MONASH University
Business and Economics

DEPARTMENT OF ECONOMICS

ISSN 1441-5429

DISCUSSION PAPER 30/14

Parental Attitude and Investment in Children's Education and Health in Developing Countries*

Lutfunnahar Begum, Philip J. Grossman and Asadul Islam

Abstract

This paper investigates whether parents' inherent gender bias is associated with intrahousehold human capital investment among boys and girls. We conduct an artifactual field experiment to identify parents' inherent gender bias and then attempt to examine how this attitude correlates with the actual decisions regarding schooling and health of their own children. We focus on five indicators for education, *viz.*, years of schooling, grade for age, enrolment status, education expenditure, and test scores; and three indicators for health, *viz.*, incidence of illness, and access to formal treatment and treatment cost, in case of illness. Although the game outcome suggests that on average, there is no systematic inherent bias among parents, yet inherently biased parents allocate resources in a discriminatory manner. The results suggest that boy-biased parents are more likely to have their boys enrolled in school and to spend more on their boys' education; and also, less likely to enrol their girls in school and spend less on girls' education. The boy-biased parents are also less likely to seek formal treatment and tend to spend less when a girl is sick.

Key Words: Household behavior, Gender, Children, Field experiment, Bangladesh
JEL Classifications: D10, J16, J13, C93, D130

*We thank Gaurav Datt, Catherine Eckel, Lata Gangadharan, Russell Smyth, Yasuyuki Sawada, as well as the seminar participants at Monash University, for their valuable comments and suggestions on earlier versions of this paper.

1 Introduction

There exist a large number of studies establishing that gender differentials exist in intrahousehold investment in developing countries (see, e.g., Orazem & King, 2007). If this differential treatment by parents arises from the differential economic return from son versus daughter, then this behavior is rational on grounds of efficient resource allocation; therefore, this does not necessarily imply that parents' have a preference for sons. Differential economic returns for males and females can be due to labor market discrimination, or different participation of males and females in economic or income generating activities (Rosenzweig & Schultz, 1982). Apart from labor market forces, boys may have higher returns due to cultural practices, for example, as old age security. Further, deep-rooted gender stratification and discriminatory beliefs can be at play in the formation of gender preferences within individuals (Pande & Astone, 2007; Glaeser & Ma, 2013). The obvious question therefore arises: Does the attitude of a person towards a gender correspond to the resource allocation within households?

This paper examines how inherent parental bias is reflected in the education and health expenditures or outcomes for boys and girls in the household, in the context of Bangladesh. We identify parental inherent bias through an artifactual field experiment by conducting a modified dictator game. [1] We differ from existing literature on gender bias by relating the ultimate parental decision of resource allocation among sons and daughters to parental attitude. To the best of our knowledge, this is the first study in which children's outcome or intrahousehold allocation is related to the parental inherent bias, which is identified through an experimental approach. We examine five indicators for education, *viz.*, years of schooling, grade for age, enrolment status, educational expenditure and test scores, and three indicators for health, *viz*., incidence of illness, access to formal treatment, and treatment cost. We identify parental attitude into three categories, *viz.*, unbiased, biased to boy, and biased to girl; with unbiased considered as the base category.

Overall, our results indicate that while inherent parental bias is associated with children's education and health, the association is different for boys and girls. Compared to unbiased parents, boy-biased parents are more likely to enrol their sons in school and to spend more on

[1] We define parents' inherent bias as that bias which is independent of any direct return from their own children. Such bias may originate from pre-existing beliefs or gender stereotyping due to socio-cultural or religious norms

their sons' education, but are slightly less likely to enrol daughters and spend less on daughters' education. This association is mainly attributed to post-primary aged children (11-18 years old) for whom greater resource allocation is necessary. Parental bias, however, do not seem to be associated with sons' or daughters' education, if parents are girl-biased. We do not find that inherent bias is associated with children's years of schooling or grade for age. In terms of health, boy-biased parents are less likely to seek formal treatment and tend to spend less when a daughter is sick, compared to unbiased parents. However, girl-bias among parents is not associated with differences in seeking treatment or expenditure on treatment for sons or daughters.

In terms of individual bias, boy-biased fathers are more likely to enrol sons in school and spend more on the education of sons, while spending slightly less on girls' education. In contrast, if mothers are girl-biased, sons are less likely to be enrolled. This differential association of fathers' and mothers' bias is consistent with empirical literature that suggests a differential effect of father's and mother's income or education on boys and girls (Thomas, 1990; Emerson & Souza, 2007). Education expenditure is less for sons and slightly more for daughters if the mother is biased to the girl, compared to unbiased mother; however, this association disappears in the sample with enrolled children only. The results also suggest that the association of parents' joint attitude towards children's schooling is mostly similar to that of the father's individual attitude but not that of the mother's attitude. The health indicators show no association with parents' individual attitude.

The finding that inherent parental bias favoring boys is associated with outcomes favoring boys and/or against girls, but that inherent parental bias favoring girls is not associated with outcomes favoring girls and/or against boys, implies that market-generated or other socio-cultural factors that cause differential returns for boys and girls act more powerfully in ultimate parental decisions. Those factors reinforce parental attitudes favoring boys and counteract parental attitudes favoring girls.

2 Related Studies: Gender Bias

Gender bias in favor of sons has received wide attention in the literature. Studies find evidence of this gender bias in schooling, suggesting that girls have a lower probability of being enrolled in school, attain less schooling, achieve poorer grades, receive lower-quality schooling, or household education expenditures are less on girls (see, e.g., Drèze & Sen, 1995; Gong et al., 2005; Kingdon, 2005;). Numerous studies also suggest gender differentials in nutrition/health status, mortality rate, and access to healthcare (Chen et al, 1981; Das Gupta, 1987; Borooah, 2004). Extensive literature also suggests that having a sister rather than a brother leads to greater schooling and better health attainment/outcomes (see, e.g., Parish & Willis, 1993; Garg & Morduch, 1998). These studies attribute this finding as an indirect outcome of gender bias against girls in the family[2].

Relatively little research has examined the sources of these gender differences. One of the major explanations in the literature for the gender gap in schooling or health is labor market discrimination or earning function bias towards males (Neumark, 1988). Economic returns from investments in daughters may also be lower due to lower female participation in the labor market or income generating activities (Rosenzweig & Schultz, 1982; Qian, 2008). Besides these labor market forces, differential economic returns may also arise from social norms or cultural practices, for example, in societies where son provides old-age support to parents, returns to parents of investing in sons rather than that in daughters is much higher. In many patriarchal societies, the marriage system is such that the bride's family pays the dowry and/or bears the major marriage costs. As the woman will then reside with her husband's family, she has little or no scope to provide support to her natal family. Further, in such societies women are often deprived of inheritance rights, which may be a direct outcome of the religious teachings that are an integral part of the culture in many Asian societies. Here, intergenerational transfer of property is only possible through sons (Das Gupta, 1987; Kishor, 1993). Due to all these forces, parents may face a higher return function for boys and, therefore, higher investment in boys over girls reflects a rational economic response on the part of the parents (Becker, 1991).

[2] Again, there are studies that do not find systematic evidence of gender differences (see, e.g., Bhalotra & Attfield, 1998; Deaton, 1989; Subramaniam, 1996).

Apart from the differential economic returns, socio-cultural and religious norms can also bias parents against a particular gender through attaching different cultural or religious values to males and females. Many authors view gender bias as a structural phenomenon, that is, established social norms and institutional settings in a patriarchal society define/specify the differentiated roles, rights or obligations for men and women (Pande & Astone, 2007). Religion often exacerbates the patriarchal norms practised in a society by secluding women, restricting their mobility, curtailing opportunities to work outside the home, and marrying girls off at early ages (Kishor, 1993). Thus, gender stereotyping or beliefs about women's ability can be formed through age-old processes of socio-cultural structure, religious norms or economic factors, with these beliefs differing among cultures and over time. Such beliefs, however, are often based on persuasion or pre-adult influences and do not necessarily reflect reality (Glaeser, 2005; Glaeser & Ma, 2013). For example, studies in social psychology suggest there exists a common belief that women are less competent than men in many workplace-related tasks (e.g., Goldberg, 1968; Eagly & Mladinic, 1994; Ridgeway & Correll, 2004), or in science and mathematics (Gunderson et al., 2012). If a person holds this sort of discriminatory belief or attitude, then he/she might invest less in girls, apart from the consideration of the direct benefit to him/her from that investment.

It is, however, difficult to directly measure the attitude of parents towards different genders, with relatively few studies attempting to explain gender differences in parental allocation by parental attitude. For example, Kingdon (2002) uses a variable measuring parental opinion about the importance of gender equality of education and finds that while parental belief in gender equality significantly raises girls' schooling, it has no effect on boys' schooling. Drèze and Kingdon (2001) find that sons benefit if they have parents who believe in importance of gender equality of education girls' education. However, identifying parental preferences through this type of attitudinal variable might result in bias, as people are often reluctant to disclose their attitudes to others. This paper addresses the gap in the existing literature by identifying the inherent bias of parents through an experimental approach and relating these biases to decisions on schooling and health of their children.

3 The data

This paper is based on the data obtained from an experiment and a survey conducted in 2012 in villages in two districts (Khulna and Satkhira) of Bangladesh. In the experiment, 900 households were selected randomly from those that had at least two school-aged (6-18 years) children of different gender. Finally, 882 household participated in the experiment and were randomly assigned to one of the four mutually exclusive treatment groups. The experiment required parents to divide a sum of money between anonymous girl students and anonymous boy students attending schools in the region. For the purpose of this paper, we consider only the two treatments with no restriction on allocation; hence, the sample in this paper is based on 507 households (1014 individuals)[3].

3.1 The experiment

Enumerators asked parents in the selected households if they were willing to participate in the study. If both parents agreed, the process was as follows[4].

The enumerator read the instructions to the parents and ensured that they both fully understood them. In the individual treatment group, fathers and mothers were each given the two envelopes and endowments of 120 taka (120 taka ≈ US$1.70 at the time of the experiment) each. The parents went to different rooms or separate closed areas in their residence and divided the money between the two envelopes according to their individual preferences. When they returned to the main room, they handed their envelopes to the enumerator. The enumerator placed the envelopes in a sealed box. After collecting all the envelopes from all the households, the enumerator submitted the boxes to the experiment coordinator, who then opened the envelopes, recorded the results, and allocated the money to the schools. In the joint treatment group, parents were given 240 taka and two envelopes, one labelled 'girl' along with a drawing indicating a girl for girl students, and another labelled 'boy' along with a drawing indicating a boy for boy students. The parents went to a second room or separate closed area in their residence and divided the money

[3] The other two treatment groups replicated these two treatments, but with restriction on allocation so that parents were forced to be biased. The purpose of incorporating those two treatments was to test whether the parents, on average, revealed their true preferences, and the results suggested that they did (see, Begum et al, 2014, for details). We do not consider the two treatments in this current study, as those treatments were restricted and not necessary for the purpose of this study.

[4] While a brief outline of the experimental procedures is provided here, the complete protocol was described in Begum, et al (2014).

between the two envelopes according to their joint preferences. Individual and household level survey data were collected just after the experiment. The survey collected detailed information on individual, household, and village level information. Either of the parents or both jointly provided the household level general information. However, individual level attitudinal questions were answered separately and privately by each parent.

Money allocated by parents to boys (girls) was used to provide education related gifts to boys (girls) at the schools[5]. Schoolmasters were recruited to distribute the money as allocated. As the money was intended to benefit anonymous girls and boys, the subjects were not directly affected by their decisions. Hence, we separate out labor market and other socio-cultural factors affecting the return to their children that typically affects parents' decisions of allocating resources among own children, leaving only their attitudes towards the gender of a child.

The experiment mentioned above identifies the inherent bias of parents, which has been examined in Begum, et al (2014). In this paper, we explore whether this identified inherent bias is reflected in parents' actual decisions related to the schooling and health of their own children. Moreover, because the actual allocation of household resources is often made through an intrahousehold bargaining process by a joint decision of husband and wife (Browning and Chiappori, 1998), we place greater emphasis on the parents' in the joint treatment group. This is detailed in the following analysis.

3.2 Descriptive statistics

Table 1 summarizes the game outcome in the two treatment groups. The mean allocated amount in both treatments is roughly equal for the boy and girl. Most of the fathers and mothers are unbiased in their individual decision (64% and 70%, respectively), but most of the couples in their joint decision chose a biased split (60%). The proportion of parents/couples biased towards the boy, however, are roughly equal to the proportion biased towards the girl in both treatments. Overall, the game outcome suggests that, on average, there is no systematic inherent bias in parents against any particular gender (see, Begum, et al, 2014, for a detailed discussion of the

[5] The money was given to schools in the same village or an adjacent village. The parents were informed that the money would be given to schools in the region, but they were not informed about the specific school the money would go to.

experiment results). Appendix tables A2a and A2b present the descriptive statistics by parental bias in treatment groups joint and individual, respectively.

[Insert Table 1 here]

Appendix tables A1a and A1b present the descriptive statistics of own children (aged 6-18 years) of parents who participated in the joint and individual treatment groups, respectively. The data suggest that the proportions of boys and girls are similar in the sample; the mean age of children is 12 years, with girls slightly older than boys in both treatments. The average schooling of children in the sample is slightly above 5 years, with girls having more education than boys in both treatments. More than 90 per cent of the children are enrolled, with the girls' enrolment rate significantly higher than boys' in the joint treatment. On average, boys have fewer brothers and more sisters in both treatments, while the average number of siblings is similar for boys and girls.

The mean ages of father and mother are 43-44 years and 34-35 years, respectively. The father and mother have, on average, a primary school education, with the father having more education than the mother in both treatments. Around 70-80 per cent of the children are Muslims in both treatments[6]. The average monthly expenditure of the households is 9–10 thousand taka. Boys and girls are not statistically different in most of the individual characteristics, or in health related and parental and household characteristics.

4 Empirical strategies

We run the following regression including parents involving the joint decision, where parents' joint bias is the treatment variable.

$$Y_{ij} = \alpha_0 + \alpha_1 bias_{pj} + \alpha_2 girl_{ij} + \alpha_3 girl_{ij} * bias_{pj} + \alpha_4 \mathrm{X}_{ij} + \alpha_5 \mathrm{H}_j + \varphi_j + \xi_{ij} \qquad (1)$$

where:

Y_{ij} = schooling or health investment/outcome for child *i* in household *j*; we take five alternate variables indicating a child's schooling investment/outcome, *viz.*, years of schooling; grade for age; dummy variable indicating enrolment status

[6] The religion of parents and their children is the same.

(enrolled=1); education expenditure (for last six months) for the child; test score (in mathematics and english in last test). The indicators for health are: incidence of illness (dummy variable indicating whether child was ill in last year); formal treatment (dummy variable indicating whether the child received any formal treatment, if ill); and treatment cost for the child, if ill.

$bias_{pj}$[7] = parents' attitude in household *j*, defined by a vector of dummies indicating whether the parents are unbiased, or biased towards boy, or biased towards girl.

$girl_{ij}$ = dummy variable indicating the gender of child *i* in household *j* (1=girl)

X_{ij} = a vector of variables representing individual and sibling characteristics of child *i* in household *j*; and

H_j = a vector of variables representing parental/ household characteristics for household *j*.

Controls for individual and sibling characteristics include age, age square, interaction of age and gender, number of brothers of the child, number of older siblings, and a vector of dummies indicating number of siblings. Parental and household controls include a vector of dummies indicating the highest education level among parents and indicating the occupation of the household head, mother's age, a dummy variable for whether the household head is Muslim and for whether the household has electricity, and the household's landholding per capita. For health-related dependent variables, we include additional controls, *viz*., dummy variables for access to safe water and sanitation in the 'illness' regression, and a vector of dummies indicating the duration of illness[8] in the 'formal treatment' and 'treatment cost' regressions. We also include village dummies in the final specification to control for school characteristics and local level factors, such as social attitudes towards boys or girls, and schooling and medical facilities that could affect children's schooling or health.

[7] We also define bias in an alternative way, *viz*., the proportion of money allocated to the boy by the parent(s). This definition, however, does not simply capture the attitudes of parents, that is, whether biased or not. The interpretation of such coefficient is also difficult in our context since it would reflect the marginal contribution of an additional taka to a boy relative to a girl or vice versa. Identifying bias using the set of dummies, as we have, clearly defines the direction of parental bias.

[8] 'Duration of illness' includes three categories: (i) illness persisted for less than one week; (ii) illness persisted for one week or more, but less than two weeks; (iii) illness persisted for two weeks or more.

The error term is assumed to consist of two components: φ_j, which is common to all children in the household, and ξ_{ij}, which varies independently across children in the household. Since people of the same village are likely to be similar across a wide variety of characteristics, we estimate standard errors clustered at the village level. We are mainly interested in the coefficients α_1 — the association with parents' joint bias, and α_3 — whether parents' bias has any differential association on boys and girls.

We also run the following regression with the sample consisting of children in individual treatment group in order to identify whether the individual bias of the father and mother is associated with the schooling/health investment/outcome of their children:

$$Y_i = \beta_0 + \sum_{m=1}^{2}\sum_{p=1}^{2}\beta_m bias_{pj} + \beta_3 girl_{ij} \sum_{n=4}^{5}\sum_{p=1}^{2}\beta_n bias_{pj} * girl_{ij} + \beta_6 \mathrm{X}_{ij} + \beta_7 \mathrm{H}_j + \epsilon_j + \mu_{ij} \quad (2)$$

where:

Y_{ij}, $girl_{ij}$, X_{ij}, and H_j are defined as above.

$bias_{pj}$ = Each parent p's individual attitude in household *j*, with p_1=father and p_2=mother, defined analogously as in the joint treatment above.

We are mainly interested in the coefficients β_1, β_2, β_4 *and* β_5.

5 Estimation results: Association of parents' joint attitude

We first examine how the experimental measure of both parents' joint bias is associated with the actual schooling or health of their own children. The regressions are based on equation (1) for the sample of households participated in joint decision.

Education:

We first examine the association of both parents' joint bias with the actual schooling of their children aged 6-18 years[9]. Since schooling at primary level is free and involves little or no cost and the opportunity cost is also very low, variation in schooling will mainly occur at the post-

[9] For years of schooling and grade for age, the sample includes 7-18 year old children, because the expected age for completing grade one is seven years, with six years being the official enrolment age.

primary level. Therefore, we further investigate the same with a subsample consisting of children at the post-primary level (aged 11-18 years)[10][11]. The schooling indicators we investigate are: years of schooling, grade for age, enrolment status, test scores, and expenditure on education.

Column 1 of Table 2 provides OLS estimates of the association between parental joint attitude and years of schooling of their children, with Panel A reporting the results for the full sample and Panel B reporting the results for the post-primary children only. The results reported in Table 2 include a full set of individual, sibling, parental and household controls, and village fixed effects[12]. The results in Panel A do not suggest any association between parental bias and years of schooling of either sons or daughters. Panel B results also suggest the same conclusion for the post-primary children sub-sample.

We also examine the association between parental attitude and children's educational attainment using grade for age as an alternative measure of educational attainment of the children. Following Islam and Choe (2013), we define grade for age as follows:

Grade for Age= 100*[Actual grade/Expected education]

Expected education= {0 if age $\leq$ 6

Age-6 if 6< age $\leq$ 14}

Thus, if a child successfully starts and completes education, grade for age is 100. If a child experiences late entry, repeats a grade, or drops out, grade for age is less than 100.

Column 2 of Table 2 indicates no significant association of children's grade for age with their parents' joint attitude, in both the full and post-primary sample.

We next investigate the association of children's enrolment status with the attitudes of their parents. According to results in Column 3 of Panel A, Table 2, sons are more likely to be enrolled if parents are biased towards boys than if they are unbiased. The interaction of boy-bias

[10] We also did the analysis with a subsample including primary children (aged 6-10 years) only. The overall results indicate no association of parental attitude to the schooling of this group. The results are available upon request.

[11] For years of schooling and grade for age, the subsample includes 12-18 years old children.

[12] The results are consistent with successive controls and we report only the results with a full set of controls for all regressions. The full set of results is available upon request.

and girl is negative with almost similar magnitude indicating that daughters' enrolment is not associated with parental boy-bias, as the negative interaction term almost offsets the positive association. Column 3 of Panel B, Table 2 indicates that parental bias is associated in a similar way with the enrolment status for the post-primary group children. Moreover, the greater magnitude of the coefficients indicates that daughters are slightly less likely to be enrolled while sons are more likely to be enrolled if parents are boy-biased.

In the dataset, we have information on education expenditure in the last six months for each child in the household. The results in Panel A suggest that half-yearly education expenditure for a son is more (by 288 taka) if his parents jointly are biased towards the boy, compared to unbiased parents. The interaction term (of boy-bias and girl) is negative and significant, suggesting that education expenditure on a daughter is less (by 143 taka) if her parents are biased towards the boy, compared to unbiased parents. Column 4 of Panel B, Table 2 indicates that the association is similar for the post-primary group children. The magnitudes of the coefficients are much greater for the post-primary group.

Including children in the sample who are not enrolled may give a biased estimate of expenditure on education. Therefore, we also run the regression with an alternative sample including only those children who are enrolled. The results in Column 5 of Panel A, Table 2 indicate no association between parents' joint attitude and girls' or boys' education expenditure. However, for the post-primary group of children in Column 5 of Panel B, Table 2, the results suggest that expenditure on a daughter is less if parents jointly are biased to the boy, compared to unbiased parents, with no association between expenditure on sons and parents' bias.

The dataset includes information on children's standardized test score in English and Mathematics in the previous test, and we investigate whether children's scores are associated with parental bias. Column 6 of Panel A, Table 2 indicates that parental bias is not associated with the test scores of children in the full sample. However, Panel B suggests that the score of post-primary girls are higher if parents jointly are biased to girls. One possible explanation might be that girl-biased parents provide greater support for or inspiration in their daughters' achievements, which plays an important role in girls' education. Another possible explanation is

that girls mostly remain at home; hence, they are closer to the parents and the parents' attitude is reflected in their score. Boys, on the other hand, are not as close to their parents and their test score do not reflect their parental attitude, as the results suggest.

[Insert Table 2 here]

Overall, the results suggest that parents' inherent bias is mainly associated with the education of the post-primary group of children. In particular, sons are more likely to be enrolled and education expenditure on sons will be more if parents are boy-biased than if parents are unbiased. Daughters' enrolment status and education expenditure is negatively associated with parental boy-bias. By contrast, neither sons' nor daughters' enrolment nor education expenditure is different if parents are girl-biased than if parents are unbiased. The association with girl-bias is seen only with the test score, in that daughters attain higher scores if they have girl-biased parents rather than unbiased parents; however, there is no association with sons' test scores. Parental inherent bias is not associated with children's years of schooling and grade for age.

Health:

We investigate the association of parents' joint bias with the health of children aged less than 16 years[13] by considering the following health indicators: incidence of illness, and whether the child receives formal treatment, and treatment cost, in the case of illness.

We define incidence of illness by a dummy variable indicating whether the child was ill during last one year, based on the survey responses from the parents. In defining 'illness', we include common diseases such as common fever or respiratory diseases, or diseases arising from nutritional deficiency. We do not consider any illnesses that are not caused by less care (e.g., broken hands/legs), or female diseases such as uterine infections. Column 1 of Table 3 reports the estimation results using incidence of illness as the dependent variable. The results suggest no significant association of parents' joint bias with their children's illness.

Next, we examine whether parental bias is reflected in children's access to formal treatment if they had been ill in the last year, considering any type of illness. Formal treatment includes

[13] We do not include children aged 16 years or above, as the data for health status is mostly missing for those children.

advice from a certified doctor (allopathic or homeopathic), or treatment in hospital (private or public). Treatment from a village practitioner (uncertified) and advice from pharmacy salesmen and the like are categorized as informal treatment. Column 2 of Table 3 reports the estimation results where the dependent variable is a dummy variable indicating whether the child received any formal treatment, if sick in the last year. The specification includes individual, sibling, parental and household controls and village fixed effects. We also include an additional control in addition to those included in the education regressions, *viz.*, a set of dummies for duration of illness, as parents are more likely to seek formal treatment if the illness continues for several days. The results indicate that, for boys, there is no significant association of formal treatment with their parents' joint bias. However, for girls, the result is different. Parents' boy-bias interacted with a girl dummy variable has a negative and significant coefficient, indicating that daughters are less likely to receive formal treatment if parents are biased to boys, compared to having unbiased parents.

Finally, we examine whether parental bias is reflected in children's treatment cost in the case of illness over the last year, considering any type of illness. Column 3 of Table 3 reports the estimation results, where the dependent variable is treatment cost (in taka), if sick in the last year. The specification includes an additional control, *viz.*, indicator variable for duration of illness, as treatment cost is likely to be positively associated with the duration of illness. The results for boys are quite similar to the results for formal treatment (Column 2), suggesting that for sons, treatment cost is not associated with parents' bias. For girls, however, the results are different. Parents' boy-bias interacted with a girl dummy variable has a negative and significant coefficient, indicating that expenditure on daughter's treatment cost is, on average, 327 taka less if parents are biased to boys, compared to having unbiased parents.

[Insert Table 3 here]

Thus, for health indicators, the overall results suggest that daughters are less likely to receive formal treatment and expenditure on the treatment cost for them is less, if they have parents who are boy-biased, rather than unbiased. There is no association of parental bias with daughters' incidence of illness. We do not find any association of parental bias with sons' health indicators.

6 Association of parents' individual attitude

The collective model of household behavior presumes that the ultimate household decision is an outcome of differential preferences as well as relative bargaining power of the members (Browning & Chiappori, 1998). In the context of the study, it is therefore interesting to explore how individual parental bias is reflected in the ultimate household decision regarding children's schooling and health.

6.1 Regression results: Education

Table 4 reports the regression results for the outcome variables on education for children in the households involving parents' private and individual decisions. We run equation (2) with a full set of controls as in the education regressions for joint group. Panels A and B report the results for the full sample and post-primary sub sample, respectively. Column 1 of both panels suggests that years of schooling, for either sons or daughters, are not associated with the inherent bias of any parent. In Column 2 of Panel A, the significant coefficient of the interaction term (of mother's boy-bias and the girl dummy) suggests that grade for age is higher for girls if mother is biased to boys, compared to having an unbiased mother. This result seems puzzling at first, but is not surprising in a situation where the relative bargaining power of the mother is less, or there is non-cooperative behavior between the mother and the father. However, this association is not reflected for post-primary school-aged children, hence, the result is driven by primary school-aged children.

Results in Column 3 of Panel A, Table 4 suggest that sons are more likely to be enrolled in school if the father is biased to the boy. The interaction term of father's boy-bias with the girl dummy is negative with a similar magnitude. On the other hand, sons are less likely to be enrolled if the mother is biased to a girl. With the interaction term (of mother's girl-bias and girl) being positive and of greater magnitude, daughters are slightly more likely to be enrolled if the mother is biased to girls. Panel B suggest a similar association. Thus, the post-primary level boys are more likely to be enrolled if the father is biased to the boy and less likely to be enrolled if the mother is biased toward the girl. However, the interaction terms (of boy-biased father and girl-biased mother with girl) are of similar magnitudes with opposite signs, indicating that the enrolment of post-primary girls is not associated with individual parents' bias.

Column 4, Table 4 reports the association of each parent's individual bias with education expenditure on their children in the last six months. The results for father's bias are similar to that for joint bias presented in Table 2. The results in column 4 of panel A suggest that education expenditure on a son is more (by 415 taka) if his father is biased towards him, compared to having an unbiased father. The interaction term is negative and significant with a similar magnitude, suggesting that education expenditure on a daughter does not vary much if her father is biased towards the boy, compared to having an unbiased father. The association is similar for education expenditure on enrolled children only, as indicated by Column 5 of Panel A, Table 4.4. For the post-primary group children (Panel B), the results suggest a similar association with the coefficients being larger in magnitude. Thus, according to column 4 of Panel B, education expenditure on a son is more (by 536 taka) and on a daughter is slightly less (by 65 taka) if father is biased to the boy. For the sample including enrolled children only, the results in column 5 of Panel B indicates a similar association. Expenditure on sons is less and expenditure on daughters is slightly more if the mother is biased to the girl. However, this association disappears when the sample includes children who are enrolled only (Column 5). Thus, this association of mother's bias with children's education expenditure is mainly driven by the association with enrolment decision.

Column 6 of Panel A, Table 4 indicates that if mother is biased to the boy, the test score of the children is slightly less with no differential association between boy and girl. However, the magnitude is very little and the association is not apparent for the post-primary sample. Neither of the parents' individual bias is statistically associated with the test score of post-primary children.

[Insert Table 4 here]

6.2 Regression results: Health

Table 5 reports the regression results for the association between each parent's individual bias and their children's health indicators. The results in Column 1, Table 5 indicate that both sons and daughters are less likely to be ill if the father is biased to the girl, compared to having an unbiased father. Mother's bias, however, is not associated with her children's illness. The results

in columns 2 and 3, Table 5 suggest that neither formal treatment nor the treatment cost is associated with the bias of either of the parents.

[Insert Table 5 here]

7. Discussion

This study has examined the association of parents' bias with children's education, using five indicators for education. The overall results indicate that parental bias is mainly reflected in education indicators for the post-primary children group (aged 11-18 years). This is not surprising given that primary education is free and the associated expenditure such as textbooks and school uniform is negligible for this group of children, as these are mostly free. Sons are more likely, and daughters are slightly less likely, to be enrolled in school if parents are jointly biased towards the boy than if they are unbiased[14]. However, neither sons' nor daughters' enrolment is different if parents are biased to the girl compared to parents who are unbiased. The result that daughters are only slightly less likely to be enrolled in school if parents are boy-biased, can potentially be explained by government or NGO programs targeted at girls' education; for example, the Female Secondary School Stipend Program (FSSSP) has been targeted at secondary school girls in rural areas in Bangladesh since 1994. Studies have shown that the stipend program has had a tremendous impact on girls' enrolment in Bangladesh[15]. However, the striking result is that in spite of no similar program favoring boys' education, boys' enrolment is associated positively if parents are biased to boys, but not associated negatively if parents are biased to girls. The result that parental bias favoring boys is reflected in sons' enrolment implies that economic factors could motivate actual parental decision favoring the sons' enrolment decision. This is also obvious when we consider the education expenditure for boys versus girls. Parents' boy-bias is associated with more expenditure for sons and less expenditure for daughters, while neither sons' nor daughters' education expenditure is associated with parents' girl-bias.

[14] One might also argue that parents show bias to the boy if their own son is enrolled in school. Although we did not mention whether the money would be given to schools in the same village or other villages in the experiments, this still could drive parents' allocation. However, if this argument holds, then we should also expect the opposite when the parents are biased to the girl, that is, the parents should show girl-bias in the game when their own daughter is enrolled in the school. But we do not see any such pattern in the results. Given the large number of students in a school, any parental allocation is less likely to benefit the participants' own children if given to the boy or girl differently.

[15] Studies find that the stipend program had significant impact on the schooling of the targeted group (see Khandker et al., 2003; Begum et al, 2013).

Overall, parents' joint bias is not reflected for either boys or girls in years of schooling or grade for age.

When we consider the relationship between parental bias and children's health, we find that parents' joint boy-bias tends to have a negative association with investment in girls' health. The results suggest that a girl tends to receive less formal treatment and treatment cost is less for a girl, in the case of illness, if she has boy-biased parents instead of unbiased parents. On the contrary, there is no association for investment in boys' health investment if parents are girl-biased. Children's illness is not associated with parental bias for either boys or girls.

Overall, the results indicate that for both education and health of children, parental bias towards the boy is reflected in favoring sons, but parental bias towards the girl is not reflected in favoring daughters. Our results also suggest that bias against the girl is reflected in discrimination against daughters, but bias against the boy is not reflected in discrimination against sons. This implies that external factors such as labor market outcomes or other socio-economic factors, which lead to a higher return from investment on sons, could be the main motivating factors behind parental investment. More precisely, the results in this study indicate that parental inherent bias is important for investment in children, provided that this bias is supported by market forces. Thus, if market forces reinforce parental bias towards boys, parents are motivated to invest more in sons and less in daughters. On the other hand, even if parents have an inherent bias towards girls, they do not act accordingly, that is, they do not invest more in daughters and less in sons because market forces counteract against this bias towards girls. This finding has important policy implications, because if discrimination against females exists in the market or in the society, then this discrimination is further aggravated by parental inherent bias.

When we examine the bias of each parent separately, mother's individual bias is reflected in the enrolment decision in that sons are less likely to be enrolled if the mother is biased to girls. In contrast, sons are more likely to be enrolled if father is biased to the boy. Father's individual bias is reflected in the expenditure on children's education as well, in that expenditure is more on sons and slightly less on daughters if the father is biased to boys. The differential association of fathers and mothers with their sons' and daughters' education is consistent with numerous

studies suggesting a differential effect of fathers' and mothers' education or income on sons and daughters (Thomas, 1990, 1994; Emerson & Souza, 2007). However, the association of parents' joint bias is mostly similar to that of the father's bias, but not that of the mother's bias. The results do not suggest any association of parents' individual bias with any of the health indicators.

Thus, the results for education suggest that the association of father's individual bias is similar to that of joint bias. While this tends to imply that the unitary model prevails in the household decision with the domination of the father, the differential association of father and mother for enrolment refutes this. Also, the health indicators show no association with either father or mother, which does not support the unitary model. Given our study design, we are not looking at how parents make the actual allocation based on their utility function. For example, if parents' utility function consists of two parts, that is, inherent bias and market return, we are only looking at the first part. Hence, identifying the model that explains the behavior of these households is beyond the scope of this study. What we can conclude from the results is that parental bias is reflected in a discriminatory way for boys and girls, and favors boys. We can also conclude that this pattern more consistently reflects fathers' bias, especially for enrolment and education expenditure. This also has important policy implications. The finding implies that development programs should focus more on motivating men to change their attitude towards gender equality, as well as emphasizes the importance of targeting women in cash transfer programs.

8. Conclusion

As identified in the literature, gender differences in intrahousehold human capital might be due to differential economic return and/or parental tastes or preferences towards a particular gender. Researchers have argued that economic factors alone are not sufficient to explain the existing gender bias in society; rather, the gender stratification that has emerged from centuries-old norms regarding women's status are important sources of this bias (Pande & Astone, 2007). This study uses randomized field experiments with a game theoretic approach to identify parental bias towards different-gendered children. We identify parental inherent bias towards boys and girls through an artifactual field experiment with 507 households in Bangladesh, in which parents allocate money to an anonymous boy and/or girl. The outcome of the game suggests that on

average, there is no systematic inherent bias among parents towards any particular gender; however, there is inherent bias both for and against boys or girls.

Overall, the results suggest that parental bias has an association with investment in children's education and health in such a way that the inherent parental bias favors boys, but works against girls. In particular, sons' education is associated positively with parents' boy-bias, but is not associated negatively if the parents are biased to the girl. This signifies that there are other factors that drive ultimate parental decisions. Hence, even if parents are biased against the boy, this is not reflected in parental investment on sons' schooling or health. On the other hand, daughters' education and health is not positively associated with parental girl bias, and is associated negatively if parents are biased against girls. In terms of individual attitude, the results suggest that father's bias is associated positively with son's enrolment and education expenditure, and negatively with daughter's education expenditure. In contrast, a son is less likely and a daughter is slightly more likely to be enrolled if mother is biased against the boy. Education expenditure on sons is less and on daughters is slightly more if the mother is biased to the boy, but this association does not exist for the sample with enrolled children only. The differential association of parental bias with children's education mostly reflects that of father's bias, particularly for enrolment and education expenditure.

Thus, although the game outcome suggests that, on average, there is no systematic inherent parental bias against any particular gender, the association with parental bias with the actual allocation of resources suggests a different picture. In the actual allocation, parental bias towards a boy is reflected in favoring boys, but parental bias towards a girl is not reflected in favoring girls. Further, bias against a girl is reflected in discrimination against girls, but bias against a boy is not reflected in discrimination against boys. This implies market-generated or other factors are at work behind the decision of the parents, favoring boys. In other words, while market forces reinforce parental bias towards boys, they counteract parental bias towards girls. The results from this study suggest the need for affirmative actions to reduce discrimination in the labor market, as well as to intervene through subsidy programs to facilitate girls' health conditions and educational achievements. The results also indirectly suggest that female-targeted development

initiatives could focus more on motivating men, and that any cash transfer program for female development should target women.

References

Becker, G. (1991). *A Treatise on the Family*. Cambridge, MA: Harvard University Press.

Begum, L., Islam, A., & Smyth, R. (2013). Girls' Education, Stipend Programs and the Effects on the Education of Younger Siblings, Working paper, Monash University.

Begum, L., Grossman, P., & Islam, A. (2014). Identifying Gender Bias in Parental Attitude: An Experimental Approach, Working paper, Monash University.

Bhalotra, S., & Attfield, C. (1998). Intrahousehold Resource Allocation in Rural Pakistan: A Semiparametric Analysis. *Journal of Applied Econometrics, 13/5*, 463–80.

Borooah, V. (2004). Gender bias among children in India in their diet and immunisation against disease. *Social Science & Medicine, 58/9*, 1719–1731.

Browning, M., & Chiappori, P. (1998). Efficient Intra-Household Allocations: A General Characterization and Empirical Tests. *Econometrica, 66/6*, 1241–1278.

Chen, L., Huq, E., & D'Souza, S. (1981). Sex Bias in the Family Allocation of Food and Health Care in Rural Bangladesh. *Population and Development Review, 7/1*, 55–70.

Das Gupta, M. (1987). Selective Discrimination against Female Children in Rural Punjab, India. *Population and Development Review, 13/1*, 77–100.

Deaton, A. (1989). Looking for Boy–Girl Discrimination in Household Expenditure Data. *The World Bank Economic Review, 3/1*, 1–15.

Drèze, J., & Sen, A. (1995). *India: Economic development and social opportunity*. Oxford: Oxford University Press.

Drèze, J., & Kingdon, G. (2001). School Participation in Rural India. *Review of Development Economics*, 5/1, 1–24.

Eagly, A. & Mladinic, A. (1994). Are People Prejudiced Against Women? Some Answers From Research on Attitudes, Gender Stereotypes, and Judgments of Competence. *European Review of Social Psychology*, 5/1, 1-35.

Emerson, P., & Souza, A. (2007). Child Labor, School Attendance and Intrahousehold Gender Bias in Brazil. *World Bank Economic Review, 21/2*, 301–316.

Garg, A., & Morduch, J. (1998). Sibling Rivalry and the Gender Gap: Evidence from child health

outcomes in Ghana. *Journal of Population Economics, 11/4,* 471–493.
Glaeser, E. (2005). The Political Economy of Hatred. *Quarterly Journal of Economics, 120/1,* 45–86.
Glaeser, E., & Ma, Y. (2013). *The Supply of Gender Stereotypes and Discriminatory Beliefs*, NBER Working Paper 19109, http://www.nber.org/papers/w19109.
Goldberg, P. (1968). Are Women Prejudiced Against Women?" *Trans-action*, 5/5, 28-30.
Gong, X., Soest, A., & Zhang, P. (2005). The Effects of the Gender of Children on Expenditure Patterns in Rural China: A Semiparametric Analysis. *Journal of Applied Econometrics*, 20, 509-527.
Gunderson, E., Ramirez, G., Levine, S., & Beilock, S. (2012). The Role of Parents and Teachers in the Development of Gender-Related Math Attitudes. *Sex Roles, 66/ 3/4*,153-166.
Islam, A., & Choe, C. (2013). Child Labor and Schooling Responses to Access to Microcredit in Rural Bangladesh. *Economic Inquiry, 51/1,* 46–61.
Khandker, S., Pitt, M., & Fuwa, N. (2003). Subsidy to Promote Girls' Secondary Education: The Female Stipend Program in Bangladesh. *MPRA Paper No.23688.* http://mpra.ub.uni-muenchen.de/23688.
Kingdon, G. (2002). The Gender Gap in Educational Attainment in India: How much Can Be Explained? *Journal of Development Studies, 39/2,* 25–53.
_____. (2005). Where Has All the Bias Gone? Detecting Gender Bias in the Intrahousehold Allocation of Educational Expenditure. *Economic Development and Cultural Change, 53(2),* 409–451.
Kishor, S. (1993). "May God Give Sons to All"': Gender and Child Mortality in India. *American Sociological Review, 58/2,* 247–265.
Neumark, D. (1988). Employers' Discriminatory Behavior and the Estimation of Wage Discrimination. *Journal of Human Resources, 23/3,* 279–295.
Orazem, P., & King, E. M. (2007). Schooling in Developing Countries: The Roles of Supply, Demand, and Government Policy. In T. Schultz, and J. Strauss (Eds.), *Handbook of Development Economics* (*4*, Ch. 55, 3475-3559), North Holland.
Pande, R., & Astone, N. (2007). Explaining son preference in rural India: the independent role of structural versus individual factors. *Population Research and Policy Review, 26/1,* 1–29.
Parish, W., & Willis, R. (1993). Daughters, Education and Family Budgets: Taiwan Experiences. *Journal of Human Resources, 28/4,* 863–898.
Qian, N. (2008). Missing Women and the Price of Tea in China: The Effect of Sex-Specific Earnings on Sex Imbalance. *Quarterly Journal of Economics, 123,* 1251–1285.
Ridgeway, C. & Correll, S. (2004). Unpacking the Gender System: A Theoretical Perspective on Gender Beliefs and Social Relations. Gender and Society, 18/4, 510-531.
Rosenzweig, R. & Schultz, P. (1982). Market Opportunities, Genetic Endowments, and Intrafamily Resources Distribution: Child Survival in Rural India. *American Economic Review, 72,* 803–815.
Subramaniam, R. (1996). Gender-Bias in India: The Importance of Household Fixed-Effects. *Oxford Economic Papers, 48(2),* 280–299.
Thomas, D. (1990). Intra-Household Resource Allocation: An Inferential Approach, *Journal of Human Resources, 25/4,* 635–664.
_____. (1994). Like Father, Like Son; Like Mother, Like Daughter: Parental Resources and Child Height. *Journal of Human Resources, 29,* 950–988.

Table 1: Outcome of the game by two treatment groups

	(1)		(2)	
	Joint		**Individual**	
	Mean	**S.D.**	**Mean**	**S.D.**
Money allocated to girl (taka):				
Joint	118.9	20.7	--	--
Father	--	--	60.5	10.4
Mother	--	--	59.9	7.09
Unbiased (% unbiased):				
Joint	0.401	0.491		
Father	--	--	0.635	0.482
Mother	--	--	0.700	0.459
If Biased (% biased towards girls):				
Joint	0.466	0.501		
Father	--	--	0.504	0.502
Mother	--	--	0.505	0.503
No of household	197		310	

Table 2: Association of parents' joint attitude with children's education

	(1)	(2)	(3)	(4)	(5)	(6)
	Years of schooling	**Grade for age**	**Enrolment status**	**Education exp. (Taka) (all children)**	**Education exp. (Taka) (if enrolled)**	**% score in English and Math**
Panel A: Full sample (children aged 6-18 years)						
Parents' bias:						
Boy-biased	0.176	5.27	0.091***	288.0**	55.1	6.67
	(0.218)	(3.86)	(0.032)	(132.8)	(102.2)	(8.62)
Girl-biased	0.021	2.47	-0.027	-31.4	73.0	2.83
	(0.256)	(3.99)	(0.037)	(117.0)	(92.6)	(6.70)
Parents' bias *Girl:						
Boy-biased*Girl	-0.233	-6.69	-0.103*	-431.0**	-208.6	-9.02
	(0.334)	(5.08)	(0.052)	(185.7)	(141.2)	(12.8)
Girl-biased*girl	-0.093	-1.72	0.043	-93.7	-213.0	2.26
	(0.300)	(4.91)	(0.050)	(138.7)	(154.6)	(10.3)
Girl	-0.019	9.14	-0.254*	-386.7	365.4	2.577
	(0.596)	(12.8)	(0.128)	(396.7)	(444.7)	(15.3)
Observations	505	505	512	477	425	112
R-squared	0.804	0.402	0.354	0.271	0.500	0.423
Panel B: Post-Primary sample (children aged 11-18 years)						
Parents' bias:						
Boy-biased	0.054	-1.03	0.127**	403.5*	142.8	-30.53
	(0.466)	(4.23)	(0.053)	(209.2)	(155.5)	(119.3)
Girl-biased	-0.108	-1.60	-0.021	-89.79	114.7	-29.71
	(0.397)	(3.86)	(0.058)	(177.2)	(179.9)	(76.69)
Parents' bias *Girl:						
Boy-biased*Girl	-0.359	-0.631	-0.176**	-741.3***	-376.6**	17.42
	(0.824)	(7.66)	(0.065)	(230.2)	(171.0)	(11.66)
Girl-biased*girl	-0.413	-2.70	0.013	-181.3	-305.0	27.18***
	(0.617)	(5.97)	(0.067)	(231.7)	(255.2)	(6.78)
Girl	3.18	34.6	-0.302	-759.6	202.9	-15.2
	(1.98)	(21.2)	(0.217)	(912.1)	(1,075)	(59.0)
Observations	239	239	341	311	261	36
R-squared	0.578	0.414	0.387	0.271	0.459	0.970
Individual/sibling control	Yes	Yes	Yes	Yes	Yes	Yes
Parent/household control	Yes	Yes	Yes	Yes	Yes	Yes
Village dummy	Yes	Yes	Yes	Yes	Yes	Yes

Notes: ***, ** and * indicate significance at the 1%, 5% and 10% levels, respectively. The standard errors (in parentheses) are corrected for clustering at the village level. The base category for 'parents' bias' is unbiased. Individual and sibling controls include age, age square, interaction of age and gender, number of brothers of the child, number of older siblings, and a vector of dummies indicating number of siblings; parental and household controls include a vector of dummies indicating the highest education level among parents and indicating the occupation of the household head, mother's age, a dummy variable for whether the household head is Muslim and for whether the household has electricity, and the household's landholding per capita. The samples include children in households involving joint decision.

Table 3: Association of parents' joint attitude with children's health

	(1)	(2)	(3)
	Incidence of illness	**Formal treatment**	**Treatment cost (Taka)**
Parents' bias:			
Boy-biased	0.041	-0.007	76.9
	(0.052)	(0.040)	(71.9)
Girl-biased	-0.044	-0.029	-32.6
	(0.072)	(0.044)	(76.5)
Parents' bias*Girl:			
Boy-biased*Girl	-0.008	-0.161**	-326.7***
	(0.089)	(0.063)	(91.0)
Girl-biased*girl	-0.009	-0.075	-125.6
	(0.084)	(0.086)	(126.1)
Girl	0.058	0.109	426.5
	(0.120)	(0.186)	(300.1)
Observations	432	316	316
R-squared	0.626	0.207	0.398
Individual/sibling control	Yes	Yes	Yes
Parent/household control	Yes	Yes	Yes
Village dummy	Yes	Yes	Yes

Notes: *** and ** indicate significance at the 1% and 5% levels, respectively. The standard errors (in parentheses) are corrected for clustering at the village level. The base category for 'parents' bias' is unbiased. Individual and sibling controls include age, age square, interaction of age and gender, number of brothers of the child, number of older siblings, and a vector of dummies indicating number of siblings; parental and household controls include a vector of dummies indicating the highest education level among parents and indicating the occupation of the household head, mother's age, a dummy variable for whether the household head is Muslim and for whether the household has electricity, and the household's landholding per capita. The illness regression (column 1) includes additional control for access to safe water and sanitation; the regressions for formal treatment and treatment cost (columns 2 and 3) also include additional controls for the duration of illness. The sample includes children aged 0-15 years in households involving joint decision.

Table 4: Association of parents' individual attitude with children's education

	(1)	(2)	(3)	(4)	(5)	(6)
	Years of schooling	**Grade for age**	**Enrolment status**	**Education exp. (Taka) (all children)**	**Education exp. (Taka) (if enrolled)**	**% score in English and Math**
Panel A: Full sample (children aged 6-18 years)						
Father's bias:						
Boy-biased	0.095	2.80	0.072***	415.4**	283.5*	3.96
	(0.111)	(2.26)	(0.020)	(154.4)	(146.5)	(3.11)
Girl-biased	-0.190	-3.34	-0.038	-22.3	-19.2	-1.15
	(0.200)	(3.80)	(0.025)	(123.2)	(123.4)	(2.08)
Mother's bias:						
Boy-biased	-0.212	-5.16	-0.016	-98.2	-131.4	-4.26*
	(0.191)	(3.62)	(0.029)	(127.6)	(115.8)	(2.32)
Girl-biased	-0.294	-2.86	-0.123***	-282.4*	-20.9	-3.06
	(0.252)	(4.22)	(0.041)	(151.5)	(135.2)	(2.44)
Father's bias*Girl:						
Boy-biased*Girl	0.090	1.94	-0.080**	-429.8**	-294.7**	-3.99
	(0.142)	(2.66)	(0.038)	(167.3)	(137.8)	(4.45)
Girl-biased*girl	0.114	2.87	0.036	-102.5	-136.7	0.165
	(0.224)	(4.85)	(0.038)	(125.9)	(135.4)	(2.60)
Mother's bias*Girl:						
Boy-biased*Girl	0.342	8.96**	-0.030	108.4	196.5	2.01
	(0.208)	(4.25)	(0.056)	(166.8)	(182.3)	(3.31)
Girl-biased*Girl	-0.026	-1.80	0.164***	310.6*	21.5	3.05
	(0.290)	(5.14)	(0.057)	(164.4)	(157.9)	(3.75)
Girl	-0.091	-4.35	-0.026	244.7	423.2	-1.11
	(0.378)	(11.6)	(0.123)	(289.2)	(308.0)	(8.33)
Observations	724	724	738	712	666	367
R-squared	0.891	0.283	0.173	0.309	0.355	0.180
Panel B: Post-primary group (children aged 11-18 years)						
Father's bias:						
Boy-biased	-0.016	-0.103	0.101***	536.1***	334.7*	3.78
	(0.187)	(2.28)	(0.027)	(182.4)	(176.7)	(3.83)
Girl-biased	-0.573	-6.76	-0.018	-90.4	-116.5	-1.78
	(0.353)	(4.18)	(0.039)	(161.2)	(176.3)	(2.73)
Mother's bias:						
Boy-biased	-0.184	-1.22	0.040	-34.9	-103.1	-4.32
	(0.365)	(3.72)	(0.030)	(162.1)	(135.3)	(3.22)
Girl-biased	-0.389	-4.22	-0.166***	-325.8*	29.7	-0.774
	(0.354)	(3.90)	(0.056)	(183.2)	(164.9)	(4.14)
Father's bias*Girl:						
Boy-biased*Girl	0.082	0.392	-0.097**	-601.5**	-388.3*	-1.22
	(0.267)	(3.24)	(0.044)	(222.1)	(210.9)	(5.29)
Girl-biased*girl	0.304	4.12	-0.007	-183.9	-159.9	1.03
	(0.391)	(4.93)	(0.061)	(188.0)	(185.6)	(3.36)
Mother's bias*Girl:						
Boy-biased*Girl	0.164	1.14	-0.041	70.5	155.0	2.56
	(0.405)	(4.31)	(0.063)	(224.0)	(234.9)	(4.23)
Girl-biased*Girl	-0.283	-3.26	0.174**	475.5**	125.2	0.926
	(0.414)	(4.95)	(0.083)	(207.1)	(187.9)	(5.18)
Girl	0.677	4.68	0.113	615.3	683.4	-4.74
	(0.928)	(9.87)	(0.121)	(560.6)	(642.7)	(13.01)
Observations	391	391	505	485	454	230
R-squared	0.788	0.291	0.209	0.304	0.351	0.269
Individual/sibling control	Yes	Yes	Yes	Yes	Yes	Yes
Parent/household control	Yes	Yes	Yes	Yes	Yes	Yes
Village dummy	Yes	Yes	Yes	Yes	Yes	Yes

Notes: ***, ** and * indicate significance at the 1%, 5% and 10% levels, respectively. The standard errors (in parentheses) are corrected for clustering at the village level. The base category for 'parents' bias' is unbiased. The estimations include full set of controls as mentioned in Table 2. The sample includes children in households involving individual decision.

Table 5: Association of parents' individual attitude with children's health

	(1)	(2)	(3)
	Incidence of illness	**Formal treatment**	**Treatment cost (taka)**
Father's bias:			
Boy-biased	-0.027	0.085	-216.9
	(0.043)	(0.139)	(212.6)
Girl-biased	-0.088**	-0.096	-146.6
	(0.0415)	(0.063)	(140.2)
Mother's bias:			
Boy-biased	0.0180	0.115	75.0
	(0.044)	(0.101)	(206.7)
Girl-biased	0.057	0.109	260.5
	(0.040)	(0.125)	(244.6)
Father's bias*Girl:			
Boy-biased*Girl	-0.043	0.014	-178.6
	(0.051)	(0.088)	(430.0)
Girl-biased*girl	0.093	0.030	-387.8
	(0.058)	(0.050)	(324.4)
Mother's bias*Girl:			
Boy-biased*Girl	0.077	-0.086	991.4
	(0.068)	(0.083)	(796.1)
Girl-biased*Girl	-0.025	-0.077	-111.8
	(0.046)	(0.062)	(323.3)
Girl	-0.127	0.104	-679.8
	(0.127)	(0.227)	(603.2)
Observations	666	407	401
R-squared	0.685	0.342	0.301
Individual/sibling control	Yes	Yes	Yes
Parent/household control	Yes	Yes	Yes
Village dummy	Yes	Yes	Yes

Notes: ** indicates significance at the 5% level. The standard errors (in parentheses) are corrected for clustering at the village level. The base category for 'parents' bias' is unbiased. Individual and sibling controls include age, age square, interaction of age and gender, number of brothers of the child, number of older siblings, and a vector of dummies indicating number of siblings; parental and household controls include a vector of dummies indicating the highest education level among parents and indicating the occupation of the household head, mother's age, a dummy variable for whether the household head is Muslim and for whether the household has electricity, and the household's landholding per capita. The illness regression (column 1) includes additional control for access to safe water and sanitation; the regressions for formal treatment and treatment cost (columns 2 and 3) also include additional controls for the duration of illness. The sample includes children aged 0-15 years in households involving individual decision.

Appendix:

Appendix Table A1a: Key descriptive statistics by gender in the treatment group involving joint decision

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Total		Girl		Boy		Girl-Boy		
	Mean	S.D.	Mean	S.D.	Mean	S.D.	Diff	T test p-value	E-S p-value
I. Individual and sibling characteristics:									
Gender (=1 if girl)	0.497	--	--	--	--	--	--	--	--
Age	12. 06	3.26	12.14	3.14	11.98	3.38	0.16	0.573	**0.084**
Enrolment status (1=enrolled)	0.898	0.302	0.933	0.250	0.864	0.344	0.069	**0.009**	--
Years of schooling	5.03	2.94	5.24	2.88	4.81	3.00	0.43	**0.090**	**0.017**
Grade for age	78.42	24.8	80.70	22.9	76.17	26.5	4.53	**0.041**	0.250
Total number of siblings	2.21	1.17	2.19	1.12	2.23	1.21	-0.04	0.671	0.400
Number of older siblings	1.15	1.12	1.09	1.13	1.20	1.12	-0.11	0.252	0.561
Number of brothers	1.19	0.971	1.54	0.796	0.833	0.999	0.711	**0.000**	**0.000**
Number of sisters	1.03	0.793	0.648	0.748	1.40	0.645	-0.754	**0.000**	**0.000**
Education expenditure for last 6 months, if enrolled (hundred taka)	14.84	7.72	15.27	7.79	14.37	7.63	0.90	0.232	0.579
Whether ill last year (1=yes)	0.701	0.458	0.691	0.463	0.712	0.454	-0.021	0.644	--
Duration of illness (day)	7.61	4.40	7.67	4.50	7.55	4.32	0.12	0.806	0.807
Whether got formal treatment, if ill	0.054	0.226	0.064	0.245	0.044	0.206	0.020	0.440	--
Treatment cost, if ill (hundred taka)	3.08	5.62	3.22	5.58	2.95	5.67	0.27	0.668	0.157
II. Parental and household characteristics:									
Father's age	43.02	6.49	43.06	6.449	42.99	6.54	0.07	0.893	0.973
Mother's age	34.19	5.44	34.20	5.39	34.19	5.493	0.01	0.971	0.839
Father's schooling	4.18	3.93	4.14	3.92	4.22	3.94	-0.08	0.844	0.999
Mother's schooling	3.409	2.97	3.408	3.01	3.410	2.93	-0.002	0.994	0.983
Muslim (1=yes)	0.789	0.409	0.785	0.411	0.792	0.407	0.007	0.862	--
Has electricity (1=yes)	0.141	0.348	0.149	0.357	0.133	0.340	0.016	0.580	--
Drinks safe water (1=yes)	0.518	0.500	0.521	0.501	0.515	0.501	0.006	0.892	--
Has sanitation facility (1=yes)	0.476	0.500	0.467	0.500	0.485	0.501	-0.018	0.690	--
Per capita landholding	62.3	212	68.1	240	56.6	179	11.5	0.535	0.931
Monthly expenditure (thousand taka)	10.11	5.74	10.12	5.89	10.10	5.61	0.02	0.959	0.833

Note: Column 7 presents the mean difference between girl and boy of each variable. Column 8 reports the p-value of the two-tailed t test with the null hypothesis that the means in the two groups are equal. Column 8 reports the p-value of the Epps-singleton test with the null hypothesis that the distributions of the variables between these two groups are same.

Appendix Table A1b: Key descriptive statistics by gender in the treatment group involving individual decision

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Total		Girl		Boy		Girl-Boy		
	Mean	S.D.	Mean	S.D.	Mean	S.D.	Diff	T test p-value	E-S p-value
I. Individual and sibling characteristics:									
Gender (=1 if girl)	0.510	--	--	--	--	--	--	--	--
Age	11.85	2.97	12.05	2.84	11.65	3.09	0.37	**0.062**	**0.030**
Enrolment status (1=enrolled)	0.938	--	0.950	--	0.925	--	0.025	0.159	--
Years of schooling	5.40	2.81	5.59	2.69	5.20	2.92	0.39	**0.062**	**0.002**
Grade for age	84.6	21.0	85.5	20.0	83.8	22.1	1.7	0.270	0.186
Number of siblings	1.89	0.903	1.92	0.917	1.87	0.889	0.052	0.429	0.918
Number of older siblings	0.992	0.945	0.925	0.906	1.06	0.980	-0.137	**0.046**	**0.017**
Number of brothers	0.974	0.820	1.37	0.652	0.561	0.774	0.809	**0.000**	**0.000**
Number of sisters	0.921	0.748	0.550	0.716	1.31	0.562	-0.757	**0.000**	**0.000**
Education expenditure for last 6 months, if enrolled (hundred taka)	14.94	8.68	14.67	8.45	15.24	8.93	-0.57	0.398	0.908
Whether ill last year (1=yes)	0.586	--	0.601	--	0.569	--	0.032	0.404	
Duration of illness (day)	9.92	11.9	9.42	8.25	10.5	14.9	-1.4	0.378	0.553
Whether got formal treatment, if ill	0.293	--	0.310	--	0.276	--	0.034	0.447	--
Treatment cost, if ill (hundred taka)	4.94	15.7	5.11	19.5	4.75	10.1	0.36	0.816	0.727
II. Parental and household characteristics:									
Father's age	43.45	6.75	43.49	6.96	43.40	6.55	0.081	0.868	0.855
Mother's age	34.97	5.67	34.99	5.68	34.95	5.67	0.038	0.926	0.875
Father's schooling	4.82	4.09	4.76	4.08	4.88	4.10	-0.121	0.716	0.962
Mother's schooling	3.77	3.44	3.72	3.39	3.83	3.49	-0.110	0.701	0.924
Muslim (1=yes)	0.691	--	0.680	--	0.704	--	-0.024	0.477	--
Has electricity (1=yes)	0.368	--	0.377	--	0.358	--	0.019	0.593	--
Drinks safe water (1=yes)	0.489	--	0.499	--	0.480	--	0.019	0.603	--
Has sanitation facility (1=yes)	0.4261	--	0.4263	--	0.4259	--	-0.0005	0.989	--
Per capita landholding	65.7	120.5	62.5	116.5	69.0	124.7	-6.48	0.460	0.918
Monthly expenditure (thousand taka)	9.19	6.86	9.15	6.56	9.21	71.76	-0.06	0.879	0.635

Note: Column 7 presents the mean difference between girl and boy of each variable. Column 8 reports the p-value of the two-tailed t test with the null hypothesis that the means in the two groups are equal. Column 8 reports the p-value of the Epps-singleton test with the null hypothesis that the distributions of the variables between these two groups are same.

Appendix Table A2a: Key descriptive statistics by joint parental attitude (Joint treatment)

	(1)	(2)	(3)	(4)	(5)	(6)
	Unbiased		Boy-biased		Girl-biased	
	Mean	S.D.	Mean	S.D.	Mean	S.D.
Years of schooling	4.65	2.90	5.12	3.00	4.91	2.93
Grade for age	75.9	27.2	80.9	22.2	78.9	24. 3
Enrolment status (1=enrolled)	0.890	0.314	0.946	0.226	0.855	0.353
Test score	58.39	16.73	62.1	17.0	62.1	15.9
Education expenditure (hundred taka), all children	12.82	9.18	14.45	8.23	12.40	8.19
Education expenditure (hundred taka), enrolled children	14.50	8.42	15.34	7.62	14.70	6.74
Whether ill last year (1=yes)	0.617	0.487	0.644	0.479	0.664	0.473
Whether got formal treatment, if ill	0.221	0.416	0.203	0.403	0.227	0.419
Treatment cost, if ill (hundred taka)	3.87	7.59	4.80	14.68	3.77	11.02

Appendix Table A2b: Key descriptive statistics by individual parental attitude (Individual treatment)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	Father's attitude						Mother's attitude					
	Unbiased		Boy-biased		Girl-biased		Unbiased		Boy-biased		Girl-biased	
	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.
Years of schooling	5.34	2.97	5.09	2.87	4.77	2.89	5.25	2.94	5.03	2.78	5.07	3.07
Grade for age	84.8	20.6	86.6	18.2	82.0	24.5	85.6	20.5	83.2	20.7	81.6	23.1
Enrolment status (1=enrolled)	0.945	0.229	0.955	0.209	0.896	0.306	0.954	0.211	0.933	0.251	0.871	0.337
Test score	58.1	12.4	57.4	11.1	56.1	11.3	57.9	12.6	55.9	10.4	57.4	10.2
Education expenditure (hundred taka), all children	14.07	9.15	14.89	10.08	12.76	8.17	14.35	8.96	14.01	9.74	12.23	9.43
Education expenditure (hundred taka), enrolled children	14.93	8.72	15.63	9.75	14.29	7.27	15.07	8.57	15.06	9.28	14.19	8.68
Whether ill last year (1=yes)	0.607	0.489	0.651	0.477	0.659	0.474	0.666	0.472	0.572	0.496	0.601	0.490
Whether got formal treatment, if ill (1=yes)	0.212	0.409	0.215	0.411	0.224	0.418	0.201	0.401	0.264	0.442	0.251	0.435
Treatment cost, if ill (hundred taka)	4.64	15.0	3.94	11.0	3.91	7.60	3.74	8.98	3.93	6.81	6.13	20.7