; to minimize this problem, he recommends the use of a dummy variable approach because a child's contribution is usually too small to pull the households out of poverty. Thus, by using a dummy variable, endogeneity violation occurs only for households that are slightly below the poverty line. For examining asset-ownership, dummy variables indicate ownership rather than monetary values of the assets, thus lessening the endogeneity issues with also addressing poverty.

[6] Variables for the direct cost of schooling are constructed using the average annual household expenditure on schooling (for a child in the 6 to 15 age-group) in the child's village of residence (note, this method reduces the endogeneity issues). Separate direct cost values are calculated for boys and girls to account for gender differences in direct costs. Conditional cash transfers for secondary-school age females are subtracted from the tuition and fee figure. Data for the average daily wage in the child's village of residence is provided in the community survey component of the HIES 2000; the values are reported as the same for all children in the village, regardless of gender.

[7] Public spending on education as percentage of GDP was 2.2% in 2000. Reported public expenditures by education level at the per-student level was $13 for primary school, $27 for secondary school, and $ 155 for higher education (World Bank and Asian Development Bank, 2003a). Of the total number of children attending schools, 85% enroll in government run primary, secondary, and higher-secondary schools.

[8] See Loury (1981), and Baland and Robinson (2000) and Ranjan (2001) for theoretical models on why credit-access is a determinant of household schooling and child labor decisions. Presently, the Grameen Bank and BRAC Bank (the two largest microcredit and microfinance institutions in Bangladesh) offer individual and group services to almost every village in rural Bangladesh (Morduch, 1999).

because almost adults engage in productive activities in a poor rural economy, either through wage employment, self-employment, or inside their own household.

Table 2 and Table 3 present the coefficients and marginal effects of the MNL analyses for boys and girls. The choice of base category is the least desirable among the household decisions in policy circles (Grootaert and Patrinos, 1999). In the estimation, I use OS as the base in the single step estimation because OS is less desirable for policymakers than SCHOOLONLY and COMBINE (i.e., it is better for a child to at least be in school rather than out-of-school, even if it means combining schooling with child labor).

*Specification Test Results*

Since the MNL specification assumes the IIA, the estimation process is equivalent to running a series of the following binomial logits where one child activity is ignored: SCHOOLONLY versus OS (where COMBINE is ignored), and COMBINE versus OS (where SCHOOLONLY is ignored). It is possible, however, to get different results from the MNL and the series of binomial logits. To examine the appropriateness of the MNL specification's IIA assumption, I conduct a Hausman-McFadden specification test to address whether the results vary from those of binomial logits. If the test statistic is significant, the assumption of IIA is rejected indicating that the MNL is inappropriate. I find that each of the test statistics are negative, which Hausman and McFadden note as evidence that IIA has not been violated (p. 1226, 1984; see also p. 245, Long and Freese, 2006); therefore, we can proceed with interpreting the MNL coefficients. [9]

[9] The first test statistic for the Hausman-McFadden test involves dropping only SCHOOLONLY, resulting in negative 28.9 for boys and negative 15.2 for girls. Next, the Hausman-McFadden test statistic is

*Results on Poverty*

There is strong support from the results that poverty discourages a household from enrolling a child in school and encourages practicing child labor. The results from the MNL suggest that the likelihood of a poor household choosing SCHOOLONLY rather than OS is 9.1% less for a boy and 10.5% less for a girl. The coefficient for the COMBINE versus OS decision for a girl is statistically insignificant, perhaps because rural Bangladeshi households expect girls to help with domestic work, regardless of the household's socioeconomic status.

*Results on Parental Education*

The results on parental education are consistent with the worldwide evidence on households with educated fathers and mothers having a strong preference for schooling and distaste for child labor. The MNL results suggest that a household with an educated father is 14.3% more likely to choose SCHOOLONLY rather than OS for a boy, and 0.4% more likely to choose COMBINE rather than OS for a boy. The benefit of having an educated father for a girl is more modest: a 7.0% greater likelihood of being in SCHOOLONLY rather than OS, and a statistically insignificant coefficient for the COMBINE versus OS decision. The MNL results for mother's education suggest that a household with an educated mother is 15.5% more likely to choose SCHOOLONLY rather than OS for its boy, and only 0.1% more likely to choose COMBINE rather than OS for a boy. The benefit of having an educated mother for a girl is larger, as a household

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estimated by dropping only COMBINE, resulting in negative 9.9 for boys and negative 10.4 for girls. Long and Freese (2006) note that negative test statistics are "very common" in Stata.

is 21.0% more likely to choose SCHOOLONLY rather than OS, and COMBINE rather than OS by just 0.4%.

*Results on Asset-Ownership*

The results call for a careful interpretation of the Wealth Paradox: while there is a positive association between household asset-ownership and child labor, those asset-owning households are more likely to send children to school. Furthermore, asset-owning households appear to have a greater preference for SCHOOLONLY: for a boy, the MNL results show that a farm or land-owning household is 13.0% more likely to choose SCHOOLONLY rather than OS, and 0.1% more likely to choose COMBINE rather than OS. For a girl, the MNL results suggest that business-owning household is 3.6% more likely to choose COMBINE rather OS.

*Results on Intra-Household Decisions*

The number and activities of other children is strongly associated with a household's decision toward a particular child. Specifically, the results imply that households in rural Bangladesh prefer to choose the same activity for all children within the household, regardless of gender. The results suggest that each additional girl in SCHOOLONLY increases the likelihood of a boy being in SCHOOLONLY by 7.8%; for each additional child who is not in SCHOOLONLY, the household's likelihood of choosing SCHOOLONLY for the boy is between 9.9% and 18.0% less. The COMBINE decision for a boy shows that each additional boy and girl in COMBINE is associated with 1.0% and 1.6% greater likelihoods of the household choosing COMBINE rather

than OS. Similarly, the results for girls show that an additional boy and girl in SCHOOLONLY is associated with a 7.3% and 3.7% greater likelihood of the household choosing SCHOOLONLY rather than COMBINE; for each additional child in a non-SCHOOLONLY activity, a girl's the likelihood of being in SCHOOLONLY rather than OS is between 7.4% and 37.7% less. For the COMBINE versus OS decision for a girl, the results suggest that each additional boy in COMBINE increases the likelihood by 0.8%; each additional child in a non-COMBINE category reduces the likelihood of a household choosing COMBINE rather than OS for a girl by under 0.5%.

*Results on the Indirect Cost of Schooling*

The results on indirect costs indicate that a household in a village with a higher daily child wage rate is more likely to invest in schooling but is unwilling to forego child labor earnings, especially in the case of girls. The results suggest that a household in a village with Tk. 10 higher daily child wage rate (corresponding to 19.3% increase in the average daily wage rate for a child in rural Bangladesh) is 2.0% and 2.4% more likely to choose COMBINE rather than OS for a boy and a girl.

*Results on the Direct Cost of Schooling*

There are limited statistically significant associations between the direct costs of schooling and household decisions. The results suggest that an annual rise of Tk. 100 (which corresponds to approximately 9.6% and 9.3% of average annual total direct costs for a boy and girl) in transportation costs reduces the likelihood of a household choosing SCHOOLONLY rather COMBINE for a girl by 4.2%. For the COMBINE versus OS

decision for a boy, a Tk. 100 increase in private tutoring cost is associated with 0.1% less likelihood; the association between miscellaneous costs is even smaller but (unexpectedly) positive. This result for a girl offers some weak support for Arends-Kuenning and Amin's (2004) study of two rural Bangladeshi villages, where they observe that direct costs affect household secondary-school decisions towards girls. There is also some support for worldwide evidence in Bray (1999), with private tutoring costs discouraging households to enroll boys to school. Overall, the probable explanation for small magnitudes is that educational policies in rural Bangladesh have succeeded in keeping direct cost levels relatively low: as a percentage of the average annual per-capita expenditure in rural Bangladesh, the average annual direct cost is 11.6% for a boy and 12.0% for a girl.

*Other Results*

There is some evidence that the number of adults in the household reduces the need to send a child to work. The results show that children in villages with electricity are more likely to choose SCHOOLONLY (rather than OS) for a boy, perhaps because economically developed villages discourage child labor, or because the adults are more productive (from being able to use electric-powered tools, and lighting to work in the evening), and therefore do need assistance from boys. For a girl, there is greater likelihood of a household choosing COMBINE (rather than OS), possibly because electricity facilitates work in the daytime and provides lighting to study in the evening. In terms of the cost of living, the prices of rice and milk decrease the likelihood of schooling

for a boy. Lastly, the recent occurrence of natural disasters reduces the likelihood of a household enrolling its child in school.

*Differences in Results by Gender*

The results provide some evidence of rural Bangladeshi households behaving differently towards boys and girls. Household decisions towards girl are less sensitive to poverty, possibly because rural Bangladeshi girls help with domestic work regardless of their household's socioeconomic status. Father's education matters less for girls than it does for boys, while mother's education matters more for girls. There is also evidence that ownership of farm or land is associated with household decisions towards boys, while ownership of business is associated with household decisions towards girls. In addition, households are also more sensitive to transportation costs of schooling for girls, perhaps out of greater safety concerns for girls.

*Evidence from an Alternative Empirical Specification*

As frequently encountered in empirical research from all disciplines, the results and policy implications drawn from the results can vary depending on the researcher's choice of empirical specification. Furthermore, it unlikely that schooling and child labor decisions are independently considered in rural Bangladesh (despite the Hausman-McFadden specification test results suggesting that schooling and child labor decisions are unrelated). I examine the sensitivity of the results and conclusions to empirical specification by adopting the Grootaert (1999b) sequential probit (SEQP) specification, which has emerged as a competing approach for understanding household schooling and

child labor decisions. While the SEQP specification relaxes the IIA, it assumes that the household's child activity decision is based on the following preferences (from the highest to lowest valued latent variable of household utility): SCHOOLONLY, COMBINE, and OS. Thus, the SEQP specification assumes that all households prefer having their children only engage in schooling and having a strong distaste for child labor. Unlike the SEQP specification, the MNL specification makes no such assumptions on household preferences. Given the descriptive nature of this study, I have placed more emphasis on the unranked approach of the MNL specification.

The SEQP results for boys and girls are shown in Appendix Tables 1 and 2. A comparison between the MNL and SEQP specifications is possible for the marginal effects and standard errors for COMBINE categories. This exercise provides evidence that results and conclusions are sensitive to the choice of specification. The magnitudes of the marginal effects in the SEQP are consistently larger than the MNL marginal effects. An exercise in constructing confidence intervals for marginal effects of the statistically significant coefficients (not shown in this paper) reveals that SEQP estimates do not lie in the 95% interval around the MNL marginal effects, and vice versa. In addition, the MNL and SEQP specifications results are somewhat different with respect to the statistical significance of coefficients: for boys, the results vary for the number of adult males, number of dependents, and the price of rice; for girls, the results differ for other OS girls, business-ownership, and flood occurrences. Overall, unlike some other research comparing alternative specifications of household schooling and child labor decisions (e.g., Grootaert, 1999a), this study cannot provide basis for favoring one specification over another.

*Limitations of the Study*

There are at least three limitations with the empirical analysis in this study. First, the small proportion of boys and girls in COMBINE in the HIES 2000 arguably makes it redundant to include the COMBINE category in the analysis, and that a category for schooling (i.e., SCHOOLONLY plus COMBINE) versus non-schooling (i.e., OS) is adequate. However, the inclusion of COMBINE is warranted on the grounds of policy formulation: historical experiences from today's developed economies has shown that it takes much longer for policy to shift OS children into SCHOOLONLY, than it does to shift OS children into COMBINE (Humphries, 2003). Unless there are substantial positive shocks, households gradually reduce child labor practices (often over generations). Moreover, considering COMBINE in the study clarifies that while the Wealth Paradox is correct in predicting that asset-ownership is positively associated with household child labor practices, there is no paradox when it comes to asset-ownership and school enrollment (i.e., asset-ownership is positively associated with schooling) in the case of rural Bangladeshi households.

Second, data limitations prevent this and other similar studies from considering several important determinants of household child activity decisions. These include variables identifying extended families (who provide valuable support during hardship, thereby alleviating the need for children to work), and the household's perceived rate of return to schooling. In studies from neighboring India, Kochar (2004) and Chamarbagwala (2007) find that regional rates of return to schooling affect the schooling and child labor decisions of rural households. I am unable to follow their approach

because Bangladesh's small size and geographic mobility imply that rural households observe national labor market conditions; since all households across regions would observe the same returns, it is redundant to follow Kochar and Chamarbagwala.

Third, the usual endogeneity-related limitations of household-level empirical methods are present and therefore undermine claims of causal relationships. Specifically, simultaneity bias causes endogeneity issues: household expenditures reflect household income, which are affected by labor supply decisions of parents, which in turn depend on whether or not children are in school. Parental education and asset-ownership also create endogeneity-related problems because each also determines poverty. Despite my use of dummy variables for poverty, parental education, and asset-ownership, these simultaneity biases are likely to persist. There is also possible omitted variable bias because of within-household differences between children. Without unusually detailed data, it is not possible to completely correct for simultaneity and omitted variable endogeneity issues and establish causal relationships. Therefore, the estimates in this study provide suggestive evidence between a household's decision and various characteristics (at the child, household, and village-levels), but not necessarily definitive proof of causal relationships.

## 6. CONCLUSION

This study used recent theoretical advances and empirical techniques to understand household schooling and child labor decisions towards children in rural Bangladesh. In this concluding section, I review the results and discuss the implications on educational and child labor policies.

The results indicate that household poverty is strongly associated with keeping children out of school and practicing child labor. While education policymakers cannot eradicate poverty, the results support the continued targeting of interventions at children from households living at or below the poverty line in rural Bangladesh. For child labor policymakers, this result implies that the current ban on child labor may be making survival difficult for poor households (since poor households are dependent on the contributions of their children).

The results suggest that households with educated parents have a deep appreciation for schooling and distaste for child labor. Under an inter-generational *ceteris paribus* assumption, the results imply that educating the present generation may increase school enrolment and reduce child labor in the next generation. For educational policy, the results suggest targeting interventions towards children from households where one or more of the parents have not completed primary education.

There is a positive association between household ownership of assets (such as farm, land, or business) and sending children to school. In some cases, however, asset-owning households may also decide to have the child combine schooling with child labor. Thus, initiatives that support asset-ownership (such as microfinance initiatives) may be contributing to greater school enrolment, but may not be reducing child labor; a caveat is that initiatives that encourage household asset-ownership may improve the nature of work for some children (since a child is arguably better off working for her own household rather than an outside employer). In terms of educational policy, the results support targeting interventions at children from households without assets.

Regarding intra-household decisions, the results indicate that households in rural Bangladesh prefer to make the same decision for all children within the household, regardless of gender. Moreover, I find no evidence of the household sacrificing girl's schooling for boys' schooling. The educational policy implication, therefore, is that interventions in rural Bangladesh should target both boys and girls.

The results suggest small associations between some direct costs of schooling and household decisions: when facing high transportation costs, girls are likely to combine schooling with child labor; and, greater private tutoring costs dissuade the household from enrolling boys in school. The coefficients for tuition, fees, books, supplies and uniform are not statistically significant. This lack of statistical association, however, does not necessarily imply that households are not sensitive to most direct costs, and that policymakers should raise direct costs. Rather, is the issue of user-fees in education is a sensitive political issue in rural Bangladesh and should be carefully addressed through in-depth research on direct cost items. For example, future research can examine the willingness of households to pay for nearer schools, and investigate the main determinants of household expenditure on private tutoring (e.g. teacher absenteeism and low school quality; Bray, 1999; Chaudhury *et al.*, 2006). For now, the results suggest that educational policy in rural Bangladesh should address school building or transportation initiatives for girls and affordable tutoring alternative for boys.

Finally, the results indicate that rural Bangladeshi households are sensitive to the indirect cost of schooling. I find that households in villages with better child wages are more likely to send children to school, but are hesitant to give up child labor earnings and instead have children combine schooling with child labor. Since these indirect costs are

substantial in rural Bangladesh, a policy involving full-compensation to out-of-school children for indirect costs is prohibitively costly; however, Mexico's Opportunidades program (formerly Progresa) provides guidance on how a well-designed conditional cash transfer program can offer partial compensation and still succeed in increasing school enrollment and reducing child labor practices among rural households (Schultz, 2004).[10]

[10] If the government were to compensate the 4.8 million out-of-school children (in the 5 to 14 age-group; Bangladesh Bureau of Statistics, 2003) at the average daily wage rate of $0.67 (Tk. 34.10) per day (as reported in the HIES 2000), it would cost the government $96.28 million per month (Tk. 4.91 billion per month), or $962.82 million for the school year (Tk. 49.10 billion per year), in addition to various administrative and monitoring costs; furthermore, there are costs of providing additional schools, supplies, and staff. This translates to at least doubling of the Government of Bangladesh's total annual educational expenditures (for Bangladesh's public expenditure review, see World Bank and Asian Development Bank, 2003b).

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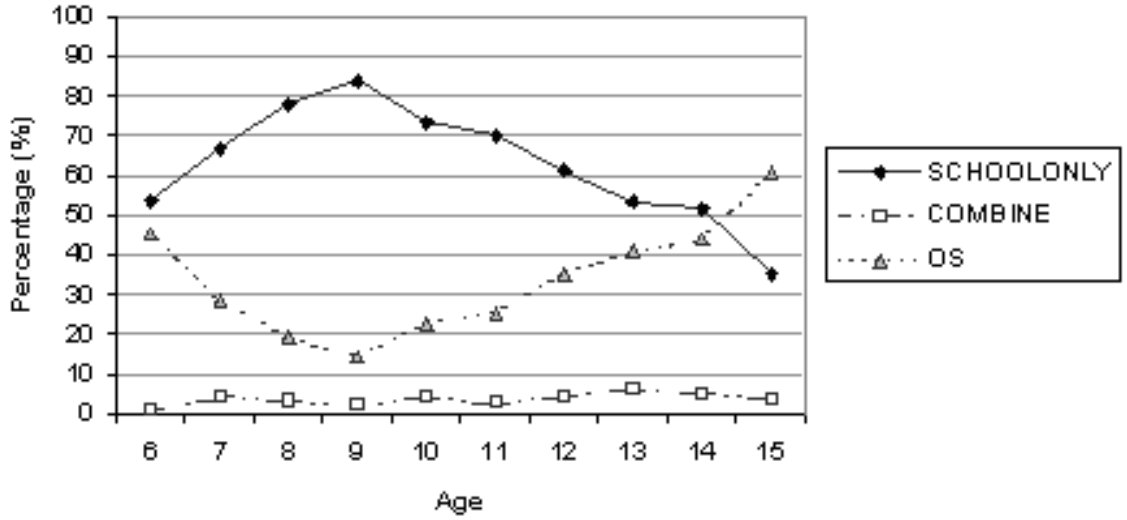
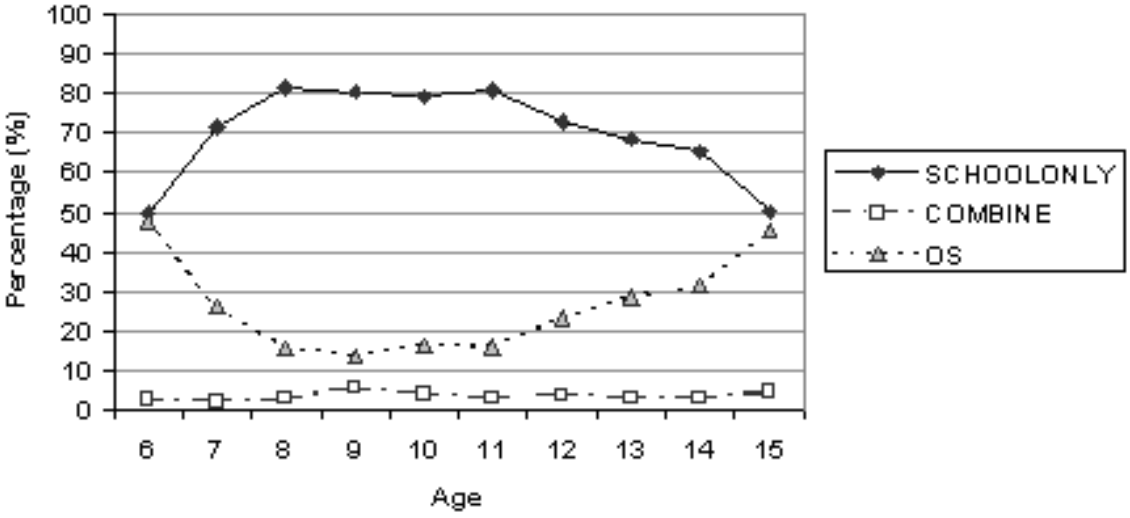
## Figures

**Figure 1:** Activities by age of boys in rural Bangladesh




*Source:* Author's calculations using HIES 2000 sample of rural males in the 6 to 15 age-group.

**Figure 2:** Activities by age of girls in rural Bangladesh




*Source:* Author's calculations using HIES 2000 sample of rural females in the 6 to 15 age-group.

# Tables

**Table 1:** Variable description and descriptive Statistics

| Variable | Description | Boys | | Girls | |
|---|---|---|---|---|---|
| | | Mean | Standard deviation | Mean | Standard deviation |
| *Child characteristics* | | | | | |
| AGE6 | Age is 6 (dummy) | 0.1017 | (0.0049) | 0.1004 | (0.0050) |
| AGE7 | Age is 7 (dummy) | 0.1200 | (0.0053) | 0.1303 | (0.0057) |
| AGE8 | Age is 8 (dummy) | 0.1053 | (0.0050) | 0.1107 | (0.0053) |
| AGE9 | Age is 9 (dummy) | 0.0828 | (0.0045) | 0.0843 | (0.0047) |
| AGE10 | Age is 10 (dummy) | 0.1372 | (0.0056) | 0.1246 | (0.0055) |
| AGE11 | Age is 11 (dummy) | 0.0694 | (0.0041) | 0.0774 | (0.0045) |
| AGE12 | Age is 12 (dummy) | 0.1259 | (0.0054) | 0.1303 | (0.0057) |
| AGE13 | Age is 13 (dummy) | 0.0755 | (0.0043) | 0.0792 | (0.0046) |
| AGE14 | Age is 14 (dummy) | 0.0838 | (0.0045) | 0.0937 | (0.0049) |
| AGE15 | Age is 15 (dummy) | 0.0984 | (0.0048) | 0.0689 | (0.0043) |
| *Household characteristics* | | | | | |
| HEADAGE | Head's age (years) | 45.349 | (0.184) | 45.345 | (0.192) |
| HEADAGE2 | Head's age squared (years) | 2185.13 | (18.69) | 2185.94 | (19.10) |
| FEMALEHEAD | Female head (dummy) | 0.0636 | (0.0040) | 0.0715 | (0.0043) |
| ADULTMALES | Number of males in the 16 to 64 age-group | 1.4426 | (0.0154) | 1.4565 | (0.0167) |
| ADULTFEMALES | Number of females in the 16 to 64 age-group | 1.4180 | (0.0125) | 1.3983 | (0.0128) |
| DEPENDENTS | Number of dependents (infants & elders) | 0.8673 | (0.0175) | 0.92225 | (0.0181) |
| SCHOOLONLYBOYS | Number of other SCHOOLONLY boys (6 to 15 age-group) | 0.4785 | (0.0111) | 0.5402 | (0.0122) |
| COMBINEBOYS | Number of other COMBINE boys (6 to 15 age-group) | 0.0309 | (0.0030) | 0.0321 | (0.0036) |
| OSBOYS | Number of other OS boys (6 to 15 age-group) | 0.3014 | (0.0094) | 0.2754 | (0.0095) |
| SCHOOLONLYGIRLS | Number of other SCHOOLONLY girls (6 to 15 age-group) | 0.5542 | (0.0121) | 0.5340 | (0.0125) |
| COMBINEGIRLS | Number of other COMBINE girls (6 to 15 age-group) | 0.0295 | (0.0032) | 0.0224 | (0.0028) |
| OSGIRLS | Number of other OS girls (6 to 15 age-group) | 0.2047 | (0.0078) | 0.2265 | (0.0086) |
| FATHEREDU | Father completed primary schooling (dummy) | 0.2798 | (0.0073) | 0.3049 | (0.0077) |
| MOTHEREDU | Mother completed primary schooling (dummy) | 0.1906 | (0.0063) | 0.2093 | (0.0068) |
| POVERTY | Per-capita expenditure at or below poverty line (dummy) | 0.3192 | (0.0076) | 0.3313 | (0.0079) |
| FARM | Farm or land ownership (dummy) | 0.5219 | (0.0081) | 0.5272 | (0.0084) |
| BUSINESS | Business ownership (dummy) | 0.2439 | (0.0070) | 0.2363 | (0.0071) |
| MUSLIM | Muslim (dummy) | 0.9154 | (0.0045) | 0.9185 | (0.0046) |
| *Village characteristics* | | | | | |
| CHILDWAGE | Wage rate for children (Taka per day) | 34.10 | (0.24) | 34.10 | (0.2471) |
| WAGERATIO | Wage rate for adults/ Wage rate for children (ratio) | 2.0547 | (0.0149) | 1.5304 | (0.0173) |
| TUITIONFEES | Tuition, fees & contributions for schooling (Taka per year) | 169.32 | (2.53) | 169.79 | (2.72) |
| BOOKSUPPLIES | Books, supplies & uniforms for schooling (Taka per year) | 391.44 | (5.19) | 400.70 | (5.50) |
| TRANSPORT | Transportation for schooling (Taka per year) | 39.66 | (2.29) | 35.85 | (2.14) |
| TUTORING | Private tutoring for schooling (Taka per year) | 324.00 | (7.19) | 346.61 | (8.32) |
| MISCCOSTS | Miscellaneous items for schooling (Taka per year) | 115.87 | (3.55) | 118.37 | (3.79) |
| SCHOOLCAP | Adequate school capacity (dummy) | 0.4565 | (0.0081) | 0.4591 | (0.0084) |
| ELECTRICITY | Electricity available (dummy) | 0.6356 | (0.0078) | 0.6516 | (0.0080) |
| RICEPRICE | Price of rice (Taka per kilogram) | 14.92 | (0.54) | 15.30 | (0.60) |
| MILKPRICE | Price of milk (Taka per litre) | 16.75 | (0.12) | 16.88 | (0.13) |
| FLOOD | Flood damage in past 5 years (dummy) | 0.8152 | (0.0063) | 0.8093 | (0.0066) |
| DROUGHT | Drought damage in past 5 years (dummy) | 0.3619 | (0.0080) | 0.3526 | (0.0083) |
| CYCLONE | Cyclone or tornado damage in past 5 years (dummy) | 0.3156 | (0.0077) | 0.3196 | (0.0080) |

*Source:* Author's calculations using HIES 2000.
*Notes:* Monetary values are expressed in 2000 Bangladeshi Takas (US$ 1= Tk. 51.00). Sample is for rural boys in 6-15 age-group.

**Table 2:** MNL results for boys

| | SCHOOLONLY (vs. OS) | | | COMBINE (vs. OS) | | |
|---|---|---|---|---|---|---|
| | Coefficient | Standard error | Marginal effect x 100 | Coefficient | Standard error | Marginal effect x 100 |
| *Child characteristics* | | | | | | |
| AGE7 | 0.5877*** | (0.2191) | 12.04 | 1.9092*** | (0.7767) | 0.88 |
| AGE8 | 1.5121*** | (0.2391) | 31.90 | 2.5792*** | (0.8109) | 0.90 |
| AGE9 | 1.9198*** | (0.2810) | 40.98 | 2.0565*** | (0.9010) | 0.43 |
| AGE10 | 1.2842*** | (0.2194) | 26.82 | 2.8555*** | (0.7686) | 1.15 |
| AGE11 | 1.1938*** | (0.2681) | 25.07 | 2.3236*** | (0.8582) | 0.88 |
| AGE12 | 0.4870*** | 0.2133 | 9.89 | 1.7841*** | (0.8106) | 0.85 |
| AGE13 | -0.0958 | (0.2474) | -2.93 | 2.1197*** | (0.7929) | 1.27 |
| AGE14 | -0.4379* | (0.2387) | -10.20 | 1.6593*** | (0.8134) | 1.14 |
| AGE15 | -1.1168*** | (0.2309) | -24.57 | 0.6326 | (0.8092) | 0.81 |
| *Household characteristics* | | | | | | |
| HEADAGE | -0.0192 | (0.0305) | -0.41 | -0.0294 | (0.0734) | -0.01 |
| HEADAGE2 | 0.0001 | (0.0003) | 0.00 | 0.0003 | (0.0007) | 0.00 |
| FEMALEHEAD | -0.3812 | (0.2506) | -8.39 | 0.2348 | (0.5331) | 0.29 |
| ADULTMALES | -0.0316 | (0.0722) | 0.60 | -0.2200 | (0.1714) | -0.12 |
| ADULTFEMALES | 0.1286 | (0.0974) | 2.75 | 0.1228 | (0.1984) | 0.02 |
| DEPENDENTS | -0.0429 | (0.0556) | -0.99 | 0.1612 | (0.1293) | 0.11 |
| SCHOOLONLYBOYS | 0.1173 | (0.0893) | 2.66 | -0.27784 | (0.2559) | -0.21 |
| COMBINEBOYS | -0.8024*** | (0.3596) | -17.95 | 1.2096*** | (0.3644) | 1.02 |
| OSBOYS | -0.7457*** | (0.0913) | -16.02 | -0.5532*** | (0.2739) | -0.25 |
| SCHOOLONLYGIRLS | 0.3377*** | (0.0817) | 7.81 | -1.1460*** | (0.3764) | -0.80 |
| COMBINEGIRLS | -0.5697 | (0.4259) | -13.32 | 2.2980*** | (0.4056) | 1.57 |
| OSGIRLS | -0.4588*** | (0.1112) | -9.85 | -0.3449 | (0.3145) | -0.02 |
| FATHEREDU | 0.6783*** | (0.1514) | 14.32 | 1.1156*** | (0.3309) | 0.38 |
| MOTHEREDU | 0.7239*** | (0.1843) | 15.51 | 0.6119* | (0.3535) | 0.07 |
| POVERTY | -0.4344*** | (0.1263) | -9.10 | -0.9030*** | (0.3649) | -0.35 |
| FARM | 0.6097*** | (0.1149) | 13.03 | 0.6112*** | (0.3030) | 0.11 |
| BUSINESS | -0.0138 | (0.1319) | -0.41 | 0.2862 | (0.29311) | 0.17 |
| MUSLIM | -0.3896 | (0.2081) | -8.55 | 0.1669 | (0.5325) | 0.25 |
| *Village characteristics* | | | | | | |
| CHILDWAGE x 100 | -0.5519 | (0.6419) | -13.20 | 2.9671* | (1.5047) | 1.95 |
| WAGERATIO | 0.0670 | (0.0898) | 1.31 | 0.3684 | (0.2309) | 0.18 |
| TUITIONFEES x 100 | -0.0024 | (0.0531) | 0.07 | 0.0552 | (0.1357) | 0.03 |
| BOOKSUPPLIES x 100 | 0.0157 | (0.0324) | 0.30 | 0.1106 | (0.0799) | 0.06 |
| TRANSPORT x 100 | -0.0145 | (0.0411) | -0.29 | -0.0577 | (0.1199) | -0.03 |
| TUTORING x 100 | -0.0022 | (0.0166) | 0.00 | -0.1300*** | (0.0589) | 0.09 |
| MISCCOSTS x 100 | 0.0010 | (0.0455) | -0.05 | 0.1724*** | (0.0918) | 0.10 |
| SCHOOLCAP | 0.0824 | (0.1136) | 1.92 | -0.3216 | (0.2974) | -0.22 |
| ELECTRICITY | 0.2855*** | (0.1206) | 6.12 | 0.2281 | (0.3296) | 0.02 |
| RICEPRICE x 100 | 0.0573 | (0.1194) | 9.73 | -21.306*** | (8.9284) | -12.44 |
| MILKPRICE x 100 | -0.5634 | (1.0360) | 11.11 | 2.9109 | (3.4257) | -1.47 |
| FLOOD | 0.0333 | (0.1658) | 0.84 | -0.2870 | (0.3765) | -0.18 |
| DROUGHT | -0.1794 | (0.1149) | -3.69 | -0.5421* | (0.2981) | -0.24 |
| CYCLONE | -0.0520 | (0.1234) | -1.00 | -0.3366 | (0.3616) | -0.18 |
| Constant | 0.6904 | (0.8651) | | -2.3208 | (2.2778) | |
| Predicted outcome | 0.6796 | | | 0.0059 | | |
| Presudo-$R^2$ | 0.2778 | | | | | |
| Log likelihood | -1330.633 | | | | | |
| Number of observations | 2229 | | | | | |

*Notes:* ***, ** and * indicate statistically significant at the 1%, 5%, and 10% levels correspondingly; statistical significance is determined using the standard normal (z) table.

**Table 3:** MNL results for girls

| | SCHOOLONLY (vs. OS) | | | COMBINE (vs. OS) | | |
|---|---|---|---|---|---|---|
| | Coefficient | Standard error | Marginal effect x 100 | Coefficient | Standard error | Marginal effect x 100 |
| *Child characteristics* | | | | | | |
| AGE7 | 1.0396*** | (0.2645) | 17.66 | 0.3118 | (0.7291) | -0.20 |
| AGE8 | 2.1301*** | (0.3170) | 35.79 | 1.8780*** | (0.7535) | 0.08 |
| AGE9 | 2.0309*** | (0.3669) | 34.08 | 1.9178*** | (0.7863) | 0.13 |
| AGE10 | 1.8774*** | (0.2927) | 31.60 | 1.4613*** | (0.7127) | -0.00 |
| AGE11 | 1.7614*** | (0.3530) | 29.65 | 1.3682 | (0.8982) | -0.01 |
| AGE12 | 1.1005*** | (0.2693) | 18.30 | 1.5745*** | (0.6731) | 0.28 |
| AGE13 | 1.1280*** | (0.3328) | 18.81 | 1.4687* | (0.7791) | 0.23 |
| AGE14 | 0.4688* | (0.2805) | 7.86 | 0.4653 | (0.7474) | 0.04 |
| AGE15 | -0.3784 | (0.2934) | -6.63 | 0.5466 | (0.7115) | 0.33 |
| *Household characteristics* | | | | | | |
| HEADAGE | -0.0156 | (0.0387) | -0.24 | -0.0724 | (0.0880) | -0.02 |
| HEADAGE2 | 0.0001 | (0.0004) | -0.00 | 0.0006 | (0.0009) | 0.00 |
| FEMALEHEAD | 0.2274 | (0.2976) | 3.75 | 0.4374 | (0.6368) | 0.10 |
| ADULTMALES | 0.0144 | (0.0917) | 0.27 | -0.0736 | (0.2125) | -0.03 |
| ADULTFEMALES | 0.0597 | (0.1222) | 0.99 | 0.1079 | (0.2663) | 0.02 |
| DEPENDENTS | 0.0053 | (0.0768) | 0.08 | 0.0443 | (0.1793) | 0.02 |
| SCHOOLONLYBOYS | 0.4195*** | (0.1140) | 7.32 | -0.5181 | (0.3828) | -0.34 |
| COMBINEBOYS | -1.6400*** | (0.5130) | -28.26 | 0.8276*** | (0.3893) | 0.84 |
| OSBOYS | -0.4424*** | (0.1196) | -7.44 | -0.3744 | (0.3437) | -0.01 |
| SCHOOLONLYGIRLS | 0.1983* | (0.1106) | 3.71 | -1.0402*** | (0.4444) | -0.47 |
| COMBINEGIRLS | -2.2100*** | (0.6062) | -37.68 | -0.1805 | (0.4831) | 0.62 |
| OSGIRLS | -1.0272*** | (0.1400) | -17.31 | -0.7417* | (0.3990) | 0.03 |
| FATHEREDU | 0.4181*** | (0.1875) | 6.98 | 0.5081 | (0.4500) | 0.07 |
| MOTHEREDU | 1.2660*** | (0.2453) | 21.00 | 1.9871*** | (0.4627) | 0.39 |
| POVERTY | -0.6137*** | (0.1713) | -10.54 | 0.2013 | (0.4586) | 0.27 |
| FARM | 0.0698 | (0.1520) | 1.14 | 0.1794 | (0.3858) | 0.05 |
| BUSINESS | 0.1759 | (0.1938) | 2.85 | 0.4809 | (0.4086) | 0.14 |
| MUSLIM | 0.0058 | (0.2510) | 0.07 | 0.0844 | (0.7289) | 0.03 |
| *Village characteristics* | | | | | | |
| CHILDWAGE x 100 | -0.8184 | (0.7813) | -15.64 | 5.0346*** | (1.6985) | 2.37 |
| WAGERATIO | 0.0344 | (0.1216) | 0.59 | 0.0052 | (0.3451) | -0.01 |
| TUITIONFEES x 100 | 0.0309 | (0.0550) | 0.57 | -0.1378 | (0.1808) | -0.06 |
| BOOKSUPPLIES x 100 | -0.0084 | (0.0370) | -0.17 | 0.0917 | (0.0942) | 0.04 |
| TRANSPORT x 100 | -0.2461*** | (0.0782) | -4.23 | 0.0963 | (0.1868) | 0.12 |
| TUTORING x 100 | -0.0237 | (0.0208) | -0.38 | -0.0747 | (0.0519) | -0.02 |
| MISCCOSTS x 100 | 0.0210 | (0.0418) | .34 | 0.0634 | (0.0801) | 0.02 |
| SCHOOLCAP | -0.1304 | (0.1526) | 0.34 | -0.2733 | (0.4233) | -0.07 |
| ELECTRICITY | 0.2784 | (0.1763) | -2.14 | 1.5953*** | (0.6828) | 0.55 |
| RICEPRICE x 100 | 0.0949 | (0.1242) | 4.26 | -11.791 | (9.2347) | -0.05 |
| MILKPRICE x 100 | -0.2441 | (2.3010) | 5.29 | 8.4044 | (5.5889) | 0.03 |
| FLOOD | -0.2424 | (0.2121) | -6.78 | 1.8167* | (0.9360) | 0.80 |
| DROUGHT | -0.3171*** | (0.1580) | -4.70 | 0.5750 | (0.4168) | 0.33 |
| CYCLONE | 0.01393 | (1.6048) | -5.59 | -1.0891*** | (0.4696) | -0.44 |
| Constant | 1.1017 | (1.1028) | 0.58 | -6.2211 | (2.9042) | |
| Predicted outcome | 0.7185 | | | 0.040 | | |
| Presudo-$R^2$ | 0.3075 | | | | | |
| Log likelihood | -791.008 | | | | | |
| Number of observations | 1510 | | | | | |

*Notes:* ***, ** and * indicate statistically significant at the 1%, 5%, and 10% levels correspondingly; statistical significance is determined using the standard normal (z) table.

**Appendix table 1 :** SEQP results for boys

| | SCHOOLONLY (vs. COMBINE + OS) | | | COMBINE (vs. OS) | | |
|---|---|---|---|---|---|---|
| | Coefficient | Standard error | Marginal effect x 100 | Coefficient | Standard error | Marginal effect x 100 |
| *Child characteristics* | | | | | | |
| AGE7 | 0.2785*** | (0.1262) | 10.52 | 0.7647* | (0.4244) | 4.19 |
| AGE8 | 0.8014*** | (0.1352) | 30.27 | 1.1812*** | (0.4566) | 6.48 |
| AGE9 | 1.0693*** | (0.1540) | 40.39 | 1.1895*** | (0.5104) | 6.52 |
| AGE10 | 0.6444*** | (0.1244) | 24.34 | 1.4780*** | (0.4270) | 8.11 |
| AGE11 | 0.6183*** | (0.1514) | 23.35 | 1.1411*** | (0.4872) | 6.26 |
| AGE12 | 0.2388* | (0.1238) | 9.02 | 0.5897 | (0.4478) | 3.23 |
| AGE13 | -0.1412 | (0.1440) | -5.33 | 1.1416*** | (0.4386) | 6.36 |
| AGE14 | -0.2982*** | (0.1384) | -11.27 | 0.7101 | (0.4443) | 3.89 |
| AGE15 | -0.6666*** | (0.1354) | -25.18 | 0.3271 | (0.4280) | 1.79 |
| *Household characteristics* | | | | | | |
| HEADAGE | -0.0121 | (0.0173) | -0.46 | -0.0029 | (0.0467) | -0.02 |
| HEADAGE2 | 0.0001* | (0.0002) | 0.00 | 0.0000 | (0.0005) | 0.00 |
| FEMALEHEAD | -0.2491 | (0.1449) | -9.41 | 0.1727 | (0.3304) | 0.95 |
| ADULTMALES | -0.0070 | (0.0403) | -0.27 | -0.1821* | (0.1021) | -1.00 |
| ADULTFEMALES | 0.0597 | (0.0546) | 2.25 | 0.1406 | (0.1254) | 0.77 |
| DEPENDENTS | -0.0332 | (0.0314) | -1.25 | 0.1359* | (0.0819) | 0.75 |
| SCHOOLONLYBOYS | 0.0973* | (0.0504) | 3.68 | -0.0654 | (0.1394) | -0.36 |
| COMBINEBOYS | -0.8965*** | (0.1799) | -33.86 | 0.5803*** | (0.2125) | 3.18 |
| OSBOYS | -0.4082*** | (0.0514) | -15.42 | -0.2720* | (0.1531) | -1.49 |
| SCHOOLONLYGIRLS | 0.2373*** | (0.0460) | 8.96 | -0.6744*** | (0.1966) | -3.70 |
| COMBINEGIRLS | -1.0115*** | (0.1761) | -38.21 | 1.3704*** | (0.2348) | 7.52 |
| OSGIRLS | -0.2499*** | (0.0642) | -9.44 | -0.1277 | (0.1648) | -0.70 |
| FATHEREDU | 0.3113*** | (0.0818) | 11.76 | 0.5927*** | (0.2011) | 3.25 |
| MOTHEREDU | 0.3208*** | (0.0955) | 12.18 | 0.6525*** | (0.2255) | 3.58 |
| POVERTY | -0.2469*** | (0.7290) | -9.44 | -0.5378*** | (0.2029) | -2.95 |
| FARM | 0.3236*** | (0.0653) | 11.76 | 0.2997* | (0.1799) | 1.64 |
| BUSINESS | -0.0256 | (0.0744) | 12.12 | 0.2008 | (0.1782) | 1.10 |
| MUSLIM | -0.2322** | (0.1173) | -9.32 | 0.1045 | ((0.3401)) | 0.57 |
| *Village characteristics* | | | | | | |
| CHILDWAGE x 100 | -0.4319 | (0.3648) | -16.32 | 1.0168** | (0.9478) | 5.58 |
| WAGERATIO | 0.0170 | (0.0509) | 0.64 | 0.2204 | (0.1452) | 1.21 |
| TUITIONFEES x 100 | -0.0174 | (0.0300) | -0.66 | 0.0892 | (0.0844) | 0.49 |
| BOOKSUPPLIES x 100 | 0.0077 | (0.0179) | 0.29 | 0.0208 | (0.0441) | 0.11 |
| TRANSPORT x 100 | 0.0044 | (0.0228) | 0.17 | -0.0087 | (0.0628) | -0.05 |
| TUTORING x 100 | 0.0076 | (0.0094) | 0.29 | -0.0562* | (0.0327) | -0.31 |
| MISCCOSTS x 100 | -0.0200 | (0.0245) | -0.75 | 0.0989*** | (0.0652) | 0.54 |
| SCHOOLCAP | 0.0519 | (0.0646) | 1.96 | -0.0985 | (0.1859) | -0.54 |
| ELECTRICITY | 0.1519*** | (0.0689) | 5.74 | 0.2847 | (0.1966) | 1.56 |
| RICEPRICE x 100 | 0.0527 | (0.0690) | 1.99 | -6.9275 | (5.0471) | -37.99 |
| MILKPRICE x 100 | -0.2302 | (0.5876) | -8.7 | -4.3133* | (2.4749) | -23.66 |
| FLOOD | 0.0367 | (0.0922) | 1.4 | -0.2039 | (0.2350) | -1.12 |
| DROUGHT | -0.0697 | (0.0653) | -2.63 | -0.3162* | (0.1830) | -1.73 |
| CYCLONE | -0.0117 | (0.0705) | -0.44 | -0.0198 | (0.2175) | -0.11 |
| Constant | 0.5177 | (0.4925) | | -1.6286 | (1.4461) | |
| Predicted outcome | 0.6295 | | | 0.0232 | | |
| Presudo-$R^2$ | 0.2193 | | | 0.5107 | | |
| Log likelihood | -1165.40 | | | -171.08 | | |
| Number of observations | 2229 | | | 874 | | |

*Notes:* ***, ** and * indicate statistically significant at the 1%, 5%, and 10% levels correspondingly; statistical significance is determined using the standard normal (z) table.

**Appendix table 2:** SEQP results for girls

| | SCHOOLONLY (vs. COMBINE + OS) | | | COMBINE (vs. OS) | | |
|---|---|---|---|---|---|---|
| | Coefficient | Standard error | Marginal effect x 100 | Coefficient | Standard error | Marginal effect x 100 |
| *Child characteristics* | | | | | | |
| AGE7 | 0.5970*** | (0.1528) | 19.59 | 0.2685 | (0.4409) | 1.96 |
| AGE8 | 1.1254*** | (0.1704) | 36.92 | 1.3015*** | (0.4873) | 9.49 |
| AGE9 | 1.0599*** | (0.1970) | 34.77 | 1.4376*** | (0.5040) | 10.48 |
| AGE10 | 1.0098*** | (0.1621) | 33.13 | 1.1928*** | (0.4650) | 8.69 |
| AGE11 | 0.9814*** | (0.1968) | 32.20 | 0.7926 | (0.6075) | 5.78 |
| AGE12 | 0.5462*** | (0.1523) | 17.92 | 0.7268* | (0.4002) | 5.30 |
| AGE13 | 0.5550 | (0.1855) | 18.21 | 0.8563 | (0.5327) | 6.24 |
| AGE14 | 0.2476 | (0.1620) | 8.12 | 0.5928 | (0.4636) | 4.32 |
| AGE15 | -0.2305 | (0.1683) | -7.56 | 0.4891 | (0.4436) | 3.56 |
| *Household characteristics* | | | | | | |
| HEADAGE | -0.0046 | (0.0207) | -0.15 | -0.0009 | (0.0628) | -0.01 |
| HEADAGE2 | -0.0000 | (0.0002) | -0.07 | -0.0001 | (0.0007) | -0.00 |
| FEMALEHEAD | 0.0980 | (0.1655) | 3.22 | 0.4405 | (0.3890) | 3.21 |
| ADULTMALES | 0.0108 | (0.0508) | 0.35 | 0.0253 | (0.1323) | 0.18 |
| ADULTFEMALES | 0.312 | (0.0659) | 1.02 | 0.1537 | (0.1624) | 1.12 |
| DEPENDENTS | -0.0118 | (0.0418) | -0.39 | 0.0072 | (0.1111) | 0.05 |
| SCHOOLONLYBOYS | 0.2632*** | (0.0631) | 8.64 | -0.0770 | (0.2286) | -0.56 |
| COMBINEBOYS | -1.2428*** | (0.2243) | -40.77 | 0.5110*** | (0.2178) | 3.72 |
| OSBOYS | -0.2427*** | (0.0686) | -7.96 | -0.3379 | (0.2067) | -2.46 |
| SCHOOLONLYGIRLS | 0.1641*** | (0.0612) | 5.38 | -0.6326*** | (0.2631) | -4.61 |
| COMBINEGIRLS | -1.5046*** | (0.2669) | -49.36 | -0.0856 | (0.3122) | -0.62 |
| OSGIRLS | -0.5761*** | (0.0792) | -18.90 | -0.5659 | (0.2310) | -4.12 |
| FATHEREDU | 0.2109*** | (0.1026) | 6.92 | 0.3057 | (0.2783) | 2.23 |
| MOTHEREDU | 0.4791*** | (0.1203) | 15.72 | 1.1791*** | (0.3041) | 8.59 |
| POVERTY | -0.3578*** | (0.0965) | -11.74 | 0.2050 | (0.2769) | 1.49 |
| FARM | 0.0453 | (0.0844) | 1.49 | 0.1631 | (0.2482) | 1.19 |
| BUSINESS | 0.0418 | (0.1050) | 1.37 | 0.4949* | (0.2623) | 3.61 |
| MUSLIM | -0.0129 | (0.1394) | -0.42 | -0.1300 | (0.4443) | -0.95 |
| *Village characteristics* | | | | | | |
| CHILDWAGE x 100 | -0.9570*** | (0.4304) | -31.40 | 2.3917*** | (1.1537) | 17.43 |
| WAGERATIO | 0.1040 | (6.7407) | 0.34 | 0.0978 | (0.1983) | 0.71 |
| TUITIONFEES x 100 | 0.0135 | (0.0308) | 0.44 | 0.0364 | (0.0943) | 0.27 |
| BOOKSUPPLIES x 100 | -0.0033 | (0.0199) | -0.11 | -0.0329 | (0.0593) | -0.24 |
| TRANSPORT x 100 | -0.1493*** | (0.0429) | -4.90 | 0.0427 | (0.1283) | 0.31 |
| TUTORING x 100 | -0.0092 | (0.0113) | -0.30 | -0.0048 | (0.0324) | -0.03 |
| MISCCOSTS x 100 | 0.0142 | (0.0218) | 0.47 | 0.0111 | (0.0553) | 0.08 |
| SCHOOLCAP | -0.0743 | (0.0849) | -2.44 | -0.1433 | (0.2688) | -1.04 |
| ELECTRICITY | 0.0948 | (0.0978) | 3.11 | 0.7571*** | (0.3615) | 5.52 |
| RICEPRICE x 100 | 0.0888 | (0.0719) | 2.91 | -2.5414 | (5.3882) | -0.19 |
| MILKPRICE x 100 | -0.7146 | (1.2629) | -23.45 | 4.1873 | (3.2222) | 0.31 |
| FLOOD | -0.2275* | (0.1177) | -7.46 | 0.5240 | (0.4570) | 3.82 |
| DROUGHT | -0.2544*** | (0.0866) | -8.35 | 0.2667 | (0.2511) | 1.94 |
| CYCLONE | 0.1104 | (0.0892) | 3.62 | -0.7797*** | (0.3084) | -5.68 |
| Constant | 0.8798 | (0.5924) | | -4.2989 | (1.9676) | |
| Predicted outcome | 0.7341 | | | 0.0326 | | |
| Presudo-$R^2$ | 0.2504 | | | 0.5180 | | |
| Log likelihood | -697.68 | | | -101.96 | | |
| Number of observations | 1510 | | | 463 | | |

*Notes:* ***, ** and * indicate statistically significant at the 1%, 5%, and 10% levels correspondingly; statistical significance is determined using the standard normal (z) table.