Gender Discrimination in Child Schooling: Why do we observe the gender disparity?

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Sydney 2006
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The gender difference in child schooling is one of the most fundamental problems faced in developing countries. Where the initial enrolment rates at the primary educational levels and there after, the overall schooling outcomes at the subsequent educational levels are significantly lower for female children in comparison to male children. Even in some countries it is observed that the drop-out rates at the primary and secondary educational levels are far more for female children than male children. This leads to the debate, if there is any disparity in parental investment in children, if not then, why we observe the gender difference in schooling outcomes. Do we need any further clarification to understand this concept? In this paper, I am looking for the much discussed gender disparity in child schooling in India, while controlling for a range of other individual, household and community level characteristics and then, if this is a manifestation of the intra-household resource allocation favoring the male child, using household fixed effects estimation model.

There is considerable evidence in the literature (Kingdon 2005; Pal, 2004; Kambhampati and Pal, 2001; Drez and Kingdon, 2001; Kingdon, 1998; Glick and Sahn, 2000; Tansel, 1997; Deolalikar, 1993), supporting this view that, there is indeed gender bias or pro-male bias in case of parental investment in children. Further, this discrimination in parental allocation of resources, might have been a result of either the low-parental literacy levels (Tansel, 1997) or the differential effect of paternal and maternal education (Kambhampati and Pal, 2001; Glick and Sahn, 2000) on child's education or the inequality in the expected returns in the labour market (Kingdon, 1998; Deolalikar, 1993) or the unequal access to labour market (Glick and Sahn, 2000) or differences in cost involved in educating a child-including both the direct costs (Drez and Kingdon, 2001; Kingdon, 1998; Glick and Sahn, 2000; Tansel, 1997)

and indirect costs of education (Pal, 2004; Glick and Sahn, 2000) or differences in returns realized by parents through children (Glick and Sahn, 2000) or the proximity to the school or cultural and religious factors.

Though there has been burgeoning literature on the presence of gender differences in schooling in these countries and further discussing the probable reasons behind such an issue and, there by leading to the conclusion that female children in general receive lower schooling resources than male children in overall household resource allocation. Yet, there have been almost rare evidence in the literature addressing the issue of 'whether this commonly observed gender differential in case of schooling outcomes is really a reflection of gender discrimination in the intra-household resource allocation', which is the subject of this present study. On the contrary, this study has found no evidence of gender bias in the intra-household allocation of resources between male and female children observed through their individual schooling outcomes once they are enrolled. Although in the initial process, when the households decide between getting their children enrolled or not, there is sufficient evidence of gender-bias. A similar argument was also forwarded by Kingdon (2005). To start with, in the cross-sectional model there is strong evidence supporting the presence of gender bias against female children both in case of initial enrolment and also while continuing in school. This gender effect becomes insignificant once we consider the household level fixed effects within regression controlling all the household specific unobserved common characteristics. This is consistent with an earlier analysis of gender-pattern in household consumption expenditure in India (Subramaniam, 1996).

The paper would proceed in two stages. In the first stage it would examine the significance of 'gender effect' on the schooling outcomes of children in India, along with a range of other individual and household level characteristics. In the second stage it would examine 'if there is any discrimination in the intra-household allocation of schooling resources leading to the overall gender differential in schooling attainment.

Literature Review

Drez and Kingdon(2001) have found strong evidence of sharp gender bias in school participation in rural north Indian states of Uttar Pradesh, Bihar, Madhya Pradesh and Rajasthan. As it has already been established in the literature, they further strengthened the argument that, the probability of school participation increases with parental education, both maternal and paternal, whereas, the inter-generational cross-sex effects are weaker than same-sex effects. The most significant effect is that of maternal education on girls' school participation. Later in rural West Bengal in Eastern India, Pal (2004) found mother's literacy significantly enhances the probability of school enrolment among girls but, it is insignificant for boys. Similarly father's education significantly encourages boys schooling only and does not have any perceptible impact on girls. In a similar attempt on Guinea, Glick and Shan (1998) also found very strong evidence of positive association between parental education and child schooling. They further substantiated the fact that inter generational same sex effect is in fact very strong and there is almost no cross-sex effect in case of the mother's education, though it is not the same with father's education. Father's education has effects on schooling of both boys and girls, while the effect is relatively smaller on boys. Aysit Tansel(1997) in his article on "Schooling Attainment, Parental Education, and Gender in Cote D'Ivoire and Ghana",

analysed the importance of parents' education in the schooling attainment of their children, the effect of distance to the nearest school and the differential of these two effects by gender. The paper also found strong evidence in supporting the facts that, though the schooling attainment of both male and female children are related to both of their parents' education in both the countries, yet the effect of father's education is stronger than that of mother's education for both sexes. Again both parents' education has a larger impact on their daughter's schooling than on their son's in Ghana, but it is entirely opposite in Cote d'Ivoire. Also the effect of mother's education on her daughter's schooling is much stronger than on her son's schooling in Ghana. This somewhat stronger relationship between the parental education and their children's schooling attainment might have been due to less social mobility, which is found to be more so in Cote d'Ivoire than in Ghana.

Differential labour market returns among male and female workers are the often cited explanation for the existing gender discrimination in schooling outcomes. Kingdon (1998) explained the lower schooling participation rates among girls in India, through the existing labour market discrimination, using household survey data. The paper focused on 15-59 years old, excluding the full-time students. The base or reference category is those not labour force participants, the unemployed and unpaid workers mostly working in family owned enterprises. Examining the relative rates of return to women's and men's education, the paper found evidence of significant omitted variable bias, if we ignore the home background in the equation. Without involving the family background variables, the equation substantially overestimates the rates of return to education. This in turn suggests that men and women, who acquire higher education, come from privileged backgrounds and a significant part of their returns to

education is due to their favourable family backgrounds. Yet after controlling for personal human capital and parental background, women's returns are substantially lower than men's and the difference is statistically significant. This sizeable gender asymmetry in returns rather explains the huge gender differential in schooling in India. Pal (2004) also confirmed this view on India, though in her analysis girls' schooling does respond to local female labour force/work force participation rates rather than to local female wage rates. Here, it is probably more influenced by the local socio-cultural practices rather than the labour market return. On the other hand, higher male wage rates significantly encourage boys work and lower their school participation.

On the contrary, in response to lower school enrolment rates for girls, particularly at the secondary and post secondary levels in Indonesia, Deolalikar(1993) found males have significantly lower returns to secondary and tertiary schooling than females in this country and this is particularly true at higher educational levels. He also found evidence of age cohort differentials in the estimated returns to schooling and there is no evidence of gender disparity in these inter-cohort differentials. Though it is difficult to reconcile these findings with the already observed gender asymmetry in schooling (lower schooling participation among girls), yet the answer may be with the time lags involved in household and individual responses to labour market returns to schooling.

However, there is also another interpretation that, it is not always the actual difference in the labour market returns between male and female workers that contribute towards the gender issue in schooling in these countries. It is rather the differences in returns

realised by parents through their male and female children. Investigating gender differences in the determinants of several schooling indicators like, grade attainment, current enrolment and withdrawal from school, in a poor urban environment in the West African country of Guinea, Glick and Shan(2000), strongly advocates that, the gender gap in schooling is partly due to the response of parents to the much different chances of success in the labour market for men and women, or because they don't realise the highly non-market benefits of female schooling in the form of better child health, nutrition and leading better quality of life in the following generation. So, when the pecuniary benefits of child schooling becomes priority, parents value boys' education more than girls' and they value the opportunity cost of girls' time in school as very high. Hence there is a very strong case of social non-market returns exceeding private returns for female education, which probably the parents don't realise in these countries. Drez and Kingdon(2001) in their analysis on India originate the parental motivation for children schooling is another very significant deciding factor in this process.

Differences in cost involved in educating a child is also one of the important explanations for the existing gender disparity in schooling. Both the direct and indirect costs of education are considered quite important for this purpose, particularly for resource constrained households. Drez and Kingdon(2001) found household wealth has significant contribution towards school participation both in case of boys and girls, but the effect is much more stronger for girls. In this context, Glick and Shan (1998) found, in Guinea, increase in household permanent income, proxy by household per adult expenditures, have positive effects on grade attainment and current enrolment of girls and also reduce the probability of teenage girls leaving

school. These expenditures do not have a significant impact on the schooling of boys. Similarly, Tansel (1997) had also established the proximity to school, which is considered as an indirect measure of the cost of attending school has a negative impact on the probability of primary school attendance, on the middle and post-middle school attainment of children of both genders in both Cote d'Ivoire and Ghana. The cost of secondary school is quite important in Cote d'Ivoire, it is both the middle school and secondary school costs those are important in reducing the probability of primary and post-primary school attainment. These factors are stronger for females than for males in Ghana. The effect of household income (proxy as per-adult total expenditure) is positive and significant in both the countries.

Similarly, household structure, which is mostly interpreted as the opportunity cost of a child's time at school or value of the child's time in home making, also exhibits very strong gender bias in cases of schooling outcomes. The presence of sibling under 5-years of age has a strongly negative impact on girls' grade attainment and current enrolment and also induces girls to leave school. No such impacts were however, identified in case of boys (Glick and Sahn, 2000). Sarmistha Pal (2004), tried to analyse the significant gender differences in child schooling in the Indian states, through the important opportunity costs of schooling, considering both the implicit and explicit opportunity costs together. She found, indicators of returns to schooling, instrumented by local labour market participation rates and wage rates; opportunity costs of participating in domestic work, instrumented by sibling composition; and parental preferences, instrumented by parental literacy levels can explain a part of the observed gender differences in enrolment.

The rural-urban variation, which is associated with lower levels of primary school attendance, middle and post-middle school attainment in the rural areas of Cote d'Ivoire in comparison to the urban areas, is also visible in the form of reduced schooling attainment of girls at the middle and post-middle school levels in Ghana (Tansel, 1997).

Caste plays a very important role in schooling attainment in India, even after controlling for other major individual and household level variables. The 'scheduled castes' and 'scheduled tribes' and the 'other backward classes' children are in disadvantage compared to general caste children. The effect is even stronger for girls (Drez and Kingdon, 2001).

Even though limited in scope, Drez and Kingdon (2001) also identified the function of some of the school quality level variables; quite significant is also the provision of mid-day meals in schools, which roughly halves the proportion of girls excluded from the schooling system. However, all the village level, community level and school quality level variables have little influence on boys school participation in comparison to girls and last but not the least, the village development index turned out to be much stronger for girls.

The gender discrimination in schooling in India might be a result of the difference in the perceived need for girls and boys education, due to the existing economic and socio-cultural factors in play. In case of boys it is considered more of a necessity to educate them, as it is the male head (partner) in a household, who is expected to support the family economically. So, educating a son is considered as the primary or

basic need of a resource constrained household. Whereas, on the other hand the parents might not really opposed to female education but they are rather in a position to be not able to afford it. So, when they are faced with the problem of allocating limited available resources, it is probably the education of male child (considered as a necessity), is preferred over the education of female one (considered rather as a luxury). Hence with the village development index or wealth development index, when people are better-off or when they have crossed that threshold of satisfying their basic necessities in life, they do not in reality differentiate between a male and a female child.

In this context it would be noteworthy to discuss the case in Bangladesh. Given the extreme poverty, high fertility rates and lower literacy rates among the population of Bangladesh, increasing the education level of the current school age population is a particularly important issue in this country. However, while attempting to identify some of the individual and household level characteristics that affect the demand for schooling in Bangladesh, Maitra (2003) found no evidence of gender effect in the probability of current school enrolment of children aged 6-12, though girls have a significantly higher probability of continuing in school relative to boys.

However, it is also equally important to note, Pal (2004) established in case of India, only one-third of the total gender related variation in child school enrolment can be explained through all these major characteristics. A significant proportion of the total variation still remains unexplained. This large unexplained part conventionally known as ‘discrimination’ component or ‘behaviour gap’ (Cameron and Heckman, 2001; in Pal, 2004) can be due to the discrimination in the intra-household allocation of

resources. Though the size of the entire unexplained variation is generally taken to be a measure of gender discrimination, yet a part of it or the entire unexplained variation can also be due to many unobserved and imperfectly observed factors in the regression model and/or child or household specific unobserved heterogeneity.

Household Fixed-Effects

One of the most important considerations, which is often ignored in such kind of discussion on gender issues, should be the characteristics of households. Though we study schooling participation always at individual level, yet in such analysis, it is always the household that is considered as the primary focus unit and the decision regarding the level of investment in child schooling is always determined at the household level mostly by parents. Hence ignoring some of the common characteristics shared by children of the same household, which we could not always observe and which might be having significant influence on the educational investment decision of the child would result in sufficiently biased estimates. Further, ignoring the fact that there might be quite a good deal of discrimination in the intra-household allocation of resources on the basis of age, gender, birth order and ability differential among members is not fair for such kind of analysis.

Now coming back to our initial question, whether there is any gender discrimination in the allocation of household resources favouring the education of male child in resource constrained households or not. If not, then why do we observe the gender asymmetry in child school outcomes in developing countries, more specifically in South and South-East Asian countries of India, Pakistan Bangladesh Indonesia etc.? In this context, observing the pattern of resource allocation within the household and variations in individual schooling investments within the household on the basis of

individual characteristic differential (age, gender, birth order etc.) might provide significant insight into the issue. For this purpose the household fixed-effect estimation models, which would control for all of the common unobserved characteristics shared by individuals from the same household and then run within household within regressions to account for any unobserved heterogeneity within the household, expressed partially through observed individual characteristics, would be of real help.

In one such effort Behrman and Deolalikar (1993), have re-examined the long standing assertion on labour market impact of schooling using household fixed-effect estimation model in case of Indonesia. Their interpretation has challenged the basic foundation of Human Capital Investment theory and more specifically the developmental or the productivity enhancing role of investment in education. In their version, the more popular interpretation of a possibly strong association between years of schooling and wages has in reality, ignored the role of a host of other household and community specific factors. Thus resulting in substantially overestimated returns to schooling in general, overestimated relative returns to the lower schooling levels and overestimated relative returns to the schooling of males relative to females. They have advocated the household fixed-effect estimation model to simultaneously control for a number of such possibly important unobserved community and household variables, those otherwise would have been additively included into the wage rate estimation model.

In a rather recent and closer endeavour to the subject of this present paper, Subramaniam (1996), presents an analysis of gender patterns in intra-household

allocation of resources with Household Fixed-Effects. Estimation results are based on household level panel data on consumption expenditure from India. The paper provides the evidence that any analysis of distribution of income across households could present a wrong picture if there are inequalities in the distribution of resources within households.

It is well known in the literature on India that parents' spend a considerable amount of resources on the marriages of female children. Based on this view, Subramaniam(1996), hypothesised that such high costs of raising female children may be an important determinant of (differential) allocation of resources within the household. In a life-cycle context the birth of a girl may be having the same impact as a negative shock on lifetime household wealth. If a girl child is born in a household then the parents are starting a life-cycle savings plan in an effort to meet the high cost of marriage expenses at a latter stage. Modern theories on inter-temporal allocation of resources within a household are based on the beliefs that, individuals try to keep their marginal utility of expenditure constant over time, owing to the special preference for a male child over a female child in some social and cultural settings like India. In a utility maximising framework, parents may reduce, household expenditure following the birth of a female child and may allocate more resources to boys and fewer to girls, as the marginal utility for boys are still lower than for girls (Subramaniam, 1996).

Though, the cross-section analysis in Subramaniam (1996) indicates male children receive more resources than female children in food expenditure. When the parental marginal utility of wealth has been modelled as the unobserved household specific fixed-effect that is constant over time, the fixed effects estimation results indicate that,

there is no further evidence of any significant gender bias in the intra-household allocation of food and other resources. Hence, the results suggest that the differential effects of gender composition against female children, in the allocation of resources derived entirely from the presence of the unobserved wealth effect, which is more a case of between household variations.

Data

The paper used Demographic Health Survey (DHS) 2001 household-level data for India, collected by the World Health Organisation (WHO), to empirically analyse the gender bias in educational outcomes in the country. The dataset is unique, it well represents the entire country and has not been previously used to analyse this issue. It is administered on 90,303 ever-married women aged 15-49 years and it contains detail information on household structure, labour market participation, asset ownership, health and educational characteristics for all the household members. However, we have only focused on the fifteen major states of India for this purpose, owing to the discrepancies encountered in dealing with the vastness of an Indian database.

Descriptions and definitions of the variables used in the regression model are presented in Table 1. The paper focused on children aged between 10-20 years, their educational demand, schooling status and background factors. In Indian system there are five grades within the primary school and five grades within the secondary school followed by two years of higher secondary education. Considering six to be the normal primary school enrolment age and late enrolments are often the common feature in mostly rural areas and poor households, the study focus on 10-20 years old children for analysing schooling behaviour. Children in this age group, either an offspring of the household head or any other subsidiary member of the household are

included in the sample, considering the presence of joint-family households a fairly common feature in India. In this way, only households with at least one child in this age cohort contribute for a total of 29,336 households in the sample.

There are a total of 61,191 children in this age cohort out of which 33,601(55 percentages) are male and 27,590 (45 percentages) are female children. Out of the total number of children in this age cohort 13 percentages of children have no education. Either because they have not enrolled at all or have withdrawn immediately after being enrolled there by recording zero years of education. The rest 87 percentages have some level of education. Among those with zero-years of education 63.5 percentages are female and 36.5 percentages are male children. Similarly, among those with some level of educational attainment only 42.3 percentages are female whereas, 57.7 percentages are male. It is in fact, representing a very high gender bias against the schooling attainment of female children in the country.

Among these 87 percentages of children, who have some level of education 36.7 percentages are with primary school level education, 42.3 percentages are with secondary school level education and only 7.9 percentages are with higher secondary school level education. This shows very high drop-out rates at primary and secondary tier of education in India.

Explanatory variables

The primary focus of our analysis is to examine the gender-bias in schooling outcomes of 10-20 year old school going children in India. Further, we would explore, if this gender-bias is a reflection of the discrimination against the female child in

intra-household resource allocation. For this purpose, we have included a range of individual, parental, household level characteristics (including wealth) along with few community level and the fifteen state level dummies as control variables.

The individual characteristics considered are the child's age, age squared (to capture the possible non-linear effect), gender and the birth order. The child's gender is a dichotomous variable that takes on a value of '1' for males and '0' for females. Similarly, the child's birth order is captured through a set of dummies representing if the child is 1^{st},or 2^{nd}, or 3^{rd}, or 4^{th}, or 5^{th} child in the household in accordance with his/her serial number in the birth history of the family.

The parental characteristics include the age of both parents, which are continuous variables; a set of dummies representing their educational status; dummies for their labour-market status; a set of dummies representing father's occupational status and finally the dummies representing mother's economic and social status.

The household characteristics exert very important function in such type of analysis, where the schooling decision of the child is entirely dependant on the economic status of the household. Hence, variables including the household size, sibling characteristics in the household like the number, age composition and gender composition of the siblings currently residing in the household are considered vital for analysis. The presence of large households sometimes considered to be imposing financial burden on the household resources. Hence, the household size can be considered as an indirect measure of household wealth, exerting an inverse pressure on the available resources for schooling though, it can also be interpreted as the

presence of more earning members in the household there by exerting positive effect on the schooling outcome of the children. Similarly the proportion of female children in the household is also considered in this analysis to capture if the resource constrained households are really in disadvantage for availing resources for schooling of children, when the proportion of female children in the household increases.

However, the household financial resources are controlled through a set of dummy representing the household wealth. Though a major shortcoming of the DHS dataset on India is that it contains no information on earnings and household expenditure patterns yet, it contains a household wealth index that divides households into five different wealth quintiles (WEALTH1-WEALTH5), with WEALTH1 representing the poorest quintiles. The wealth index is calculated using the households' assets ownership, so it is not endogenous, neither is it affected by the transitory nature of the labour income in the database, there by providing a reasonably reliable measure of the household economic status.

The effect of caste and religion, which has got very strong influence in Indian society, is also included in this study through a set of caste dummy and a dummy variable representing if the household is Hindu or non-Hindu.

Finally, a dummy variable representing the rural or urban residence of the household and fifteen state level dummies are included in the model to capture the effect of urbanisation and regional variations in schooling outcomes in Indian states

Methodology

In this paper, the general model of parental investment in the human capital of their children is based on the collective household framework (McElroy and Horney, 1981 and Chiappori, 1988), rather than on the unitary household model (Hoddinott and Haddad, 1995 and Alderman *et al,* 1995), where the investment in the human capital of a daughter or son in the household depends on the relative bargaining power of each parent. Again, the level of parents' investment in the schooling of their children is driven by their desire to equate the marginal benefits of schooling investments to their costs. Following, Glewwe and Jacoby (2004), we can divide the households investment into human capital H and physical capital K. Where,

$$H= \psi (G^m (e, x) + G^f (e, x)) \quad (1)$$

The human capital is accumulated through schooling investment in school age children e, purchasing a schooling input such as books, uniforms and transportation costs etc. x, at price p, where G^m and G^f are neo-classical production functions of mother and father in a household on their children and ψ is the learning productivity parameter that reflects school quality and child ability and motivation. Similarly, the physical capital accumulates according to

$$K= \theta F (K^m, K^f, L^m, L^f) - px - c \quad (2)$$

Where the households generate their current income Y by combining their physical capital with their labor in the production function, where, $Y = \theta F (K^m, K^f, L^m, L^f)$. θ is a productivity parameter reflecting the state of technology, K^m and K^f are the physical capital already under the possession of mother and father in the household and, L^m and L^f are their respective labor. The household finances all their investment by forgoing their current consumption c. Further, we have constrained the above equation by setting $K \geq 0$, suggesting that households cannot hold negative amount of physical capital. This is like a 'borrowing constraint'.

Now, considering that parents derive utility from investment in both the physical and human capital, the utility of the mother and father are modeled as,

$$U^i = u\,(c, e); \qquad i=m,f \tag{3}$$

Further the reservation utility levels of both the parents are represented by $\tilde{U}^m$ and $\tilde{U}^f$, which represents their threshold utility levels or options outside the marriage once their marriage breaks. An improvement in the reservation utility of any one of the parents would expect to improve his/her bargaining power in the household. Hence, mothers with better earning abilities, education and improved social and economic status are considered to have better bargaining power in the household decision making process in the allocation of resources towards their children's schooling. The household's objective is then to maximize the collective utility of both the parents,

$$U^H = [U^m\,(c, e) - \tilde{U}^m\,(p, K^m; \gamma^m)] \times [U^f\,(c, e) - \tilde{U}^f\,(p, K^f; \gamma^f)] \tag{4}$$

subject to the constraints (1) and (2) along with a borrowing constraint. The schooling investment of a child, h_{ij}, is then given by a simple reduced form demand function:

$$h_i = f(I, H, z, \varepsilon_i) \tag{5}$$

I, is a vector of parental characteristics, which include the age of both parents, their educational status, their labour-market status, father's occupational status and finally mother's economic and social status. H, is a vector of household characteristics, like wealth, household size and proportion of daughters in the household. z, is a vector of individual child characteristics, such as age, age squared, gender, birth-order and, ε represents unobserved individual, household and community characteristics influencing the child's schooling.

Econometric Estimation Strategy

Our database has got no information on the level of investment on the schooling of each child in a household. However, it has information on their schooling outcomes in

the form of actual number of years of schooling that the child has currently attained. Hence, considering that these years of schooling acquired by children are the representation of household preference for children schooling investment we have used years of schooling as our dependent variable in the model. Further, bearing the fact that 13 percentages of children in our database have no education, we have adopted a sample selection model to deal with the issue of sample selection bias. Where, in stage 1, we estimate a probit equation examining the probability of a child going to school and in the stage 2, we estimate a maximum likelihood estimation(MLE) equation with years of schooling as our dependant variable, choosing those children the stage 1 attended school. So, we are interested to estimate

$$h_i = \beta x_i + \varepsilon_i \quad (6)$$

Here, h_i rather represents the child's years of schooling and it is a continuous variable, x_i is a vector of explanatory variables, β is the vector of coefficients that will be estimated and ε_i is a random error term. Now, the selection equation is

$$h_{1i}^* = \sigma x_{1i} + \upsilon_i \qquad [x \subset x_1] \quad (7)$$

h1* is a latent variable representing the household desire or preference to enroll a child in school, which can be expressed as a linear function of variables that affect the probability of a child attending school. However, we do not observe h1* and instead we observe the dummy variable h_1, which takes the value 1 if the child is enrolled in a school and 0 otherwise. Hence,

$$h_{1i} = 1 \quad \text{iff} \quad h_{1i}^* > 0$$

$$h_{1i} = 1 \quad \text{iff} \quad h_{1i}^* \leq 0 \quad (8)$$

and h_i is observed when h_{1i} is 1. The sample selection model allows for a correlation coefficient between the disturbances of the two equations, if these disturbances are uncorrelated i.e. if the estimated ρ is not significant, then the above h_i equation could be estimated by the OLS. However, in our model ρ is very significant.

Household Fixed Effects Model

In using cross-section household level data for individual analysis on schooling demand, we can't, however, deny the presence of siblings or more than one children from the same household in the database and hence, the corresponding co-relation among themselves in the model. Hence, ignoring these household fixed effects is likely to give us biased estimates. Further, in order to capture the presence of gender discrimination in the intra-household allocation of resources, we proceeded with an estimation of household fixed effect model. Though estimating a fixed effects model with a cross-sectional database is not a usual practice, yet in demography, it is more commonly used on siblings to control for unobserved household and background characteristics (Wooldridge, 2002). Using the within transformation within a household, removes household effects that may be correlated with the explanatory variables. Here, each household is treated as a cluster and we have adopted the fixed effects model with unbalanced clusters, owing to the fact that, number of siblings from one household does not necessarily equate to that from the other one and in our data they vary between 2 to 11 in households.

However, in the beginning we can not again ignore the fact that, there are non-trivial percentages (13%) of children in the database having no schooling at all. Consequently, the dependant variable, years of schooling, is not a continuous one, rather the optimizing behavior in this model leads to a corner solution. Behrman and Deolalikar (1993) have claimed that this method of household fixed effect estimation, apart from controlling for all the household and community characteristics also limits or even eliminates the selectivity bias in the model. But, still we have estimated the model in two different stages to correct for selectivity bias. In the first stage, we have

estimated random-effects probit regression pooled across households to examine the probability that, a child in the household is enrolled in school or not. Including the 'Inverse Mills Ratio' obtained from this first stage pooled probit regression we have then calculated a fixed effect regression model with unbalanced clusters in the second stage. Here, we are interested to estimate

$$h_{ij} = \beta x_{ij} + a_i + \varepsilon_{ij.} \qquad (9)$$

Here, the subscript i represents the household and j represents the child in the household. So, h_{ij} represents the child's years of schooling and it is a continuous variable, x_{ij} is a vector of explanatory variables, β is the vector of coefficients that will be estimated, a_i is a vector of unobserved variables which changes only across households and is the unobserved household fixed effect and ε_{ij} is a random error term. Now, the selection equation is

$$h_{1ij}^* = \sigma x_{1ij} + \upsilon_{ij} \qquad [x_{ij} \subset x_{1ij}] \qquad (10)$$

h_{1ij}^* is a latent variable representing the household desire or preference to enroll a child in school, which can be expressed as a linear function of variables that affect the probability of a child attending school. However, we do not observe h_{1ij}^* and instead we observe the dummy variable h_{1ij}, which takes the value 1 if the child is enrolled in a school and there are at least 2 children per household present in the sample, and 0 otherwise. Hence,

$$h_{1ij} = 1 \quad \text{iff} \quad h_{1ij}^* > 0$$

$$h_{1ij} = 1 \quad \text{iff} \quad h_{1ij}^* \leq 0 \qquad (11)$$

and h_{ij} is observed when h_{1ij} is 1.

Estimation results

We start our analysis, in the first part, by considering the sample selection model, both the results of the first stage probit selection equation and then the second stage maximum likelihood estimation with the selected samples from the first stage. Our

decision to estimate the sample selection model is offcourse supported by the fact that, we observe a very significant *rho* in the second stage estimation of the model. We have presented the first round probit estimation results in Table 2 and the second round maximum likelihood estimation results in Table 3.

As already discussed, with the sample selection model we are able to analyse the factors those affect a child's years of education contingent upon the fact that the child has enrolled in a school. Considering first the probit and then the maximum likelihood results, both the age and gender of the child do matter in the decision to enrol and once enrolled in the decision to continue in school. As the age of the child increases there is less likely that he/she would get enrolled in a school whereas, in the second stage maximum likelihood estimation the rising age of the child is an indicator of more years of education is being acquired. The child's gender is significant in both the stages. While in the first stage, being a male child, it profoundly raises the probability that he would be enrolled in a school; in the second stage, it also raises 17.76 percentages of the probability that he would acquire one more year of education. So, in both the stages the child's gender is coming out as a very significant determining factor in the decision to enrol as well as in the decision to continue in school.

There is very strong evidence of significant resource constraints on child school enrolment and further on child's continuity in school, in our sample. All most all of the variables those are considered as an indirect measure of household resources like the household size, proportion of daughters present in the household, parental educational levels, parental labour market status and father's occupational levels are significant. Though, the variable household size is analysed as being endogenous to

the model in some studies, yet we considered both the household size and proportion of daughters in the household as exogenous, assuming that a quality-quantity trade-off in deciding the size of the household is still a far thing in a predominantly rural Indian database. Furthermore, relative to the base category of no schooling both mother's and father's rising schooling levels like primary, secondary and higher secondary, do have significantly positive and increasing effects on the likelihood of children's attending school and hence, continuing in school. Similarly, compared to the base category of children, whose fathers do not work, to those children in the sample with fathers employed in official jobs and agriculture and self-employed, have significantly higher probably of continuing in school though these factors have no significant effect on the enrolment decision. The labour market status of the father that is, if the father worked all through the year prior to the study, has positive significance for children continuing in school. However, mother's employment status that is being in paid or unpaid employment relative to the base category of mother didn't work all through the previous year, though coming out significant for the decision concerning a child continuing in school and only the variable mother in paid employment is significant for the enrolment decision, yet they have negative coefficients. This is probably a peculiar feature for mostly rural-Indian datasets, where a working mother in the household means the household is resource constrained and the mother is mostly working as casual labourer. This argument is in parlance with Behrman *et al*. (1999), while assessing the significance of female schooling in India, in an environment of technical progress, improved agricultural productivity and economic growth but, low participation of women in the labour market; their results unravel the underlying significant effect of maternal literacy on production of child human capital at home. Further the variables representing mothers' economic status in the household like, if

the mother is allowed to have money set aside and if the mother needs permission to go to market have significant influence on the decision to enrol a child in school.

Again, the significance of all of these factors does not however, weaken the stance of household wealth, a direct indicator of household resources, in the model. Both Table 2 and 3 represent that an increase in household wealth significantly increases the probability of a child in school and also the probability of a child acquiring more and more years of education. In particular an increase in household wealth significantly increases the likelihood of a child's schooling, both in attending and years of education. Not quite unexpected though, the greatest increase in the probability of schooling in both the stages comes from belonging to the wealthiest quintile compared to the lowest wealth quintile.

As it is already established in literature the influence of community norms in Indian society such as those of religion-Hindu or non-Hindu or, caste-scheduled or non-scheduled on child schooling (Borooah and Iyer, 2005; Drez and Kingdon, 2001), our results at both the stages of schooling further substantiate this observation.

Finally, most of our state level dummies in this sample selection model are also coming up as significant compared to the base category of Uttar Pradesh, the biggest state in India[1]. However, we need more insight to explain a negative coefficient for the state of Punjab in the initial probit regression of our model..

[1] Though now this state has been divided into two different separate states, yet in our database it is represented as a singe state.

Household Fixed Effects Model

Now coming to the second part of our analysis, where in the first stage we have estimated random effects probit regression pooled across households, results presented in Table 4 and in the second stage a household fixed effect model with unbalanced clusters, presented in Table 5, controlling for all household level unobserved heterogeneity in the model. Here, we would be specifically looking for the gender bias in the intra-household allocation of resources using within transformation within a household removing all household specific common characteristics that may be correlated with the explanatory variables.

In the first stage random effects probit pooled regression (Table 4), there is significant gender bias supporting the view that at initial stage the decision to send a child to school or not in a household is significantly in favour of a male child, where being a male child in the household substantially improves the probability of being enrolled in a school. However, there are some significant differences between this random effects probit pooled regression results and the first part sample selection probit results. First we observe that variables those were not significant at the first part probit selection equation like the father's occupational levels[2], employment status[3] are significant here. Similarly variables like mothers with secondary school qualification, mother's economic status[4], and the community level variables like the religion[5] and caste[6] those were significant in the first part probit selection regression are not significant in this

[2] like being employed in official jobs (professionals, clerical, sales), agriculture and self employed, skilled manual and manual compared to the base category of not working.
[3] like if the father was employed all through the year prior to this study and if he was employed in an official job all through the year.
[4] If the mother in the household is allowed to have money set aside.
[5] the religion of the household like, Hindu or non-Hindu
[6] in this case the households belonging to scheduled castes are no longer significant only the households belonging to scheduled tribe are still significant.

pooled probit regression. However, unlike the previous probit selection model the state level dummy like Madhya Pradesh is significant and Punjab is having the expected positive coefficient.

In the second stage household fixed effect model with unbalanced clusters (Table 5), controlling for all household level unobserved heterogeneity in the model, we found no significant gender bias. The variable like the 'Inverse Mills Ratio', which is included from the first stage pooled probit regression is significant and also *rho* is significant reminding the fact that, we have a non-trivial proportion of children with zero level of education in our sample, ignoring them we would have landed up with sample selection bias. In this stage, after all the household, community and state level dummies are dropped and unobserved household common characteristics are controlled, there is no significant gender bias in the intra-household allocation of resources though other individual characteristics like age and birth order of the child are still significant factors in the intra-household resource allocation. Therefore, here we can consolidate our findings to strengthen the argument that though in the initial stage, faced with a decision to enrol a child in the school or not, the households demonstrate significant gender bias in the allocation of schooling resources favouring male children[7], yet once enrolled in school there is no significant gender discrimination in within household allocation of schooling resources.

In retrospect, the gender bias observed in our first part sample selection model without controlling for the fixed effects, if not because of the gender-bias in intra-household resource allocation, then why do we observed it. Following Kingdon (2005), either this is entirely derived from the initial gender bias observed in case of

[7] However, at this stage we could not succeed in estimating a fixed effect pooled probit regression instead we estimated a random effects pooled probit regression.

the decision to enrol a child in the school, even though once enrolled in a school there is no gender bias at all, or following Subramaniam (1996), this is derived entirely from the presence of the unobserved wealth effect, which is rather a between household variation. However in our household fixed effects model, we found along with the individual characteristics like age, age squared gender and birth order of the child some of the family characteristics, those are not dropped from the model[8] and the variable proportion of daughters in the family is still partially significant. This is again due to a peculiar feature of Indian database, where a household consists of multiple families owing to the fact that traditional joint family system a fairly common feature in Indian society[9]. Yet, the significant coefficient of proportion of daughters in the family, is rather surprising, as it suggests that, presence of more daughters in a family within the same household places the family in disadvange, in allocating schooling resources to their children though the gender of the child for whom the schooling resources are allocated does not matter. Hence, number of daughters in a family is a significant determining factor in the allocation of schooling resources within the children, which, as forwarded by Subramaniam (1996), possibly works as a negative wealth effect.

Conclusion

In this paper we have discussed the concept of gender bias observed in case of child schooling outcomes, both at the enrolment level at primary school and then at the secondary and higher secondary schools, while progressing with further education. We have used two separate models to examine this concept. In the first part, we have estimated a cross-sectional sample selection model and in the following part we

[8] like the parental characteristics and the proportion of daughters in the family.

[9] Faced with this problem and to exclusively study the intra-family schooling resource allocation, we proceeded with repeating the same econometric procedures at the family level with a family fixed effects model, and still found no evidence of gender bias within the family

estimated a random effects pooled probit regression and then a household fixed effects model with unbalanced clusters, here we have treated the cross-section household level data with the presence of siblings as a panel data set. However, there is evidence of significant gender bias in the initial sample selection model and then, also at the second part random effects pooled probit regression, yet there is no gender effect in the fixed effects model. Hence, our analysis propose that the initial gender bias in the model is not a result of biased parental investment in the family favouring the male child once the child is enrolled in a school, though, while enrolling in a school the gender of the child may still matter.

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Table 1: Descriptive Statistics

variable name	variable label	No. Obs	Mean	Std. Dev.
scattended	1 if the child attended school	61191	0.870	
CYOE	The child's years of education corrected for the child attended school=1	53060	6.430	3.007
CMALE	1 if the child is male	61191	0.549	
CAGE	the child's age	61191	14.152	3.051
CAGESQ	the child's age squared	61191	209.587	89.716
URBAN	1 if the place of residence is urban	61191	0.300	
HINDU	1 if the religion of the household head is Hinduism	61191	0.844	
CASTSC	1 if the household belongs to Schedule Cast	61191	0.193	
CASTST	1 if the household belongs to Schedule Tribe	61191	0.077	
CASTOBC	1 if the household belongs to Other Backward Classes	61191	0.341	
CASTOTHER	1 if the household belongs to other casts	61191	0.388	
HHSIZE	The number of household members	61191	6.880	3.233
PRDAUGH	The proportion of daughters in the household	61191	0.424	0.278
WEALTH1	1 if the household belong to the 1st quantile of wealth	61191	0.175	
WEALTH2	1 if the household belong to the 2nd quantile of wealth	61191	0.173	
WEALTH3	1 if the household belong to the 3rd quantile of wealth	61191	0.196	
WEALTH4	1 if the household belong to the 4th quantile of wealth	61191	0.223	
WEALTH5	1 if the household belong to the 5th quantile of wealth	61191	0.233	
PAGE	The father's age	61191	43.665	7.669
PNOED	1 if the father has no education	61191	0.294	
PPRIM	1 if the father's educational level is primary	61191	0.208	
PSECO	1 if the father's educational level is secondary	61191	0.345	
PHIGH	1 if the father's educational level is higher secondary	61191	0.153	
PDNW	1 if the father didn't work	61191	0.025	
POFFICE	1 if father works in office jobs(professionals, clerical, sales)	61191	0.218	
PAGRIC	1 if father works in agriculture-self employed	61191	0.400	
PSKILLM	1 if father works in skilled manual jobs(household-domestic, services, skilled manual)	61191	0.252	
PMANU	1 if father works in unskilled manual jobs	61191	0.105	
PALLYEAR	1 if the father worked in last 12 months in office job	61191	0.390	
PALLOF	1 if the father worked in last 12 months in office job	61191	0.051	
MAGE	The mother's age	61191	37.158	5.619

MNOED	1 if the mother has no education	61191	0.592
MPRIM	1 if the mother's educational level is primary	61191	0.178
MSECO	1 if the mother's educational level is secondary	61191	0.180
MHIGH	1 if the mother's educational level is higher secondary	61191	0.051
MDNW	1 if the mother didn't work	61191	0.595
MWPAID	1 if the mother works in paid employment(paid employees and self employed)	61191	0.259
MWUNPAID	1 if the mother works in unpaid employment	61191	0.146
MES1	1 if the mother is allowed to have money set aside	61191	0.621
MES2	1 if the mother needs permission to go to market0.499831401	61191	0.643
MSS1	1 if the mother decides on her own or is involved in the decision about her staying with the family	61191	0.496
MSS2	1 if the mother needs permission to visit relatives or friends	61191	0.731
CBLINE1	1 if he/she is the 1st child in order	61191	0.284
CBLINE2	1 if he/she is the 2nd child in order	61191	0.252
CBLINE3	1 if he/she is the 3rd child in order	61191	0.190
CBLINE4	1 if he/she is the 4th child in order	61191	0.125
CBLINE5	1 if he/she is the 5th child in order	61191	0.149
andhrapradesh	1 if the state is Andhra Pradesh	61191	0.047
bihar	1 if the state is Bihar	61191	0.103
gujarat	1 if the state is Gujarat	61191	0.055
haryana	1 if the state is Haryana	61191	0.048
himachalpradesh	1 if the state is Himachal Pradesh	61191	0.047
karnataka	1 if the state is Karnataka	61191	0.052
kerala	1 if the state is Kerala	61191	0.033
madhyapradesh	1 if the state is Madhya Pradesh	61191	0.100
maharastra	1 if the state is Maharastra	61191	0.075
orissa	1 if the state is Orissa	61191	0.060
punjab	1 if the state is Punjab	61191	0.046
rajasthan	1 if the state is Rajasthan	61191	0.102
tamilnadu	1 if the state is Tamil Nadu	61191	0.053
westbengal	1 if the state is West Bengal	61191	0.048
uttarpradesh	1 if the state is Uttar Pradesh	61191	0.130

Table 2: Results for the Sample Selection Model: the First Stage Probit Selection Regression for the Full Sample

variable name	variable label	Coefficients	Standard Errors
CAGE	the child's age	-0.063*	0.017
CAGESQ	the child's age squared	0.000	0.001
CMALE	1 if the child is male	0.817*	0.021
URBAN	1 if the place of residence is urban	-0.141*	0.039
HINDU	1 if the religion of the household head is Hinduism	0.266*	0.038
CASTSC	1 if the household belongs to Schedule Cast	-0.055*	0.012
CASTST	1 if the household belongs to Schedule Tribe	-0.231*	0.032
CASTOBC	1 if the household belongs to Other Backward Classes	-0.043	0.045
HHSIZE	The number of household members	-0.030*	0.005
PRDAUGH	The proportion of daughters in the household	0.163*	0.043
WEALTH2	1 if the household belong to the 2nd quantile of wealth	0.291*	0.051
WEALTH3	1 if the household belong to the 3rd quantile of wealth	0.631*	0.064
WEALTH4	1 if the household belong to the 4th quantile of wealth	1.030*	0.044
WEALTH5	1 if the household belong to the 5th quantile of wealth	1.537*	0.034
PAGE	The father's age	0.001	0.001
PPRIM	1 if the father's educational level is primary	0.475*	0.020
PSECO	1 if the father's educational level is secondary	0.774*	0.031
PHIGH	1 if the father's educational level is higher secondary	0.999*	0.080
POFFICE	1 if father works in office jobs(professionals, clerical, sales)	0.036	0.047
PAGRIC	1 if father works in agriculture-self employed	0.076	0.051
PSKILLM	1 if father works in skilled manual jobs(household-domestic, services, skilled manual)	0.058	0.045
PMANU	1 if father works in unskilled manual jobs	-0.099	0.066
PALLYEAR	1 if the father worked in last 12 months in office job	0.024	0.062
PALLOFF	1 if the father worked in last 12 months in office job	0.066	0.047
MAGE	The mother's age	-0.006*	0.001
MPRIM	1 if the mother's educational level is primary	0.555*	0.024
MSECO	1 if the mother's educational level is secondary	0.655*	0.070
MHIGH	1 if the mother's educational level is higher secondary	0.765*	0.286
MWPAID	1 if the mother works in paid employment (paid employees and self employed)	-0.194*	0.054
MWUNPAID	1 if the mother works in unpaid employment	-0.112	0.076

MPAYMALE	1 if the mother is in paid employment and the child is male	-0.078*	0.014
MES1	1 if the mother is allowed to have money set aside	0.049*	0.023
MES2	1 if the mother needs permission to go to market0.499831401	-0.078*	0.016
MSS1	1 if the mother decides on her own or is involved in the decision about her staying with the family	0.035	0.026
MSS2	1 if the mother needs permission to visit relatives or friends	0.064*	0.032
CBLINE2	1 if he/she is the 2nd child in order	-0.062*	0.014
CBLINE3	1 if he/she is the 3rd child in order	-0.080*	0.013
CBLINE4	1 if he/she is the 4th child in order	-0.084*	0.044
CBLINE5	1 if he/she is the 5th child in order	-0.071*	0.020
andhrapradesh	1 if the state is Andhra Pradesh	-0.043	0.045
bihar	1 if the state is Bihar	-0.377*	0.056
gujarat	1 if the state is Gujarat	-0.072	0.063
haryana	1 if the state is Haryana	0.092*	0.035
himachalpradesh	1 if the state is Himachal Pradesh	0.674*	0.135
karnataka	1 if the state is Karnataka	0.133*	0.035
kerala	1 if the state is Kerala	0.823*	0.194
madhyapradesh	1 if the state is Madhya Pradesh	0.021	0.027
maharastra	1 if the state is Maharastra	0.476*	0.053
orissa	1 if the state is Orissa	0.229*	0.027
punjab	1 if the state is Punjab	-0.134*	0.060
rajasthan	1 if the state is Rajasthan	-0.220*	0.021
tamilnadu	1 if the state is Tamil Nadu	0.596*	0.085
westbengal	1 if the state is West Bengal	0.171*	0.073
_cons		0.852*	0.119

* indicates significant at 5% level
Here the dependant variable takes the value 1 if the child is enrolled in a school and 0 otherwise.

Table 3: Results for the Sample Selection Model: the Second Stage MLE for the Selected Samples

variable name	variable label	Coefficients	Standard Errors
CAGE	the child's age	1.627*	0.046
CAGESQ	the child's age squared	-0.035*	0.002
CMALE	1 if the child is male	0.178*	0.036
URBAN	1 if the place of residence is urban	-0.150*	0.016
HINDU	1 if the religion of the household head is Hinduism	0.427*	0.053
CASTSC	1 if the household belongs to Schedule Cast	-0.102*	0.014
CASTST	1 if the household belongs to Schedule Tribe	-0.176*	0.019
CASTOBC	1 if the household belongs to Other Backward Classes	-0.043	0.024
HHSIZE	The number of household members	-0.026*	0.005
PRDAUGH	The proportion of daughters in the household	0.197*	0.053
WEALTH2	1 if the household belong to the 2nd quantile of wealth	0.304*	0.063
WEALTH3	1 if the household belong to the 3rd quantile of wealth	0.636*	0.073
WEALTH4	1 if the household belong to the 4th quantile of wealth	0.990*	0.089
WEALTH5	1 if the household belong to the 5th quantile of wealth	1.563*	0.112
PAGE	The father's age	-0.004*	0.002
PPRIM	1 if the father's educational level is primary	0.139*	0.028
PSECO	1 if the father's educational level is secondary	0.561*	0.034
PHIGH	1 if the father's educational level is higher secondary	0.977*	0.038
POFFICE	1 if father works in office jobs(professionals, clerical, sales)	0.196*	0.061
PAGRIC	1 if father works in agriculture-self employed	0.117*	0.052
PSKILLM	1 if father works in skilled manual jobs(household-domestic, services, skilled manual)	0.040	0.046
PMANU	1 if father works in unskilled manual jobs	-0.007	0.035
PALLYEAR	1 if the father worked in last 12 months in office job	0.193*	0.061
PALLOF	1 if the father worked in last 12 months in office job	-0.005	0.040
MAGE	The mother's age	0.022*	0.002
MPRIM	1 if the mother's educational level is primary	0.274*	0.022
MSECO	1 if the mother's educational level is	0.557*	0.013

	secondary		
MHIGH	1 if the mother's educational level is higher secondary	0.599*	0.075
MWPAID	1 if the mother works in paid employment(paid employees and self employed)	-0.332*	0.097
MWUNPAID	1 if the mother works in unpaid employment	-0.222*	0.047
CBLINE2	1 if he/she is the 2nd child in order	-0.098	0.078
CBLINE3	1 if he/she is the 3rd child in order	-0.161*	0.072
CBLINE4	1 if he/she is the 4th child in order	-0.242*	0.069
CBLINE5	1 if he/she is the 5th child in order	-0.320*	0.060
andhrapradesh	1 if the state is Andhra Pradesh	0.779*	0.032
bihar	1 if the state is Bihar	0.113*	0.050
gujarat	1 if the state is Gujarat	0.102	0.061
haryana	1 if the state is Haryana	0.068	0.043
himachalpradesh	1 if the state is Himachal Pradesh	0.416*	0.030
karnataka	1 if the state is Karnataka	0.925*	0.037
kerala	1 if the state is Kerala	1.342*	0.061
madhyapradesh	1 if the state is Madhya Pradesh	-0.102*	0.041
maharastra	1 if the state is Maharastra	0.610*	0.023
orissa	1 if the state is Orissa	0.593*	0.047
punjab	1 if the state is Punjab	0.126*	0.055
rajasthan	1 if the state is Rajasthan	0.056	0.056
tamilnadu	1 if the state is Tamil Nadu	0.858*	0.040
westbengal	1 if the state is West Bengal	-0.672*	0.125
_cons		-11.834*	0.384
rho		-0.196*	0.006

* indicates significant at 5% level

Here the dependant variable is child's years of education corrected for the child attended school=1

Table 4: Results of the Random Effects Pooled Probit Regression

variable name	variable label	Coefficients	Standard Errors
CAGE	the child's age	0.784*	0.033
CAGESQ	the child's age squared	-0.025*	0.001
CMALE	1 if the child is male	0.895*	0.024
URBAN	1 if the place of residence is urban	0.038	0.043
HINDU	1 if the religion of the household head is Hinduism	-0.057	0.045
CASTSC	1 if the household belongs to Schedule Cast	-0.029	0.044
CASTST	1 if the household belongs to Schedule Tribe	-0.216*	0.061
CASTOBC	1 if the household belongs to Other Backward Classes	-0.004	0.038
HHSIZE	The number of household members	0.127*	0.006
PRDAUGH	The proportion of daughters in the household	0.996*	0.055
WEALTH2	1 if the household belong to the 2nd quantile of wealth	0.301*	0.048
WEALTH3	1 if the household belong to the 3rd quantile of wealth	0.732*	0.051
WEALTH4	1 if the household belong to the 4th quantile of wealth	0.967*	0.058
WEALTH5	1 if the household belong to the 5th quantile of wealth	0.843*	0.073
PAGE	The father's age	-0.002	0.003
PPRIM	1 if the father's educational level is primary	0.609*	0.042
PSECO	1 if the father's educational level is secondary	0.810*	0.042
PHIGH	1 if the father's educational level is higher secondary	0.842*	0.062
POFFICE	1 if father works in office jobs(professionals, clerical, sales)	0.423*	0.099
PAGRIC	1 if father works in agriculture-self employed	0.467*	0.093
PSKILLM	1 if father works in skilled manual jobs(household-domestic, services, skilled manual)	0.451*	0.094
PMANU	1 if father works in unskilled manual jobs	0.320*	0.100
PALLYEAR	1 if the father worked in last 12 months in office job	0.313*	0.113
PALLOF	1 if the father worked in last 12 months in office job	0.193*	0.081
MAGE	The mother's age	0.003	0.004
MPRIM	1 if the mother's educational level is primary	0.315*	0.044
MSECO	1 if the mother's educational level is secondary	0.083	0.052
MHIGH	1 if the mother's educational level is higher secondary	-0.462*	0.084
MWPAID	1 if the mother works in paid employment (paid employees and self employed)	-0.398*	0.114
MWUNPAID	1 if the mother works in unpaid employment	-0.404*	0.116
MES1	1 if the mother is allowed to have money set aside	0.050	0.032
MES2	1 if the mother needs permission to go to market0.499831401	-0.137*	0.047
MSS1	1 if the mother decides on her own or is	0.037	0.031

	involved in the decision about her staying with the family		
MSS2	1 if the mother needs permission to visit relatives or friends	0.157*	0.048
CBLINE2	1 if he/she is the 2nd child in order	0.892*	0.027
CBLINE3	1 if he/she is the 3rd child in order	1.045*	0.034
CBLINE4	1 if he/she is the 4th child in order	1.168*	0.042
CBLINE5	1 if he/she is the 5th child in order	1.397*	0.051
andhrapradesh	1 if the state is Andhra Pradesh	-0.181*	0.079
bihar	1 if the state is Bihar	-0.530*	0.063
gujarat	1 if the state is Gujarat	0.018	0.079
haryana	1 if the state is Haryana	0.250*	0.082
himachalpradesh	1 if the state is Himachal Pradesh	0.433*	0.086
karnataka	1 if the state is Karnataka	0.159*	0.078
kerala	1 if the state is Kerala	0.122	0.096
madhyapradesh	1 if the state is Madhya Pradesh	-0.063	0.064
maharastra	1 if the state is Maharastra	0.149*	0.072
orissa	1 if the state is Orissa	0.133	0.073
punjab	1 if the state is Punjab	0.267*	0.089
rajasthan	1 if the state is Rajasthan	-0.168*	0.063
tamilnadu	1 if the state is Tamil Nadu	0.046	0.081
westbengal	1 if the state is West Bengal	-0.231*	0.077
_cons		-9.123*	0.285

* indicates significant at 5% level

Here the dependant variable takes the value 1 if the child is enrolled in a school and there are at least 2 children per household present in the sample, and 0 otherwise.

Table 5: Results of the Household Fixed Effects Regression Model

variable name	variable label	Coefficients	Standard Errors
CAGE	the child's age	1.343*	0.036
CAGESQ	the child's age squared	-0.028*	0.001
CMALE	1 if the child is male	0.035	0.030
CBLINE2	1 if he/she is the 2nd child in order	-0.703*	0.038
CBLINE3	1 if he/she is the 3rd child in order	-0.955*	0.050
CBLINE4	1 if he/she is the 4th child in order	-1.083*	0.063
CBLINE5	1 if he/she is the 5th child in order	-1.191*	0.083
PRDAUGH	The proportion of daughters in the household	-0.291*	0.159
PAGE	The father's age	0.031*	0.011
PPRIM	1 if the father's educational level is primary	0.117	0.191
PSECO	1 if the father's educational level is secondary	0.443*	0.169
PHIGH	1 if the father's educational level is higher secondary	0.346	0.212
POFFICE	1 if father works in office jobs(professionals, clerical, sales)	-0.146	0.443
PAGRIC	1 if father works in agriculture-self employed	-0.519	0.442
PSKILLM	1 if father works in skilled manual jobs(household-domestic, services, skilled manual)	-0.237	0.440
PMANU	1 if father works in unskilled manual jobs	-0.231	0.504
PALLYEAR	1 if the father worked in last 12 months in office job	0.433	0.730
PALLOF	1 if the father worked in last 12 months in office job	-0.160	0.301
MAGE	The mother's age	0.070*	0.014
MPRIM	1 if the mother's educational level is primary	0.141	0.147
MSECO	1 if the mother's educational level is secondary	0.128	0.173
MHIGH	1 if the mother's educational level is higher secondary	-0.218	0.289
MWPAID	1 if the mother works in paid employment (paid employees and self employed)	0.064	0.765
MWUNPAID	1 if the mother works in unpaid employment	-0.438	0.754
mills	Inverse Mills Ratio	-0.888*	0.082
_cons		-9.650*	0.651
rho		0.608*	

* indicates significant at 5% level

Here the dependant variable is child's years of education corrected for the child attended school=1 and there should be at least 2 children in the household.