

The Bangladesh gender gap in education : biased intra-household educational expenditures

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Abu S. SHONCHOY* and Mehnaz RABBANI**

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By investigating the educational expenditure of children over the ten years (2000 to 2010), we evaluate whether there exists any gender specific discrepancy at the household level and the trend of such discrepancy over the years. Using three rounds of nationally representative Household Income & Expenditure Surveys this study reveals that households spend less on education for their school-going girls compared to boys. By disaggregating the total expenditure into fixed and variable components, we find persistent gender imbalance in educational expenditure where households provide better quality of education for boys. Moreover, we find that gender based discrepancy has a very persistent trend and does not show any significant sign of narrowing the gap over the years. Cohort wise difference-in-difference estimation also reveals that the gap has initially widened and later converged but has not diminished beyond the initial level of discrepancy, which may warrant targeted policy intervention.

Keywords: Intra-household, Education, Expenditure, Discrepancy, Bangladesh.

JEL classification: D13, J160, O150

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The Bangladesh Gender Gap in Education: Biased Intra-household Educational Expenditures

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Abstract

For the last two decades, Bangladesh has made impressive progress in reducing gender disparity in education. With pro-active policy towards female education coupled with improved employment opportunities for women, the demand for girls' education has accelerated, leading to a commendable improvement in enrolment and years of schooling. However, how much of these policy interventions and market opportunities have translated into a better intra-household resource allocation has still not been explored in the literature. By investigating the educational expenditure of children over the ten years (2000 to 2010), we evaluate whether there exists any gender specific discrepancy at the household level and the trend of such discrepancy over the years. Using three rounds of nationally representative Household Income & Expenditure Surveys (2000-2001, 2005-06 and 2010-11), this study reveals that households spend less on education for their school-going girls compared to boys. By disaggregating the total expenditure into fixed and variable components, we find persistent gender imbalance in educational expenditure where households provide better quality of education for boys. Moreover, we find that gender based discrepancy has a very persistent trend and does not show any significant sign of narrowing the gap over the years. Cohort wise difference-in-difference estimation also reveals that the gap has initially widened and later converged but has not diminished beyond the initial level of discrepancy, which may warrant targeted policy intervention.

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I. Introduction

Bangladesh has made notable progress in gender equality for education over the past two decades. With intensive investment and interventions in the education sector, gender based discrepancy in enrolment and schooling years has gradually decreased, as found in various education outcome indicators (Ahmed et al 2007). However, how much of these policy interventions have translated into a better intra-household resource allocation for education has still not been explored in the literature.

Classical household theory suggests that intra-household resource allocation decisions are made based on preferences, investment returns, time and income constraints (Behrman 1982). Despite having the same genetic endowments, human capital investments on children in the same household may vary by birth order, cognitive endowment, age and income of parents at the time of birth and gender (Lehmann et al 2012).

Gender disparity in education and the labour market is a source of concern for policy makers and social scientists. One of the fundamental roots for gender disparity is the discrepancy in intra-household resource allocation on education for girls compared to boys in developing countries. This phenomenon of parents investing systematically more on sons compared to daughters has been studied in many contexts (for example, see Deaton 1989, Li and Tsang 2003). Evidence of differential investment in education exists for countries in South Asia (Saha 2013, Chaudhury and Roy 2006, Himaz 2008, Lancaster 2008, Qureshi 2012). Saha (2013) summarizes evidence from India on intra-household gender discrimination and shows, using Indian nationally representative sample, that total expenditure on girls is lower than that on boys in Indian households. Himaz (2008), on the contrary, found Sri Lankan parents spend more on daughters' education compared to sons'. Qureshi (2012) makes an attempt at linking parental investment on girls' education and labour market returns in Pakistan with inconclusive results. All these studies suggest differences in labour market returns and cultural factors (such as strong son preference in India) as explanatory factors for the intra-household allocation discrepancy.

Parents, perhaps, are not discriminatory by nature, but different economic and social incentives drive them to invest differently based on the gender of their children. Typically, in developing countries, boys have more opportunities to get engaged in the labour market and have more access to high paying jobs. Moreover, sons are traditionally held responsible for providing old age support for their families. Hence, parents with limited resources choose to invest more on sons' education, which will entail higher returns and old age insurance. However, this preference may change due to structural shift in the economy that provides better employment possibilities for females or due to targeted government support for girls' education.

One can reasonably expect such a change of lower Intra-household gender discrepancy to occur in Bangladesh over the last two decades. Bangladesh has achieved commendable improvements in gender parity and much applause for its effective policies for promoting girls' education through providing free education and cash transfer program. Female labour force participation also increased from 26 percent to 36 percent from 2000 to 2010 (Labor Force Survey 2010). A major contributor to this improvement could be attributed to the thriving Ready Made Garments (RMG) sector of Bangladesh, which is the largest exporting source of the economy, hiring about 4 million workers, predominantly women (Kabeer and Mahmud 2004, BGMEA 2013). Heath and Mobarak (2014) compare the educational attainment of girls in villages that are close to garment factories to those villages that are not, to show that garment factories have a significant effect on girls' education (an extra 1.5 years of schooling, according to the study). A vast number of studies (for example see, Raynor and Wessen 2006, Ahmed et al 2007) present the positive achievements made in enrolment rates, years of schooling and attendance rates of girls in Bangladesh. However, there exists no rigorous work that systematically examines whether a more fundamental preference change has emerged within households in reducing gender based discrepancy of resource allocation for education.

Using three rounds of nationally representative repeated cross-section data spanning 2000/2001 to 2010/2011, this paper is one of the first attempts to provide an in-depth analysis of intra-household gender based discrepancy and its trend in Bangladesh. In doing so, we disaggregate educational spending into various components to identify the source of such

discrepancy. Furthermore, we analyzed the trend of intra-household educational discrepancy in Bangladesh over a decade. Educational expenditure consists of various components, some of which are arguably fixed, such as textbook costs, based on the type of school a child is enrolled in. Other components such as transport costs, school tuition, and private tutor are flexible and depend on the decisions made by parents. Systematic investments on these important expenditure components could have sizable impact on educational achievements for school going children (see, Kremer 2003, Banerjee et al 2005, Duflo 2012). Hence, identifying the source of disparity for educational investment will better our understanding of why girls are in a disadvantaged position with regard to educational and labour market achievements at a later stage of their lives.

The empirical finding of this paper supports the theoretical framework that investment discrepancy exists in favour of boys in Bangladesh. Our result shows, by and large, gender based discrepancy in intra-household educational resource allocation has been quite persistent despite the intervention of female stipend programme (introduced at that time) and the garment revolution that employs mostly women (Heath and Mobarak 2014). By disaggregating the total expenditure into fixed and variable components, we find that households prefer a better quality of education for sons, by providing them expensive schooling and more supplementary teaching in the form of private tutors. Such a form of gender-based discrepancy had become more pronounced at the secondary level of schooling. Cohort wise difference-in-difference estimation also reveals that the gender gap of household educational expenditure has initially widened when we compare the eldest cohort with the immediate younger ones. Although this gap has narrowed down for the youngest cohorts but the convergence is not beyond the initial level of discrepancy of educational investment between boys and girls. Exploring the average expenditure of education, we see that a substantial part of gender gap could be classified as “unexplained” component based on the Oaxaca-Blinder decomposition method.

The paper is organized as following, in section II, we present the context and motivation of the paper with a brief discussion of relevant literature, followed by section III that deals with the

conceptual framework of the paper. In section IV we present the data and methodology and in section V the estimation strategy. In section VI, VII and VIII we analyse the regressions, cohort analysis and Oaxaca decomposition results and finally in section IX we conclude the paper with a discussion.

II. Context and Motivation

Women empowerment in Bangladesh has been at the heart of much of its development and poverty reduction policies. Bangladesh is particularly known for a large and thriving non-government organization (NGO) sector which works primarily for the economic empowerment of women. Unlike neighboring India, the country also does not suffer from issues like sex selective abortion or female infanticide. Dreze and Sen (2013), in their discussion on India's development challenges, draws extensively on the example of Bangladesh as a success case, particularly highlighting the evidence of no sex selective abortion or female infanticide in Bangladesh. Similarly, evaluating the intra-household health investment on children, Morduch (1997) did not find any existence of gender based disparity in Bangladesh.

However, the scenario for intra-household resource allocation could be different for education, which has largely been unexplored by academic community. Literature on the education sector in Bangladesh has particularly focused on trends in educational outcomes such as enrolment and drop-out rates (Ahmed et al 2007). Bangladesh has made praiseworthy achievements in some of the crucial indicators of overall education performance. For instance, the net enrolment rate at the primary level rose from 62.9 percent in 2000 to 97.3 percent in 2013 according to the current Annual Sector Performance Review (ASPR 2014). Primary education completion rate increased from 52 percent to an impressive 79 percent over the same period, as well.

Bangladesh has also achieved greater gender parity as defined by the targets of the Millennium Development Goals, as girls' enrolment rates have grown faster than that of boys'. Thanks to the commitment and effective partnership of donors, NGOs and the government, girls' education has been at the forefront of policy activities in Bangladesh. The government of Bangladesh, backed by international support, has rightly invested in extensive campaigns,

infrastructure and stipend programs for uplifting gender balance in education. The national stipend program for girls in Bangladesh is seen as one of the first conditional cash transfer programs in the world. Recent literature on the status of education in Bangladesh highlights this as a success in education policy. Chowdhury *et al.* (2002), using a nationally representative data set collected by “Education Watch” in 1998, found that the gender gap in primary enrolment has disappeared in Bangladesh. Enrolment rate for girls at the primary level exceeded that of boys throughout the last decade. Shafiq (2009) confirmed this finding for both primary and secondary school going children, using the 1999-2000 Household Income and Expenditure Survey data, and aptly termed this result a ‘*Reversal of Educational Fortune*’ for Bangladesh. This reversal of the gender gap in education occurred in the late 1990s, as shown by Asadullah and Chaudhury (2009). In their analysis using data from 1995, 2000 and 2005, the authors attributed this phenomenon to the cash incentives introduced by the government for girls’ schooling.

Despite these achievements, the lower attendance, high drop-out rates and poor academic performance of girls are of concern. Several forms of financial aid (such as the Female Stipend Program, FSP) are in place to encourage girls to enroll and continue schooling. Although numerous studies have shown these interventions have been successful in increasing girls’ enrolment (Khandker, Pitt and Fuwa 2003), unfortunately, the stipend amounts have remained constant while inflation has soared, especially in the past few years, making the amount a small fraction of total educational expense. Consequently, the monetary value of the stipends has become insufficient to cover the direct and indirect costs of education for girls. Moreover schooling infrastructure, quality of teaching, early marriage and gender discrimination in the classroom are recent issues that have been raised as reasons behind the low retention rates of girls in school. Ahmed *et al.* (2007) and Chowdury *et al.* (2003) show that girls have consistently lower learning achievements in schools than boys. Due to a mismatch in the demand and supply for schools, classrooms in Bangladesh are typically overcrowded and not adequately designed to facilitate girl students. For example, 36 percent of primary schools in Bangladesh did not have separate toilet facilities for girls in 2013, which is seen as one of the reasons for the low attendance of girls in rural areas (DPE 2014).

Qualitative and exploratory studies examined the role of early marriage and cultural norms that lead to gender disparities in education. In Bangladesh, sons are traditionally held responsible for taking the role of bread-earners and to provide old age support for their elderly parents, whereas child bearing, taking care of the family members and day-to-day household activities are the role traditionally imposed upon girls. Hence, for many parents, educating girls often means preparing them to be good mothers and to provide a better signal in the marriage market, whereas for boys, the purpose of education is to gain better employment and income earning opportunities. Lack of security and mobility for girls coupled with the custom of dowry, which proportionally increases with age, force many parents in rural areas to discontinue investment in the education of daughters and to opt for early marriage. Mahmud and Amin (2006) argue that the concern for the security of adolescent girls and poverty continue to motivate parents to prioritize marriage over education for their daughters, leading to dropping out of school despite financial incentives from the government.

The lack of job opportunities and low participation of women in the labour market also lead to a lower private return to education for girls compared to boys. The female unemployment rate in Bangladesh is four times higher than that for males, and a majority of women are engaged in economic activities with low private return, such as working in the agriculture and manufacturing sector (Toufique 2014). According to Asadullah (2006), despite higher social returns to education for girls compared to boys in Bangladesh, women earn 65.3 percent less than men, which reduces the private gains of education for girls.

There exists some evidence that girls get less attention when studying at home and in the classroom. Shahjamal (2000) and Mahmud (2003) argue that teachers pay less attention to girls in the classroom and boys get more educational aid in the form of private tutoring facilities. Having access to private tutors (most often private tutors are school teachers who often give preferential treatment to their private students whose parents hire them outside of the school time) is a common practice in Bangladesh and is seen as a necessary input for succeeding in school. Baulch (2010) points out that access to a private tutor, which is seen more and more as a necessity to survive in school, costs about 200 BDT (about 2.58 USD) on average per month.

The monthly stipend for girls in secondary school is only 100 BDT, which hardly covers a fraction of the cost of education, let alone private tutoring.

In the last two decades, labour market opportunities for women in Bangladesh have improved significantly. Dreze and Sen (2013) argued that women's participation in remunerated work has increased more in Bangladesh compared to India. The growth of the ready-made garments sector, where women are the majority of workers, has increased women's opportunity to join the labour force. Anecdotal evidence points towards economic growth, increased employment opportunities in the garments sector for women, greater coverage and accessibility of microfinance, wide use of modern family planning methods and changing marriage market conditions are contributors to a significant improvement in the demand for girls' education in Bangladesh (Shafiq 2009, Amin 1998, Dreze and Sen 2013). Heath and Mobarak (2014) compare the effects of garment factories (providing employment opportunities almost exclusively to women) and the female stipend program in Bangladesh and argue that the demand side (employment opportunities) plays a greater role in improving schooling outcomes for girls than supply side (cash incentives for schooling) interventions.

Due to these varied factors, despite no evidence of parental gender preferential treatment in Bangladesh in other sectors, gender based disparity in education expenditure within the household may persist. However, broader changes in the economy (such as the female stipend program and growth of the garment sector) suggest that this discrepancy may be reducing.

III. Conceptual Framework

Parents in developing countries invest in their children because they wish to ensure the welfare of their children as well as their own. The investment decision at a given time for each child can be explained using a typical two period model. Parents earn and invest a fraction of their income on children in the first period and reap benefits from children's income in the second period when they are unable to earn. It is intuitively logical that parents will invest more on children who benefit most from investment (in this case education) and/or share their wealth

with their parents more (old-age support). Alderman and King (1998) summarize such a model to show the basic implications of differences in returns to education by gender. We use this general model as the basis for understanding our empirical findings. We assume that parents care equally about each child and their investment decisions are based solely by the rate of return from investment.

If parents' (assuming joint decision of both parents) lives consist of two periods – the first when they work, earn income and invest in children's education and the second when they retire – returns from children's education are enjoyed by parents in the second period. A simple two-period objective function for a household that has one son and one daughter is as follows (as presented in Alderman and King 1998):

$$U = F(C_1) + G(C_2, W_b, W_g),$$

where C_1 is consumption in the first period, C_2 is consumption in the second period, W_b and W_g are the wealth of son and daughter respectively. We assume,

$$C_2 = \beta W_b + \gamma W_g$$

where β is the fraction of son's wealth that parents receive in their old age (transfers from son) and γ is the fraction of daughter's wealth that parents receive in their old age (transfers from daughter). Let us also assume that

$$W_b = bH_b \text{ and } W_g = gH_g$$

where b is the private returns to education for boys, H_b is parental investment in their son's education, g is the private returns to education for girls and H_g is parental investment in their daughter's education. The gap between H_b and H_g is what we refer to in this paper as the gender based discrepancy in educational expenditure.

The budget constraint for the parents is $Y = P_b H_b + P_g H_g + C_1$, where Y is income (parents earn only in the first period), and P_b and P_g are the costs of education for boys and girls respectively.

Using this setting, the optimization problem for the household is as follows:

$$\max_{H_b, H_g} F[Y - P_b H_b - P_g H_g] + G[(\beta b H_b + \gamma g H_g), b H_b, g H_g].$$

The first order conditions for this problem are:

$$1. P_b \frac{\delta F}{\delta C_1} = \frac{\delta G}{\delta C_2} \beta b + \frac{\delta G}{\delta W_b} b \text{ and}$$

$$2. P_g \frac{\delta F}{\delta C_1} = \frac{\delta G}{\delta C_2} \gamma g + \frac{\delta G}{\delta W_g} g.$$

Assuming that the marginal costs of investment (left hand side) on sons and daughters are equal, the above implies the following optimal condition:

$$\frac{\delta G}{\delta C_2} \beta b + \frac{\delta G}{\delta W_b} b = \frac{\delta G}{\delta C_2} \gamma g + \frac{\delta G}{\delta W_g} g.$$

Here $\frac{\delta G}{\delta W_b}$ and $\frac{\delta G}{\delta W_g}$, which represent parents' utility from the human capital achievement of their children, are assumed to be equal. This is a safe assumption given that there is no evidence of parental gender discrimination in Bangladesh with regard to health investments or infanticide based on gender. Then this optimality condition clearly points out to the importance of the relative magnitudes of b versus g (the private return to education for children) and β versus γ (transfers from children) as the key to differential investment by gender. If the wage rate in the labour market is lower for women than for men, as is the case in most of the world, then it is safe to assume that $b > g$. For the same level of human capital investment, this would make the left hand side of the equation larger than the right hand side. For optimality, parents invest more on sons than on girls (since marginal benefit from investment on boys is higher). This is one explanation for the existence of gender based discrepancy in education spending.

In the cultural context of Bangladesh, daughters move in with their husbands' families after marriage and are not expected to provide any financial support for their parents during old age. Moreover, if parents are required to pay dowry for their daughters' marriages, the transfers from daughters to parents in their old age can even be negative. In such a context, $\beta > \gamma$. Again, this justifies higher education expenditure on sons.

Given the strong cultural norm of sons being old age support providers for parents and daughters moving out of the family, there is no reason to believe that the difference between β and γ has changed over the last decade. However, the gap between b and g can be speculated to have changed. There are three potential issues that could lead the gap between g and b to decline over the years in Bangladesh. First, as discussed before, the female participation rate in the labour market has improved significantly over this period. Rapidly increasing opportunities in the manufacturing sector for women can be expected to improve private benefits from education. This should have increased g , reducing the gap between b and g . Second, proactive government policy to encourage female education has reduced the direct cost of education for girls. This should have increased g and reduced the gap between b and g . Third, preferential public financial support for girls' education means a rise in the relative cost of education for boys. Although there is no empirical evidence for this crowding out effect, theoretically this can reduce b and narrow the gap between b and g as a result. Given these factors, we may observe a persistent fall of gender discrepancy in intra-household spending decisions in Bangladesh.

IV. Data and methodology

For the empirical analysis of this paper, we used the Household Income and Expenditure Survey (HIES), a nationally representative household survey conducted by the Bangladesh Bureau of Statistics (BBS), which provides detailed information about expenditure on each school going child of sample households in Bangladesh. Using three rounds of data (repeated cross-sections) from 2000, 2005 and 2010, we investigate intra-household resource allocation for education and its trend in Bangladesh. We defined primary school-going children as those students who are in grade 5 or below during the time of survey and secondary school-going children are defined as those who are above grade 5 and below grade 11. We restricted our sample to the children of the household head and those who are enrolled in primary or secondary schools (higher levels of education excluded). For the purpose of this study, as we are not particularly looking at the extensive margin, we focused on the intensive margin by taking the sample of boys and girls who have reported to be enrolled in some education institution during the time of the survey.

The sample size for our analysis is 4,013, 7,144 and 11,461 school going children for the three respective HIES survey rounds. The average age of students has fallen from almost 13 years (in 2000) to 11 years old (in 2010). This may suggest that either the age of first enrolment or grade repetition has fallen. For all three rounds of data, about 68 percent of the sample is girls (Table 1). Government and private schools account for most of the enrolled students, whereas a small fraction of students go to madrasa (religious schools) and NGO schools (non-formal education provided by NGOs). Among our sample, almost 100 percent were never married and were not full-time earners (data for earnings unavailable for 2000 round). The value of average stipend per student has fallen as well, especially after 2005. The literature on the stipend programs suggest this has been expected since the budget available for the program has not increased as fast as the coverage. The household characteristics of the samples for the three rounds of data do not vary much. The proportion of mothers with secondary education has been consistent over the decade and the average number of children for each couple has fallen over the years.

[Table 1 here]

Education expenditure per school-going child for the household is on average 5016.78 BDT (about 64.48 USD)³ of which a significant portion is dedicated for the flexible component of the expenditure. Table 2 shows the mean expenditure on each components for education expenditure for our sample households. In 2000, expenditure on fixed components as a fraction of total expenditure on education was about 23.7 percent. Interestingly this fraction falls to almost 9.15 percent in 2005 and 15.6 percent in 2010. Hence it is clear that that fixed component is only a small fraction of overall spending on education for households. The highest expenditure item among flexible components is the payment for accessing private tutoring, which is higher than the total expenditure on fixed components for all children in Bangladesh.

[Table 2 here]

There exists a significant variation in education indicators across the divisions of the country (Table 3), especially the proportion of students in private schools, which is an important

³ The conversion rate used here is 1USD = 77.80 BDT (as of 4th March 2014).

determinant of education expenditure. In 2000 Chittagong had the highest proportion of students in private schools while Rajshahi had the lowest. In the 2000 data set, there was no information available on financial support for boys. About 40 percent of school going girls in Dhaka received some form of financial support (stipend, tuition waiver and other external and private resources), followed by girls in Rajshahi (38 percent), whereas Chittagong received the least. Average expenditure on education was highest in Chittagong and lowest in Khulna. The average annual education expenditure on boys in Chittagong was 5981 BDT while the corresponding number for girls in Khulna was 1482 BDT.

[Table 3 here]

Figure 1 demonstrates the gender difference of average expenditure based on the enrolled grade by each student (combining all three rounds of data). It is evident from the diagram that the education expenditure has a positive co-relation with the grade, as the cost of education increases for the students enrolled in higher grades. However, for each grade, we see a clear discrepancy in the average amount of expenditure dedicated for the boys compared with girls and the gap of educational expenditure is increasing for the higher grades compared with the primary education grades in Bangladesh.

[Figure 1 here]

Keeping the above descriptive statistics in mind, we did separate regressions by region and education levels in our analysis. We also investigated expenditure on private tuition separately, since that accounts for a large proportion of expenditure on education for households.

V. Estimation strategy

We estimate the gender discrimination in education expenditure by the following model:

$$\text{Log}(\text{expenditure})_{ijk} = \alpha_{ij} + \beta_1 \text{Female}_{ij} + \beta_2 \text{Ind}_{ij} + \beta_3 \text{School}_{ij} + \beta_4 \text{HH}_j + \beta_5 \text{Region}_j + \mu_{ijk} \quad (1)$$

Where expenditure_{ijk} is the household educational expenditure for child i in household j in region k . Female_{ij} is a dummy variable which is 1 if child i in household j is a girl. Ind_{ij} is a vector of child specific characteristics such as birth order. School_i is a vector of dummies for the type of

school attended by child i . HH_j is a vector of household characteristics common to all children of household j , and $Region_k$ is a vector of district dummies. Our coefficient of interest is β_1 , which shows the difference in expenditure based on gender. The standard errors of all our regressions are clustered at the household level to control for the common unobserved correlated errors.

We first estimate the model by pooling all the data of different rounds of survey together and interacted the survey year dummy with our coefficient of interest (female dummy), along with survey dummy, to check whether there exists different trends in gender based discrepancy for different rounds of survey. We then run our core regression model (equation 1) separately for each of the three rounds of survey. We also run separate regressions for fixed and flexible components in the expenditure list along with major expenditure components to check the source of discrepancy. The fixed component of the expenditure consists of the following items: admission fees, annual/session fees, registration fees, examination fees and tuition fees. The flexible component, on the other hand, consists of the following items: text and note books, exercise books and stationary, uniform and footwear, residential hostel expenses, transportation costs, tiffin/mid-day meal, cost of internet/email and communication and fees for private tutor.

As individual child-control variables, we added birth order (the first child of household head is 1, the second child is 2 and so on), a dummy variable to capture "Twins" (which is equal to 1 if child i has a twin brother or sister), grade (variable age dropped because of high collinearity with grade), age squared (to control for non-linearity) and a dummy to capture financial support, indicating if the child receives any form of financial support for education (mostly stipend and tuition waivers). Schooling controls include dummies for government school, private school and madrasa, which means that the coefficients show the effect of moving from 'other' schools (mostly non-formal and NGO schools) to each of the mentioned types of schools. Parental education has a role in preferences for children's education. All regressions include dummies for parental educational indicators. The total number of children and the number of school going children also affect education expenditure in the household, as pointed out in the literature (Begum 2013). We added the sum of offspring (of household head), sum of

school-going children and ratio of male to female school going children for each household to control for this effect. Other household controls are household size, dummy for female headed household, dependency ratio (ratio of under-15 and over-65 year olds to total household members), value of household durable goods as a proxy for household wealth and dummy variables for religion (Muslim, Hindu). The summary statistics for all control variables are shown in Table 1.

To control for systematic difference of cohorts born in different years, we construct five birth year specific cohorts using the age information available in each of our three rounds of HIES dataset, as shown in Table 4. The oldest cohorts we have information is born during the period of 1980-1984 and youngest one is born during the period of 2000-2005. We controlled for cohort fixed effects for all the regressions.

[Table 4 here]

As mentioned earlier, all standard errors are clustered at the household level. As seen in the earlier section, there are geographical variations in schooling indicators. District dummies are added to control for any geographical difference (suppressed in the tables). All expenditure and stipend amounts are adjusted for inflation.

As discussed before, the improvement in female school enrolment is often attributed to the Female Stipend Programme of the Bangladesh government, which we could not adequately control in our regression mainly due to the unavailability of precise information. The HIES questionnaire collects information about whether each school-going child receives any form of stipend/cash support, without specifying the exact kind or provider of such support. The expenditure amount reported is inclusive of any financial aid received by the household. Financial aid in the form of stipends, scholarships and tuition waivers are available for both boys and girls at the primary levels.

Although government stipends at the secondary level are exclusively available for girls, our data reveals that a large number of boys at the secondary level also reported receiving financial support which might have been accessed through interventions by international donors and

NGOs at the community level or by private philanthropic support provided by individuals. It is important to note that there exist no common targeting or eligibility criteria for education based financial aid in Bangladesh. Students who meet certain performance requirements in government schools receive government stipends while NGO schools provide supports based on economic and social needs (for example stipends are given to the socially excluded, dropouts, disabled, etc). The criteria for receiving stipends is unclear in practice, as there exists widespread mis-targeting of government stipend programs since each school committee is responsible for the selection of stipend recipients. Given the heterogeneity of targeting criteria, mis-targeting issues and the negligible value of stipends as a fraction of total educational expenditure (see Table 2), we did not attempt to model this as endogenous in our estimation. Instead we added financial support simply as a control in our regressions. We do not aim to provide any causal interpretation of this variable.

VI. Results

Table 5 shows the regression results for the three rounds (2000, 2005 and 2010) of HIES dataset pooled together with total (log of real total expenditure) as well as fixed and flexible component of education expenditure for each child as the dependent variable. Columns (1) to (3) present the results for regression for all these three categories without controls, and columns (4) to (6) show the results where additional individual and household-level controls are added. Our main coefficient of interest is the indicator variable 'Female' which captures the gender of the child. We see that the coefficient for Female is statistically significant and negative in all regressions, demonstrating the existence of gender based discrepancy in household education spending. This finding is true for all three expenditure categories (total, fixed and flexible) of data showing a persistent trend. Our estimation suggests that girls, after controlling for all other important individual, household observables and regional received about 14 percent (using Column 4) less in educational expenditure from parents compared to boys (in terms of geometric mean because of the logarithm transformation). In the fixed and flexible component category of the expenditure, this discrepancy was about 18 and 12 percent, respectively.

[Table 5 here]

In order to check the existence of any systemic difference of discrepancy across different rounds of HIES surveys, we included survey-round specific dummies (year 2005 and year 2010 dummy) and its interaction with the female variable. Although in the restricted model (without any household and personal control variables, depicted in column 1 to 3) this interaction variable shows significance, in the full model (column 4 to 6) such a sign of statistical significance disappears presenting evidence of no systematic difference of gender discrepancy across different rounds of survey. This finding confirms that the gender based expenditure gap in education is quite persistent in Bangladesh. The survey year coefficients are positive and significant indicating rising expenditure share for children's education.

Among the control variables, birth order of the children demonstrate a significant correlation with education expenditure, confirming the fact that younger siblings in the same household received less in educational spending compared to older ones, which is consistent with the evidence in the literature. The coefficient for grade is positive and significant indicating greater expenditure on senior grade students, as the cost of education rises with the higher level of academic progression.

Children who received any form of financial support for education, received more investment on education, most likely in the flexible expenditure category. Adding an interaction term for females with financial aid (not shown) also did not change the regression findings. The type of school a child is enrolled is also significantly correlated with expenditure. Compared to non-formal and NGO schools, education expenditure is highest for those who go to private schools. Similarly, parental education has an important effect on educational expenditure for children and the effect is much larger when both parents have an education level above primary. This could be explained partly by the fact that parents with higher education may earn more income and partly by the inherent preference for education in households with educated parents. Moreover, the number of school going children in a household has a significant correlation with educational spending. The higher the number of school going children in a family, the lower the

amount spent on education for each child. However, for brevity, we did not report these covariates in the table and is available from authors upon request.

As explained in Section V, we disaggregated total expenditure into sub-components to identify the source of discrepancy. Table 6 shows the regression results for major components of education spending. Columns (1) to (3) show the results for the major items categorized under fixed component by pooling all the three rounds of data. It appears that gender based discrepancy exists for the tuition expenses, which indicates that boys were sent to more expensive schools. We repeated this exercise for the major components of flexible expenditure categorization in columns (4) to (8) of Table 6. Here, we observe an interesting pattern, as for expense categories of uniform and conveyance, parents allocate more for their girls. These findings are not surprising as girls' uniforms require additional components compared with boys. On the other hand, due to security and safety concern, girls are in most cases accompanied by family members for reaching the educational institutes which may incur additional cost for transportation. However, we find persistent gender based discrepancy in the cost category of accessing private tutoring, which is highly statistically significant.

We examined further to see whether more boys receive this additional aid for improved academic performance and the amount spent for this. Column 9 of Table 6, we report the regression results with a dummy variable for every child who had access to private tutors as the dependent variable. We see that girls are less likely to receive this supportive learning aid compared to boys. One could argue that girls are better disciplined, more attentive to school and less exposed to out-of-school activities, and as a result, unlike boys, require less support in the form of private tutoring to help them with their school works and academic performance. While we have no supporting data to overrule this possibility, there exists ample anecdotal evidence in Bangladesh (as discussed earlier) that school teachers often provide preferential treatment, if not more attention, to those children they tutor at home. We find that girls receive less private tutoring, which may lead to lower achievement at schools; or it could simply mean that parents systematically choose better quality education for boys compared to girls.

[Table 6 here]

In Table 7 we investigate gender based discrepancy by the level of schooling based on the enrolment during the time of survey. All the odd columns report the point estimates of female variable when we restrict our sample for those who are enrolled at the primary level (grade 5 and below) and all even columns report for the secondary level (grade 6 and beyond). In the first panel we reported the total, fixed and flexible cost estimations as dependent variables and in the second panel we reported some important selected cost components. Panel 1 reveals that the expenditure on total, fixed and flexible component for female students enrolled in either primary or secondary level of schooling was not systematically different, except for the fixed component for the secondary enrollees. Exploring further in the second panel, we see clear evidence of gender based discrepancy for important cost components, namely tuition fees and tutor cost, to have systematic negative association with education expenditure for girls enrolled in secondary schools (column 8 and 10). Moreover, in column 11 and 12, we used a dummy variable to indicate the access to private tutors as the dependent variable. Similar to our earlier findings, we see that the discrepancy of providing private tutor facility for girls mainly occur when they are enrolled at the higher grades compared with primary level.

[Table 7 here]

In Table 8, we separately ran our main regression (equation 1) for each sampling year and separating the dependent variables in different panels as done in Table 7. Across these all survey rounds, we see a general downward trend in relative discrepancy for girls' education expenditure for all different expenditure components. For example, the average coefficient decreases from 0.23 to 0.097 for total education expenditure, indicating an improvement of overall discrepancy against girls, however, the coefficient is still sizable.

[Table 8 here]

Next we ran regressions for educational spending by region (Table 9). In 2000 there were five official divisions in Bangladesh. By 2005 Chittagong division was split into two – Chittagong and Sylhet, and by 2010 Bangladesh had 7 divisions with Rajshahi split into two (Rajshahi and

Rangpur). We aggregated Chittagong with Sylhet and Rajshahi with Rangpur for comparability with the survey round of 2000.

It appears that gender based discrepancy is quite pronounced in Rajshahi for all indicators, except for fixed component, compared to other districts. Interestingly, the choice of expensive schools for boys is univocal for households located in any division (column 16-20). In terms of magnitude, gender based discrepancy for total expenditure is found to be lowest in Dhaka, the capital of Bangladesh, followed by Khulna, Chittagong and Barisal and the worst is in Rajshahi.

[Table 9 here]

VII. Cohort Analysis:

To analyze the trend of gender-based discrepancy over time and to understand the relative position of such discrepancy, we constructed five birth specific cohorts, based on the available age information of each sample child from all rounds of survey. The detailed construction of these cohorts is depicted in Table 4. To understand the relative position of the level of discrepancy, we first conducted a simple t-test of cohort specific educational expenditure component analysis, based on gender, in Table 10. We also separate the estimation based on the schooling level (primary or secondary) as the overall comparison of education expenditure will not be able to provide a clear information of the relative discrepancy scenario of education expenditure based on gender.

It appears that the gender based educational discrepancy was not very pronounced, for total and flexible category of the eldest cohorts. This finding is consistent even if we separate the expenditure based on level of schooling category (in Panel 2 and 3). The only statistically significant difference of education expenditure based on gender for cohort 1 exists for fixed component which could be due to the parental preference for expensive schools for boys.

Interestingly, such discrepancy for preferential treatment for boys in the fixed components of the educational expenditure kept on soaring for younger cohorts, especially for the secondary

education, and seems to be quite sizable even for the youngest ones. In terms of magnitude, using Panel 1, the difference of total education expenditure between boys and girls within a cohort was maximum for Cohort 2 (1364.6 BDT) and minimum was for cohort 4 (289.9 BDT). For fixed and flexible cost of education, this expenditure gap is highest for cohort 3 and 2, and lowest is for cohort 1 and 5, respectively.

[Table 10 here]

Focusing on the estimation of total expenditure based on the schooling level (primary or secondary), we observe that the total expenditure gap of cohort 1 enrolled in primary education (see panel 2) was 138 BDT, the equivalent gap for later cohorts which are statistically significant, is of cohort 3 and 5 which are 557.9 and 334.3 BDT respectively. A similar comparison for secondary enrollees where the expenditure gaps are statistically significant is of cohort 2, 3 and 4. To evaluate the relative position of discrepancy and the trend over time, we calculated the difference-in-difference (DID) estimation following the work of Deshpande and Ramachandran (2013). Formally,

$$(2) \quad D - I - D = \Delta Cost_n - \Delta Cost_{(n-t)}$$

Where $\Delta Cost$ captures the gender based expenditure gap for the n^{th} cohort, which is being compared with $n-t^{th}$ cohort. At first, we compare the DID estimations of subsequent cohorts to understand the evolution of gender gap in education expenditure for total, fixed and flexible cost components, which are depicted in Table 11a. In the Panel 1, we have the results based on total sample and panel 2 and 3 report the schooling specific results, respectively. If the sign of DID estimation is negative that it means that the gap has widened for sequential cohorts. It appears that the gap of total expenditure has first diverged but later converged. The gap has widened for cohort 2 and narrowed for cohort 4, but this trend did not continue for the youngest cohort. Estimations based on schooling (see Panel 2 and 3 in Table 11a) also shows similar trend, except for the total and flexible cost trend in primary enrollees which shows widening of expenditure gap between cohort 2 and 3.

[Table 11a and 11b here]

Another way of assessing this gender gap growth could be by comparing the oldest cohorts, those who are born in 1980-1984 period, with all other cohorts. This exercise would give us a relative picture of evolution based on the initial gender gap of educational expenditure. In Table 11b we present the result of such exercise which follows the same presentation style as the Table 11a. Using all the samples, we see an initial divergence of the gap, which later converged for the younger cohorts except for the flexible cost component, which provides an optimistic view of the gender discrepancy (see Panel 1). We see similar trend for secondary education as well (see Panel 3). However, for the primary enrollees the picture is not that optimistic, as we see persistent divergence of the expenditure gap for the younger cohorts. We presented this graphically in Figure 2, 3 and 4. Figure 2 shows the overall trend of the total expenditure, where it is clear that the gap has widened initially but later converged. This tendency is similar when we see the evolution for expenditure gap for the secondary enrolled students. However, for primary education, this gap is alarmingly diverging, as shown in Figure 4.

[Table 2, 3 and 4 here]

VIII. Oaxaca-Blinder Decomposition:

In order to understand how much of this gender gap of education expenditure could be attributed to the human capital or endowments; we performed the Blinder-Oaxaca decomposition exercise, which is well known to address wage gap in the labor economics. For our analysis, we used personal characteristics, parental education and regional controls for the regression and we chose pooled model for our decomposition exercise. We reported all the results in Table 12. Using the entire sample, we see that the total expenditure gap is about 15 percent of which about 33 percent could be explained. This gap rises for the fixed cost component (about 24 percent) of which a large portion (71.4 percent) is classified as unexplained. Survey year specific decomposition reveals that the expenditure gap was larger in HIES 2005 survey compared with other rounds and the unexplained portion of the expenditure gap was larger if we do the decomposition based on that specific round.

Cohort specific decomposition shows similar trend as found in the DID estimations of the previous section. It appears that the gap has diverged for cohort 2 and 3 and then converged for cohort 4. However, for the youngest cohort, we see again a divergence and the expenditure gap is still quite sizable, about 17.5 percent (12.3 percent larger than the expenditure gap of cohort 1), of which a large portion is classified as unexplained category which could often be attributable as a proxy for discrimination.

[Table 12 here]

IX. Discussion

The allocation of educational resources on children is a key determinant of their employment and income in later life. Vital indicators for the overall performance of the education sector in Bangladesh show impressive improvements in girls' enrolment and schooling years, often attributed to the affirmative action policies employed by the government, such as the Female Stipend Program. With the rise in employment opportunities for women which could increase the return to education for girls, one could argue that there might exist an equal intra-household resource allocation for girls. To test this systematically, this paper investigated the existence of gender based discrepancy for education spending in Bangladesh and whether this intra-household allocation has changed over the years. Our detailed evaluation reveals that gender based discrepancy in education spending is very persistent and significant for all the HIES survey data, whether we pool all rounds together or we estimate separately. Though we observed a negative trend in the relative discrepancy coefficients, the magnitude is still quite sizable and highly statistically significant. Our results remain valid even if we estimate regressions based on schooling level, which show an even wider gap in expenditure on females enrolled at the secondary level.

Using detailed information on how much parents spent on each component of education, our evidence suggests that boys are sent to more expensive schools with higher cost for fixed components (such as higher tuition fees). Boys also get more educational resources, in the form of better access to private tutors. This suggests that the perceived demand for quality education is significantly dissimilar for boys and girls, and parents continue to invest differently

on children's education based on gender. Even if parents send both of their children to schools, they spend more to ensure a better quality of education for their son(s).

To examine the evolution of gender gap in the educational expenditure in Bangladesh, we compared different cohorts, based on their years of birth in the standard difference-in-difference (DID) set-up. Our DID estimation reveals that the expenditure gap had initially widened but later narrowed for the youngest cohorts. The picture is, however, not pleasant for the primary enrollees where we see a persistent divergence of expenditure gap for the younger cohorts. Although in some specifics the gap between the amount spent on girls and boys has decreased over the years, in most cases these findings are not statistically different from zero at the conventional level.

Our findings strongly state a couple of important facts: first, the reversal of the gender gap in enrolment rates has unfortunately, not been translated into a reversal of gender-based discrepancy in educational investment within households. Second, pro-active government and donor supported programs and the market forces have been largely unsuccessful to reduce the gender preference within households. As a result, we still observe a strong and persistent gender imbalance for educational resource allocation in Bangladesh.

It is important to note that how much a household can spend on education for each child depends on a host of variables. Although we controlled for individual, household-level and regional observables, there may exist possible omitted variables (such as cognitive ability and self-discipline factors) which can bias the estimation. However, assuming that the distribution of these unobserved factors is normal and time invariant, we can assert that gender based discrepancy in household educational expenditure strongly exists in Bangladesh and the trend of such discrepancy does not appear to be converging. In order to sustain and ensure the positive effects of affirmative action policies to translate into better intra-household resource allocation, this issue needs to be addressed at the policy making level and may need further intervention. Eliminating unequal investment on girls and boys at the household level may ensure gender parity at all levels and may provide women with a fair and equal chance to compete in the labour market with their male counterparts.

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Figure 1: Educational Expenditure Difference between Boys and Girls

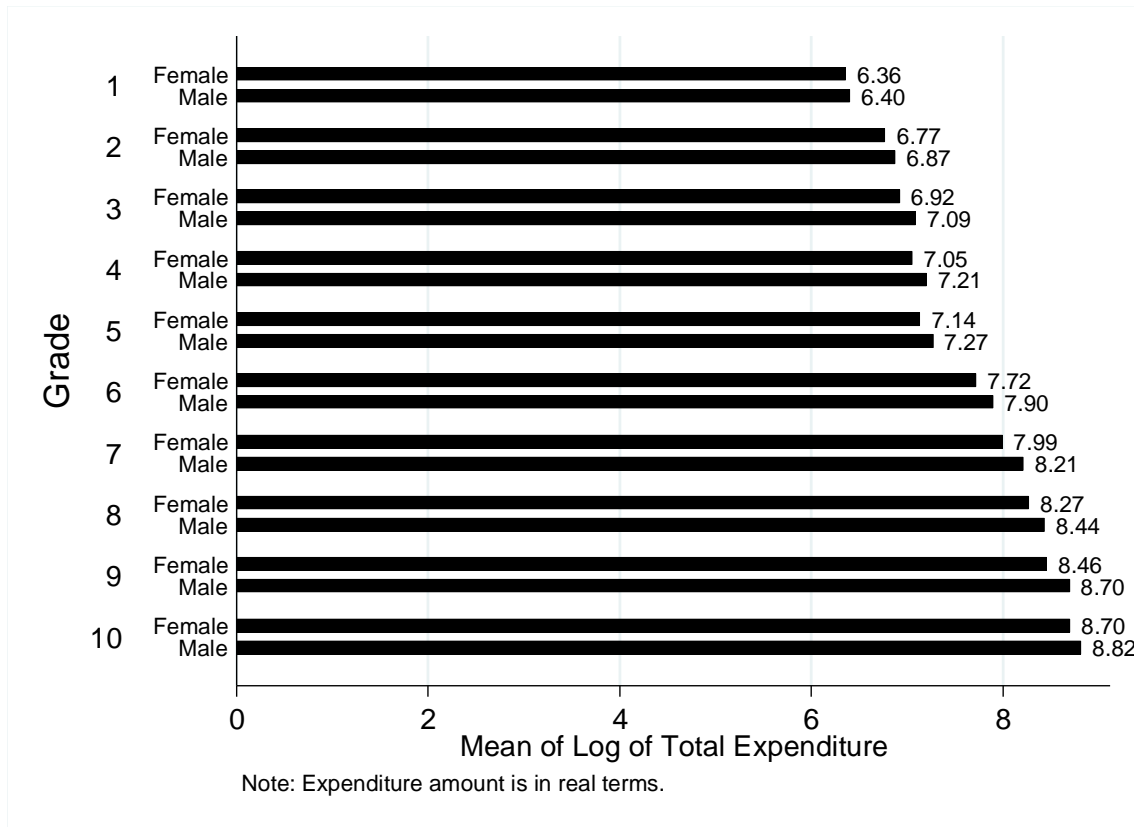


Figure 2: Total Education Expenditure across cohorts

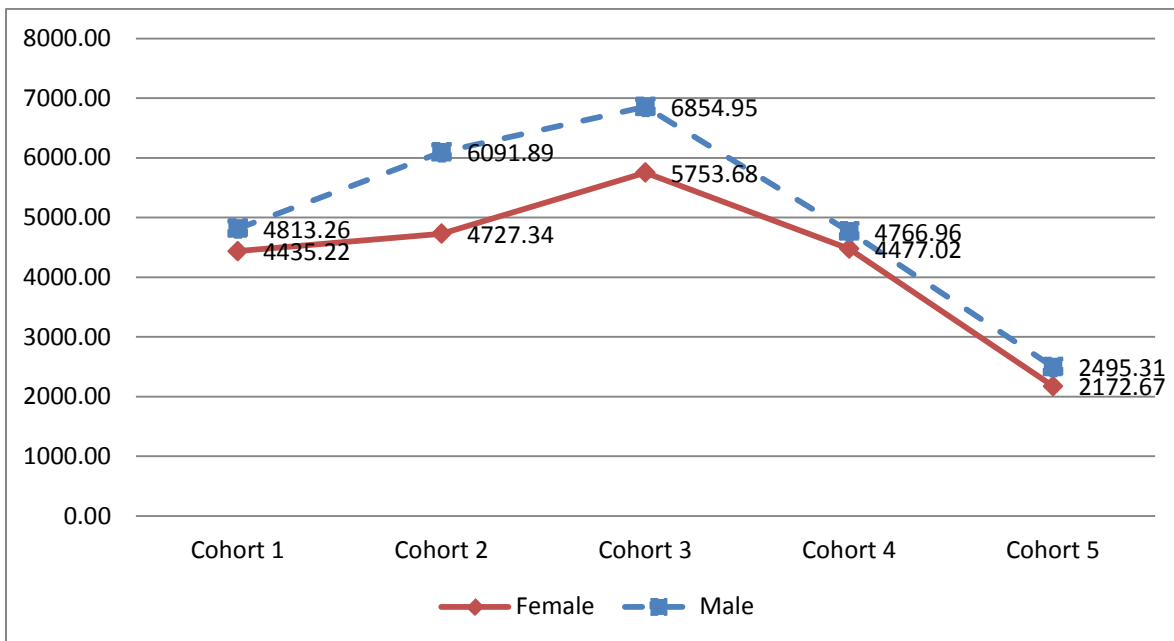


Figure 3: Total Education Expenditure across cohorts

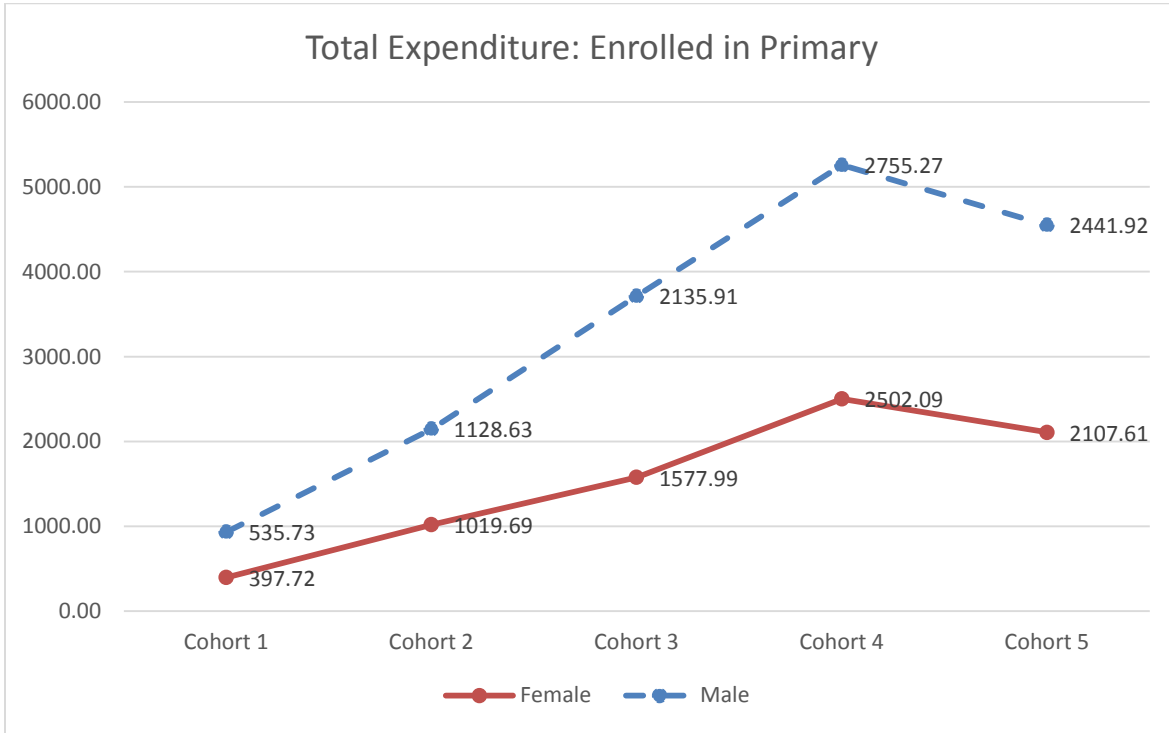


Figure 4: Total Education Expenditure across cohorts

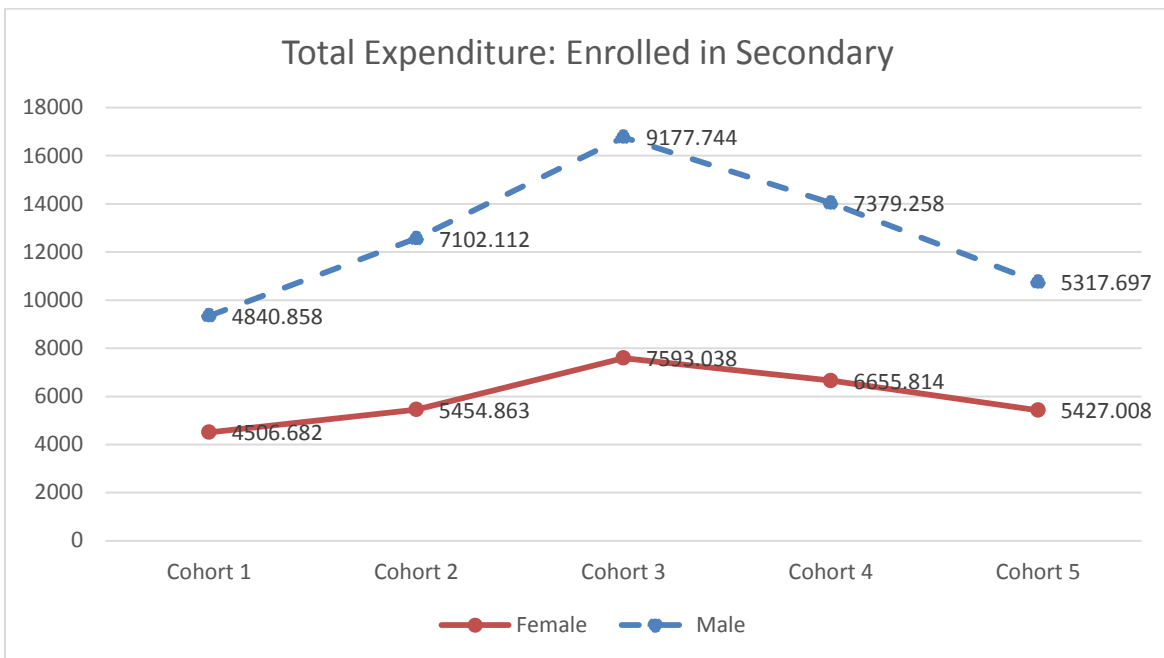


Table 1: Descriptive Statistics

	HIES 2000		HIES 2005		HIES 2010		Total	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Female	0.649	0.477	0.692	0.462	0.690	0.462	0.683	0.465
Age	12.882	2.882	12.114	3.234	11.092	3.336	11.742	3.300
Birth Order	2.220	1.247	2.179	1.190	2.100	1.116	2.147	1.165
Grade	6.779	2.564	6.048	2.971	5.099	3.178	5.705	3.080
Child Received any financial aid (d)	0.236	0.425	0.276	0.447	0.186	0.389	0.223	0.416
Child is Enrolled in a public school (d)	0.406	0.491	0.362	0.481	0.302	0.459	0.340	0.474
Child is enrolled in a private school (d)	0.535	0.499	0.421	0.494	0.341	0.474	0.402	0.490
Child is enrolled in a religious school/NGO (d)	0.037	0.189	0.050	0.217	0.050	0.217	0.047	0.212
Father's Education level is Primary (d)	0.111	0.315	0.112	0.315	0.089	0.285	0.100	0.300
Mother's Education level is Primary (d)	0.164	0.370	0.141	0.351	0.124	0.330	0.137	0.345
Father's Education level is Secondary (d)	0.102	0.303	0.090	0.286	0.063	0.243	0.079	0.269
Father's Education level is Secondary (d)	0.059	0.235	0.065	0.250	0.056	0.231	0.059	0.238
Father's Education level is Post-secondary (d)	0.144	0.351	0.134	0.341	0.099	0.298	0.118	0.323
Mother's education level is Postsecondary (d)	0.027	0.163	0.040	0.197	0.039	0.194	0.037	0.189
Size of the household	6.443	2.197	5.355	1.738	5.540	1.707	5.652	1.858
Dependency Ratio	0.492	0.167	0.427	0.167	0.504	0.163	0.478	0.169
Sum of off-Springs	3.831	1.553	2.960	1.319	3.227	1.292	3.257	1.385
Location of the household:Rural (d)	0.624	0.484	0.615	0.487	0.618	0.486	0.619	0.486
The child is twin (d)	0.019	0.137	0.015	0.120	0.008	0.090	0.012	0.110
Sum of scholl going children in HH	2.878	1.272	2.375	1.101	2.397	1.032	2.480	1.118
Sex ratio of school going children in HH	0.922	0.854	0.728	0.811	0.717	0.755	0.759	0.796
HH head is female	0.071	0.257	0.074	0.263	0.111	0.314	0.092	0.289
Log of HH durables	9.571	2.292	9.206	1.460	10.115	1.657	9.734	1.786
Religion is Muslim(d)	0.925	0.263	0.898	0.302	0.904	0.295	0.906	0.292
Religion is Hindu(d)	0.068	0.251	0.086	0.281	0.088	0.283	0.084	0.277
Number of Observation	4013		7144		11461		22798	

Table 2: Components of education expenditure

	HIES 2000		HIES 2005		HIES 2010		Total	
	Male	Female	Male	Female	Male	Female	Male	Female
Total Expenditure	3062.830	2488.957	6198.425	5547.331	4956.502	4293.991	5016.767	4353.395
Fixed component	725.640	482.523	628.533	495.033	881.148	705.441	775.415	601.044
Admission fee	114.336	97.687	111.013	108.542	202.865	173.771	158.890	140.154
Annual session fee	70.326	46.889	49.053	44.460	59.668	45.997	58.197	45.687
Registration fee	35.543	22.544	21.544	25.224	36.799	26.575	31.820	25.438
Tuition fee	344.075	174.092	304.486	177.436	388.131	281.837	354.407	230.551
Flexible Component	2337.190	2006.434	5569.892	5052.298	4075.354	3588.550	4241.352	3752.350
Material	672.931	608.373	660.965	630.517	1332.146	1281.677	1008.686	961.571
Uniform	177.434	205.395	249.285	254.864	445.150	426.134	337.733	334.103
Tiffin/mid-day meal	178.260	138.990	132.189	125.382	296.177	265.526	224.606	199.931
Private tutor	1018.136	859.219	1123.099	1019.632	2006.783	1724.924	1560.043	1353.714
Transportation cost	158.391	129.736	129.874	154.537	208.240	237.557	175.161	192.799
Others	293.398	206.030	317.706	233.072	440.385	277.125	376.682	250.883
Stipend amount	0.000	148.150	66.281	87.341	111.098	188.967	77.903	150.546
Fixed component as a fraction of total expenditure	0.257	0.217	0.097	0.086	0.163	0.149	0.159	0.142
Stipend as a fraction of total expenditure	0.000	0.114	0.113	0.125	0.125	0.186	0.100	0.155

Note: All expenditure amounts are reported in real terms.

Table 3: Education indicators by region

	Barisal		Chittagong		Dhaka		Khulna		Rajshahi	
	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
Panel 1: HIES 2000 Data										
Average grade passed	6.1	5.6	5.9	5.7	6	5.9	5.6	5.32	5.5	5.4
% in government school	38.7	42.6	30.3	33.2	41.9	38.9	41.3	42.1	59.8	61.2
% in private school	53.7	54.2	63.5	61.4	52	52.2	53.5	48.3	33.9	35.6
% in NGO school	0	0	1.7	2.7	2	1.4	1.7	4.3	0.7	0
% in madrassa	7	2	4	2.4	3.6	7	2.9	5	5.3	2.7
% gets financial aid	0	33	0	32.7	0	40.9	0	37.7	0	38.1
Mean of financial support	NA	513.76	NA	540.34	NA	576.83	NA	504.89	NA	588.43
Total education expenditure per child	4245.17	3203.96	5981.87	5250.97	3916.41	3313.97	2522.57	1472.59	3576.88	3165.35
Obsevrations	413	472	575	614	248	283	402	416	301	289
Panel 2: HIES 2005 Data										
Average grade passed	4.6	4.7	4.3	4.6	4.83	4.9	5	4.9	4.5	4.8
% in government school	49.6	49.7	35.3	36	30.9	30.1	32.4	35.3	39.9	37.8
% in private school	32.6	31.7	37.1	41.4	45.3	44.9	46.9	46.7	40	42.9
% in NGO school	0.5	0.9	1.2	7.8	1.3	1.6	2.8	2.8	3.8	4.7
% in madrassa	10.6	12.8	2.2	2.9	4.3	4.6	4.4	3.2	4.5	4.7
% gets financial aid	8.9	37.4	5.8	27.8	6.5	35.8	6.9	42.6	10	43.6
Mean of financial support	89.64	158.5	46.49	66.25	62.89	77.53	56.68	110.39	100.78	102
Total education expenditure per child	2483.89	2319.19	3490.53	3246.62	4625.5	4249.8	2770.17	2384.48	2574.54	1986.81
Obsevrations	341	334	915	863	869	929	476	566	912	870
Panel 3: HIES 2010 Data										
Average grade passed	3.8	3.8	3.3	3.6	3.5	3.6	4.2	3.9	3.9	3.9
% in government school	22.4	26.8	32.1	33	28.8	27.7	34	34.8	26.7	28.4
% in private school	29.7	28.6	29.9	32.5	33	33.9	39.2	32.4	38	36.3
% in NGO school	1.3	0.9	0.6	0.7	0.5	0.6	0.2	0.7	1.4	1.5
% in madrassa	8.6	7.7	5.5	4.5	3.5	3.5	2.8	3.4	4.3	4.3
% gets financial aid	16.2	32.4	9.9	15.7	10.9	18.5	12.5	25.2	15.3	26.7
Mean of financial support	158.82	297.88	103.76	152.24	109.52	173.18	122.88	135.38	140.43	264.72
Total education expenditure per child	4807.23	3913.41	5503.44	4977.89	5967.01	5242.06	5545.37	4290.41	4501.99	3808.42
Obsevrations	531	534	1604	1700	1615	1743	796	752	1173	1193

Table 4: Cohort sample of school going children available from different rounds of HIES Survey

	Birth year	Data Available in HIES 2000	Data Available in HIES 2005	Data Available in HIES 2010	N
Cohort 1	1980-1984	813	0	0	813
Cohort 2	1985-1989	2248	1158	0	3406
Cohort 3	1990-1994	943	3423	1331	5697
Cohort 4	1995-1999	9	2519	4645	7173
Cohort 5	2000-2005	0	44	5665	5709

Table 5: Regression for education expenditure per child (pooled regression)

Dependent variables are In Logarithm	(1)	(2)	(3)	(4)	(5)	(6)
	Without HH Controls			With all controls		
	Total cost	Fixed Cost	Flexible Costs	Total cost	Fixed Cost	Flexible Costs
Female	-0.151*** (0.045)	-0.289*** (0.048)	-0.106** (0.049)	-0.135** (0.053)	-0.163*** (0.057)	-0.112* (0.058)
Year2005 X Female	0.0705 (0.061)	0.0987 (0.062)	0.0386 (0.064)	0.0560 (0.072)	-0.0431 (0.073)	0.0415 (0.076)
Year2010 X Female	0.0385 (0.052)	0.110* (0.057)	0.0157 (0.056)	-0.0343 (0.058)	-0.00905 (0.064)	-0.0401 (0.063)
Year2005	1.347*** (0.083)	0.747*** (0.086)	1.523*** (0.089)	0.785*** (0.104)	0.0353 (0.108)	0.995*** (0.112)
Year2010	2.474*** (0.086)	2.592*** (0.090)	2.493*** (0.092)	0.887*** (0.118)	0.570*** (0.122)	0.968*** (0.129)
Child characteristics						
Birth Order				-0.0667*** (0.017)	-0.0630*** (0.018)	-0.0615*** (0.018)
Grade				0.241*** (0.010)	0.246*** (0.010)	0.243*** (0.010)
Gets any financial support				0.144*** (0.027)	-0.0275 (0.029)	0.201*** (0.030)
Constant	7.123*** (0.357)	5.063*** (0.229)	6.758*** (0.491)	5.243*** (0.444)	2.801*** (0.354)	4.825*** (0.486)
Observations	22798	22798	22798	15081	15081	15081
R-squared	0.342	0.400	0.328	0.512	0.561	0.490
Other household controls	No	No	No	Yes	Yes	Yes
Cohort Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Sub-district Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
District Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Division Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes

Notes: Robust standard errors in parentheses, cluster by household. Significance level: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. The regression of column (4)-(6) also includes all the variables as additional controls as reported in Table 1.

Table 6: Component Specific Analysis of education expenditure (pooled regression)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Dependent variables are in Logarithm	Fixed Cost			Flexible Cost					Had Tutor
	Session	Registration	Tuition	Matrial	Uniform	Tiffin/ Midday meal	Conveyance	Tutors	
Female	-0.108 (0.077)	-0.0910 (0.064)	-1.356*** (0.099)	-0.0567 (0.050)	0.364*** (0.104)	-0.0581 (0.086)	0.185** (0.082)	-0.398*** (0.128)	-0.0602*** (0.018)
Year2005 X Female	-0.0368 (0.094)	0.0460 (0.080)	-0.123 (0.127)	0.0442 (0.067)	-0.232* (0.126)	0.146 (0.107)	-0.109 (0.100)	0.0577 (0.157)	0.0177 (0.022)
Year2010 X Female	0.0842 (0.087)	0.00835 (0.072)	0.631*** (0.114)	0.00243 (0.058)	-0.394*** (0.118)	-0.130 (0.103)	-0.0451 (0.095)	0.0666 (0.146)	0.0238 (0.020)
Year2005	-0.103 (0.148)	-0.240** (0.110)	-0.278 (0.182)	0.142 (0.102)	0.842*** (0.210)	-0.353* (0.203)	-0.0687 (0.160)	0.706*** (0.251)	0.0872** (0.034)
Year2010	-0.187 (0.169)	-0.480*** (0.128)	-0.523** (0.210)	1.247*** (0.121)	2.131*** (0.237)	0.520** (0.229)	0.0302 (0.183)	1.624*** (0.287)	0.183*** (0.039)
Observations	15081	15081	15081	15081	15081	15081	15081	15081	15081
R-squared	0.341	0.270	0.436	0.444	0.376	0.361	0.292	0.394	0.338
Other Household controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cohort Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Sub-district Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
District Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Division Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

*Notes: Robust standard errors in parentheses, cluster by household. Significance level: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. Regressions include all the variables as additional controls as reported in Table 1.*

Table 7: Regressions by the level of schooling (pooled regression)

Panel 1: Overall

Dependent Variable: Log expenditure	(1)	(2)	(3)	(4)	(5)	(6)
	Total Expenditure		Fixed Component		Flexible Component	
	Primary	Secondary	Primary	Secondary	Primary	Secondary
Female	-0.0884 (0.091)	-0.0856 (0.072)	0.000386 (0.095)	-0.238*** (0.080)	-0.0436 (0.104)	-0.0756 (0.078)
Observations	7621	7460	7621	7460	7621	7460
R-squared	0.438	0.436	0.450	0.410	0.428	0.434

Panel 2: Selected Cost

Dependent Variable: Log expenditure	(7)	(8)	(9)	(10)	(11)	(12)
	Cost of Tuition Fees		Cost for Tutors		Had a private tutor	
	Primary	Secondary	Primary	Secondary	Primary	Secondary
Female	0.128 (0.126)	-1.961*** (0.143)	-0.194 (0.207)	-0.546*** (0.189)	-0.0387 (0.030)	-0.0753*** (0.026)
Observations	7621	7460	7621	7460	7621	7460
R-squared	0.470	0.469	0.371	0.368	0.339	0.317
Other Household controls	Yes	Yes	Yes	Yes	Yes	Yes
Cohort Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Sub-district Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
District Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Division Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes

*Notes: Robust standard errors in parentheses, cluster by household. Significance level: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. Regressions include all the variables as additional controls as reported in Table 1.*

Table 8: Regressions by Sampling Year

Panel 1: Overall

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Dependent Variable:	Total Expenditure			Fixed Component			Flexible Component		
Log expenditure	2000	2005	2010	2000	2005	2010	2000	2005	2010
Female	-0.235*** (0.069)	-0.141*** (0.055)	-0.0986*** (0.030)	-0.269*** (0.073)	-0.241*** (0.055)	-0.0765* (0.040)	-0.214*** (0.071)	-0.133** (0.054)	-0.0858*** (0.032)
Observations	2817	4646	7618	2817	4646	7618	2817	4646	7618
R-squared	0.494	0.456	0.544	0.512	0.499	0.542	0.497	0.456	0.498

Panel 2: Selected Cost

	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)
Dependent Variable:	Cost of Tuition Fees			Cost for Tutors			Had a private tutor		
Log expenditure	2000	2005	2010	2000	2005	2010	2000	2005	2010
Female	-1.004*** -0.119	-1.205*** -0.097	-0.657*** -0.072	-0.473*** -0.153	-0.364*** -0.107	-0.229*** -0.082	-0.0686*** -0.021	-0.0502*** -0.015	-0.0246** -0.011
Observations	2817	4646	7618	2817	4646	7618	2817	4646	7618
R-squared	0.541	0.426	0.391	0.418	0.398	0.384	0.384	0.358	0.328
Other Household controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cohort Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Sub-district Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
District Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Division Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes: Robust standard errors in parentheses, cluster by household. Significance level: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. Regressions include all the variables as additional controls as reported in Table 1.

Table 9: Regressions by Geographical Location (pooled regression)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(10)	(9)
Dependent Variable:	Total Expenditure					Fixed Component				
Log expenditure	Chittagong	Dhaka	Khulna	Rajshahi	Barishal	Chittagong	Dhaka	Khulna	Rajshahi	Barishal
Female	-0.133	-0.0944	-0.114	-0.375***	-0.133	-0.148	-0.309**	-0.00225	-0.131	-0.176
	-0.126	-0.112	-0.149	-0.118	-0.126	-0.134	-0.126	-0.185	-0.125	-0.122
Observations	4053	4247	2001	3212	1568	4053	4247	2001	3212	1568
R-squared	0.459	0.472	0.435	0.496	0.466	0.518	0.512	0.429	0.470	0.462

	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)
Dependent Variable:	Flexible Component					Cost of Tuition Fees				
Log expenditure	Chittagong	Dhaka	Khulna	Rajshahi	Barishal	Chittagong	Dhaka	Khulna	Rajshahi	Barishal
Female	-0.113	0.0126	-0.0848	-0.472***	-0.125	-1.695***	-1.238***	-1.276***	-1.106***	-1.016***
	-0.124	-0.117	-0.16	-0.143	-0.127	(0.243)	(0.196)	(0.295)	(0.194)	(0.238)
Observations	4053	4247	2001	3212	1568	4053	4247	2001	3212	1568
R-squared	0.442	0.456	0.425	0.475	0.465	0.391	0.466	0.346	0.326	0.374

	(21)	(22)	(23)	(24)	(25)	(26)	(27)	(28)	(29)	(30)
Dependent Variable:	Cost for Private Tutors					Had a private tutor				
Log expenditure	Chittagong	Dhaka	Khulna	Rajshahi	Barishal	Chittagong	Dhaka	Khulna	Rajshahi	Barishal
Female	-0.456	-0.208	-0.770**	-0.654***	-0.454	-0.0768*	-0.0386	-0.103*	-0.102***	-0.0491
	(0.292)	(0.261)	(0.383)	(0.253)	(0.297)	(0.039)	(0.035)	(0.057)	(0.038)	(0.041)
Observations	4053	4247	2001	3212	1568	4053	4247	2001	3212	1568
R-squared	0.363	0.358	0.334	0.369	0.431	0.317	0.306	0.269	0.312	0.379
Other Household controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cohort Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Sub-district Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
District Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes: Robust standard errors in parentheses, cluster by household. Significance level: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. Regressions include all the variables as additional controls as reported in Table 1.

Table 10: Discrepancy of Educational Expenditure by Cohort

Variables	Cohort 1			Cohort 2			Cohort 3			Cohort 4			Cohort 5		
	Male	Female	diff	Male	Female	diff	Male	Female	diff	Male	Female	diff	Male	Female	diff
Panel 1: All Sample															
Total Cost	4813.26	4435.2	378.0	6091.89	4727.34	1364.6***	6854.95	5753.7	1101.3***	4766.96	4477.02	289.9*	2495.31	2172.67	322.6***
Fixed Component	1246.02	971.03	275.0*	797.041	565.011	232.0***	1018.79	730.58	288.2***	736.841	621.579	115.3**	426.419	370.53	55.89*
Flexible Component	3567.24	3464.2	103.1	5294.85	4162.32	1132.5***	5836.17	5023.1	813.1***	4030.11	3855.44	174.7	2068.89	1802.14	266.8***
Panel2: Enrolled in Primary															
Total Cost	535.733	397.72	138.0	1128.63	1019.69	108.9	2135.91	1578	557.9***	2755.27	2502.09	253.2	2441.92	2107.61	334.3***
Fixed Component	81.6667	31.85	49.82**	281.992	193.326	88.67	318.686	205.5	113.2***	341.402	278.633	62.77	419.963	367.207	52.76*
Flexible Component	454.067	365.87	88.20	846.634	826.364	20.27	1817.22	1372.5	444.7***	2413.87	2223.46	190.4	2021.96	1740.4	281.6***
Panel3: Enrolled in Secondary															
Total Cost	4840.86	4506.7	334.2	7102.11	5454.86	1647.2***	9177.74	7593	1584.7***	7379.26	6655.81	723.4**	5317.7	5427.01	-109.3
Fixed Component	1253.53	987.66	265.9*	901.874	637.945	263.9***	1363.39	961.88	401.5***	1250.35	999.927	250.4***	767.711	536.768	230.9*
Flexible Component	3587.33	3519	68.30	6200.24	4816.92	1383.3***	7814.36	6631.2	1183.2***	6128.91	5655.89	473.0*	4549.99	4890.24	-340.3

Note: All expenditure amounts are reported in real terms.

Table 11a: Difference-in-difference estimation of education expenditure based on consecutive cohorts.

	DID: Cohort1 -Cohort 2	DID: Cohort2 -Cohort 3	DID: Cohort3 -Cohort 4	DID: Cohort4 -Cohort 5
Panel 1: All Sample				
Total Cost	-986.5**	263.3	811.3***	-32.70
Fixed Cost	42.96	-56.17	172.9**	59.37
Flexible Cost	-1029.5**	319.5	638.4***	-92.08
Panel 2: Enrolled in Primary				
Total Cost	29.08	-449.0*	304.7	-81.14
Fixed Cost	-38.85	-24.52	50.42	10.01
Flexible Cost	67.93	-424.5**	254.3	-91.15
Panel 3: Enrolled in Secondary				
Total Cost	-1313.1**	62.54	861.3**	832.8
Fixed Cost	1.948	-137.6	151.1	19.48
Flexible Cost	-1315.0***	200.1	710.2*	813.3

Table 11b: Difference-in-difference estimation of education expenditure based on cohort 1 compared with other cohorts.

	DID: Cohort1 -Cohort 2	DID: Cohort1 -Cohort 3	DID: Cohort1 -Cohort 4	DID: Cohort1 -Cohort 5
Panel 1: All Sample				
Total Cost	-986.5**	-723.2	88.10	55.40
Fixed Cost	42.96	-13.22	159.7	219.1
Flexible Cost	-1029.5**	-710.0*	-71.62	-163.7
Panel 2: Enrolled in Primary				
Total Cost	29.08	-419.9	-115.2	-196.3
Fixed Cost	-38.85	-63.37	-12.95	-2.940
Flexible Cost	67.93	-356.5	-102.2	-193.4
Panel 3: Enrolled in Secondary				
Total Cost	-1313.1**	-1250.5**	-389.3	443.5
Fixed Cost	1.948	-135.6	15.46	34.93
Flexible Cost	-1315.0***	-1114.9***	-404.7	408.6

Note: All expenditure amounts are reported in real terms.

Table 12: Blinder-Oaxaca Decomposition of Education Expenditurr between male and female

Variables	Mean Expenditure: Male	Mean Expenditure: Female	Expenditure gap in %	% of Gap Explained	% of Gap Unexplained	N
All Sample Pooled together						
Total Cost	1920.18	1649.24	15.2	33	67	20363
Fixed Cost	181.28	142.66	24	28.6	71.4	20363
Flexible Cost	1566.5	1379.52	12.7	36	63.9	20363
HIES 2000						
Total Cost	1245.46	1041.94	17.8	49.4	50.6	3555
Fixed Cost	230.86	160.37	36.4	35.1	64.9	3555
Flexible Cost	875.34	779.93	11.5	71	29	3555
HIES 2005						
Total Cost	2224.77	1984.07	11.4	14.2	85.8	6402
Fixed Cost	152.66	122.96	21.6	15.9	84.1	6402
Flexible Cost	2005.62	1810.38	10.2	13.6	86.4	6402
HIES 2010						
Total Cost	2027.89	1726.96	16.1	35.1	64.9	10406
Fixed Cost	185.83	150.06	21.4	39.1	60.9	10406
Flexible Cost	1635.39	1423.31	13.9	35.7	64.3	10406
Cohort Specific Analysis for Total Cost						
Cohort 1: born between 1980-1984	2595.89	2734.55	5.2	19.4	80.6	707
Cohort 2: born between 1985-1989	2426.04	1807.75	29.4	61.2	38.8	3045
Cohort 3: born between 1990-1994	2849.39	2410.33	16.7	41.3	58.7	5133
Cohort 4: born between 1995-1999	2044.12	1902.13	7.2	7.9	92.1	6467
Cohort 5: born between 2000-2005	982.9	825.26	17.5	24.6	75.4	5011

Note: Control variables include age, age squared, twin, birth order, parental education and region