

Research Article

Intergenerational Transmission of Education in India: Evidence from a Nationwide Survey

Kakoli Borkotoky,¹ Sayeed Unisa,² and Ashish Kumar Gupta³

¹Room No. 23, Old Hostel, International Institute for Population Sciences (IIPS), Govandi Station Road, Deonar, Mumbai, Maharashtra 400088, India

²Department of Mathematical Demography & Statistics, International Institute for Population Sciences (IIPS), Govandi Station Road, Deonar, Mumbai, Maharashtra 400088, India

³Room No. 17, Old Hostel, International Institute for Population Sciences (IIPS), Govandi Station Road, Deonar, Mumbai, Maharashtra 400088, India

Correspondence should be addressed to Kakoli Borkotoky; kakoli.26nov@gmail.com

Received 30 September 2014; Revised 4 March 2015; Accepted 9 April 2015

Academic Editor: Shirlena Huang

Copyright © 2015 Kakoli Borkotoky et al. This is an open access article distributed under the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

The intergenerational transmission of education has been investigated extensively in social science research. The existing literature shows that none of the studies in India related the process of partner selection and differential fertility with the intergenerational transmission of education. Here, we examined the timing of marriage and childbearing along with the probability of partner selection, according to education of women and how these processes lead to heterogeneity in educational attainment of children. The educational attainment of children was estimated by fitting the estimated marriage probabilities and children ever born in the intergenerational transmission model. The results were replicated in different random samples to examine its validity. The study found that higher educated women marry late, have fewer children, and marry men with higher or equal education. Further, the results indicate that education of women is a more significant predictor than education of husband in reducing average number of children born to couples. The findings confirm that children attain higher education than their parents, and better educated mothers do not discriminate between their children to provide higher education. These findings reinforce the significance of government initiatives to provide incentives to families with higher educated girls to ensure better education of the next generation.

1. Introduction

Transmission of demographic traits from one generation to another has been the subject of interest for demographers for a long time. Education being the driving force for long-term economic advancement, better health, and social mobility [1–3], particular interest has been given to the intergenerational transmission of educational attainments in different socioeconomic set-up. Educational mobility has particular relevance because, in its absence, differential fertility will influence the reproduction rates and groups with higher fertility rates would predominate. On the other hand, if upward mobility is prevalent, the proportion of highly educated women in the next generation would be high, regardless of the level of differential fertility [4]. Existing literature suggests

that education had a significant association with fertility reduction [5]. Thus, it is important to determine whether the increase in mothers' education reduces fertility or the reduction in fertility of mother increases the chances of better schooling for her children [5]. In India, the female literacy levels have increased over time from 8.9 percent in 1951 to 66 percent in 2011, but the gender gap in educational attainment persists. It is possible that reducing the gender gap in schooling will improve the life of both woman and her children [6]. Therefore, exploring the role of female education in the intergenerational transmission is of particular importance.

An increase in the years of a woman's schooling affects the timing of her marriage and fertility. These factors will affect the educational attainments of her offspring by changing the resources available to each child [6, 7]. In addition, mothers

with more schooling will be able to create better learning environments at home for their children than less educated women [8, 9]. It is also important to mention that in the Indian sociocultural set-up, the head of the household makes all the important decisions in the family. Therefore, it is important to know how the education of women affects family-related issues. Some studies found a positive association of the father's education with the educational attainment of their children [10, 11]. Some studies, on the other hand, reported a positive effect of only the mother's education on education of children [12, 13]. Several studies substantiated the observation that the effect of parents' education is not independent of the gender of the parent, as well [14, 15]. Intergenerational transmission from highly educated parents may be influenced by father's education, and transmission from less educated parents may be influenced by mother's education. It is also found that intergenerational education transmission has a stronger association with biological than with adoptive mothers. In contrast, both biological and adoptive fathers had a similar impact on the education of adopted children [16]. Additionally, the associations of mother's education with the education of her children are very sensitive to sample size [17].

Socioeconomic characteristics of parents define the family backgrounds and hence affect the social status and characteristics of the next generation [18]. Published studies argue that educated parents are capable of providing appropriate family environments that enable their children to acquire better education [7, 10, 11]. Thus, from a policy perspective, it is important to identify the mechanism that leads to differential outcomes in the educational attainment of children relative to their parents' education. If parents' education is the primary determinant of their children's educational achievement, providing better facilities for the present generation should increase educational opportunities for the future generations. Thus, information about the intergenerational effect of schooling has tremendous implications for the formulation of public policy [12]. In the light of the above discussion, it is necessary to examine how the educational attainment of women is transferred to the next generation. The study assumes that women completed most of their schooling prior to marriage and childbearing. Therefore, this study attempted to understand how changes in maternal education affect the educational attainment of their children through intermediate factors such as marriage and fertility.

2. Materials and Methods

The study analysed data from the third round of District Level Household Survey (DLHS-3), which was conducted during 2007-08 [19]. The survey collected data from a sample of over 720,000 households from 601 districts of India. In all, 3,784,031 persons (1,932,070 males and 1,851,804 females) of all ages were included in the survey. In DLHS-3, the data included information on the years of schooling and the educational levels of household members who had ever attended school. The survey also gathered information on the status of current school attendance for members of the household

who were in the 6–17 years' age group. In addition, the data also give information on the age at marriage, age at first birth, and educational attainment of ever-married women and their husbands. This data set had the benefit of providing information on educational attainment at the individual-level. The parents and their children were identified using the information on kinship of all members of the household with respect to the head of the household. The DLHS-3 survey collected information on demographic and socioeconomic characteristics of ever-married women in 15–49 years' age group through a separate women's questionnaire. Among the various types of information collected in the survey, this study utilised information on the relationship with the head of households, the number of children born to the women, and educational attainments of the respondents and their family members.

Sample used in this study was extracted from the DLHS-3 survey sample after applying the modifications required for the study. This study selected households with only one ever-married woman aged 35 years or above who has children aged above 20 years. This sample of ever-married women was then used to examine the association between women's educational attainment with their selection of marriage partners, the number of children ever born, and their educational levels. In order to study the association of parents' education with education of their children, this study adopted the intergenerational transmission model [20]. This model is widely applied to examine how parents with different levels of schooling transmit educational attainment to their offspring. The model focused on three processes: (1) the intergenerational transmission of educational status; (2) differential fertility, as affected by mother's and father's education; and (3) marriage, with respect to the likely choice of marriage partner based on the women's education levels.

3. Model for Intergenerational Transmission

We divided completed years of schooling into five different categories: 0: no education, 1–5: primary, 6–10: middle & high school, 11–12: higher secondary, and 13–15: graduate and higher.

Let C_j = the number of persons in the offspring generation with educational level j . W_i = the number of women in the mother generation with education level i . $r_{jk|i}$ = the number of children who attain education level j whose fathers have education level k per women who attained education level i .

The term $r_{jk|i}$ is the rate at which women at given levels of educational attainment marry men and have children with various levels of educational attainment. These rates incorporate the effects of marriage, fertility, and intergenerational transmission on reproduction. Let $i = 1, \dots, 5$; $j = 1, \dots, 5$; $k = 1, \dots, 5$. Thus, education has five discrete but ordered levels. Then,

$$C_j = \sum_{i=1}^5 \sum_{k=1}^5 r_{jk|i} W_i \quad (1)$$

(see [20]).

Given $r_{jk|i}$ one can compute the expected number of children born to women of education level i , who will attain an education level of j . If the processes governing $r_{jk|i}$ are time invariant and the distribution of educational attainment of women at a given time is known, then this equation can project the education distribution of offspring in the succeeding generation.

The effect of marriage, fertility, and intergenerational transmission on $r_{jk|i}$ can be expressed with the help of the following equation:

$$r_{jk|i} = p_{k|i}^H r_{ik}^C p_{j|ik}^C, \quad (2)$$

where $p_{j|ik}^C$ = the probability that children with mothers at education level i and fathers at education level k will attain an education level j . r_{ik} = the expected number of children born to women in education category i who are married to men in education category k ; $p_{k|i}^H$ = the probability that a woman in education category i will be married to a man in education category k .

The components of (2) are computed with the help of ordered logit model and Poisson regression. The probabilities of children's educational attainment are estimated using ordered logit model that considers the parents' educational attainments and the child's sex as covariates. To estimate fertility rates r_{ik} , Poisson regression model was applied in which the covariates included different combinations of educational attainment of parents. Further, marriage probability $p_{k|i}^H$ was estimated from an ordered logit model using the categories of women's and husband's educational attainment as covariates.

4. Replication of the Results Obtained from the Model

Model validity depends on the accuracy of the results with respect to its purpose [21]. Validity or predictability of the model can be tested by applying the model to similar data from different regions or with the help of simulations. In addition, the model may also be applied to a randomly selected part of the sample or by excluding a portion of the sample to examine whether the model gives similar estimates in both the processes. In this study, the results were tested by applying the model to two randomly selected subsamples of the original sample and by comparing the observed distribution of children's education with the estimated distribution of education. The study also applied the chi-square test for goodness of fit to ensure applicability of the model to the data.

5. Results

5.1. Differentials in Age at Marriage and Children Ever Born by Education of Women. The pattern of age at first marriage and the number of children ever born to women with different levels of education are presented in Table 1. The results given in Table 1 are based on women who are above 35 years of age and had at least one child aged twenty years or older at the time of the survey. The percentage of women who married by age 20 reduced from 86 percent for uneducated

women to 73 percent, 38 percent, and 17 percent, respectively, for women with primary, higher secondary, or graduate education. Similarly, 98 percent of illiterate women were married by the age of 25, but only 81 percent of graduate women married by the same age. The results also show that average number of children ever born declined from about 6 for uneducated women to 3 for graduate women.

5.2. Educational Attainment of Husband and Children Observed in the Sample by Women's Education. The distribution of husbands' education for different levels of women's education observed in the sample is presented in Table 2. The distribution shows that, except the 10 percent of uneducated women, no other educated women in the sample had an uneducated husband. More than one-third of women with primary education are married to men with primary education, and more than half of the primary educated women are married to men with high school education. Similarly, about 58 percent of high school educated women are married to men with the same level of education, and about one-third are married to either higher secondary or graduate men. At the same time, more than three-fourth of graduate women had graduate husband.

The distribution of children's education according to women's education is shown in Table 3. The results indicate that only 5 percent of the children with illiterate mothers had no education, and all other children in the sample are educated. The results also show that more than thirty percent of children with illiterate mother had primary education, and another 37 percent had high school education. Similarly, the percentage of graduate children increases from 9 percent to 17 percent, 55 percent, and 73 percent, respectively, with an increase in mothers' education from illiterate to graduate.

The probabilities of women selecting the marriage partner with different levels of education are shown in Table 4. The results indicate that the probability of an educated woman marrying an uneducated man is very low. Additionally, it is seen that women with primary education had the highest possibility of marrying men with high school education (0.54) followed by primary education (0.35). Women with higher secondary education had the highest probability of marrying graduate men. Similarly, graduate women had the highest probability of selecting graduate men for marriage (0.75), followed by men with a higher secondary education (0.14).

5.3. Education of Parents and Its Association with Number of Children Ever Born and the Highest Education of Children. The result on average number of children ever born to couples by controlling husband's education is presented in Table 5. With husband's education held constant at primary level, mean CEB decreases substantially from about 5.5 children for illiterate women to 4 for high school and 3.3 children for graduate women. Thus, with an increase in wife's education, there is an average decline of 2.2 children born to couples. Similarly, there is a decrease of 2.6 children for the couple when wife's education varies, and the husband's education is controlled at high school. The study identified similar

TABLE 1: Differences in age at marriage and children ever born by education of women, DLHS-3, India, 2007-08.

Women's education	Married at age 20	Married at age 25	Married at age 30	Mean CEB
No education	86.1	98.1	99.2	5.54
Primary	72.5	97.5	99.3	4.52
Middle & high School	57.9	94.9	98.9	3.71
Higher secondary	37.5	90.2	98.3	3.00
Graduate & above	16.9	81.0	95.4	2.51

TABLE 2: Percentage of distribution of educational attainment of husband and wife, DLHS-3, India, 2007-08.

Women's education	Husbands highest standard of schooling					Total
	No education	Primary	Middle & high school	Higher secondary	Graduate & above	
No education	10.2	41.3	41.2	4.7	2.7	100.0
Primary	0.2	35.3	51.6	7.9	5.0	100.0
Middle & high school	0.0	10.8	57.6	16.5	15.0	100.0
Higher secondary	0.0	2.1	28.1	26.3	43.5	100.0
Graduate & above	0.0	0.5	11.5	11.5	76.5	100.0

* All values are significant at 1% level of significance.

reductions of 2.1 children and 2.7 children, respectively, as the women's education level varies from illiterate to graduate and husband's education is controlled at higher secondary and graduate level. Similar analysis was done to examine the association of husband's education with children ever born by controlling wife's education, and the result is given in Table 10 of the Appendix. There was no consistent pattern of change in the average number of children born when the husband is uneducated and the wife's education changes from uneducated to graduate. The only exception is when wife had high-school education and the husband was uneducated. In that case, the number of children born declined to 4.1 from 6.2 when both parents were illiterate.

The results further show that when husband is uneducated, and education of wife increases from illiterate to high school, the highest years of schooling for children increases from 3 years to 12 years. When husband's education is controlled at primary and education of wife increases from illiterate to graduate, the highest years of schooling for children increase initially and then decline. Similarly, when education of husband is controlled at the graduate level and education of wife changes from illiterate to graduate, the highest years of schooling of children also increase from 12 years to 18 years.

5.4. Educational Attainment of Children according to Mother's Education. The probabilities of child's educational attainment for different levels of parent's education are shown in Table 6. It is seen that when both parents are illiterate, there is very low probability that their children will attain education beyond high school. When the husband's education level is fixed at high school and wife's education level increases from illiterate to graduate, the probability of their children being graduates also increases from 0.14 to 0.55. When both parents are graduate, then the likelihood of their children becoming graduates is as high as 0.76.

The distribution of children's educational attainment obtained from model (1) shows that more than one-fourth of the children born to illiterate women had a primary education (Table 7). Similarly, more than half of the children born to mothers with primary education completed high school. Out of those children whose mothers had high school level of education, 28 percent had a higher secondary education and 27 percent completed graduation. The results showed that 74 percent of the children with graduate mother and 59 percent of children born to women with higher secondary education studied up to graduate level. Thirty percent of the children whose mothers had a higher secondary education and about one-fifth of children with graduate mothers had higher secondary education. Further, only one percent of the children born to uneducated mothers were illiterate, and none of the children with educated mothers were uneducated. At the other extreme, 14 percent of the children of uneducated mothers and about 30 percent of the children of primary school educated mothers also reach the higher secondary level. Moreover, 7 and 8 percent children, respectively, of uneducated and primary educated mothers were graduates.

The results on the association of the sex of the parent with the educational attainments of children are presented in Table 8. The results indicate that 9 percent of sons and 38 percent of daughters born to illiterate women had primary education; 70 percent of sons and 30 percent of daughters had high school education. Similarly, 6 percent of sons and 17 percent of daughters of illiterate mothers are graduates. For mothers with primary, high school, higher secondary, or graduate level of education, the corresponding percentage of sons who attained graduation was 7 percent, 23 percent, 50 percent, and 66 percent compared to 20 percent, 41 percent, 64 percent, and 79 percent, respectively, for the daughters.

5.5. Replication of the Results Obtained from Intergenerational Transmission Model. The results of the comparisons of educational attainment of children at different levels of

TABLE 3: Percentage of distribution of children's education by mother's education, DLHS-3, India, 2007-08.

Women's education	Years of schooling for children					Total
	No education	Primary	Middle & high school	Higher secondary	Graduate & above	
No education	5.2	30.7	37.2	17.3	9.4	100.0
Primary	0.0	8.3	49.2	25.1	17.4	100.0
Middle & high School	0.1	2.2	29.4	31.6	36.7	100.0
Higher secondary	0.0	0.7	9.5	34.9	55.0	100.0
Graduate & above	0.0	0.1	4.0	23.1	72.8	100.0

* All values are significant at 1% level of significance.

TABLE 4: Probabilities of selecting marriage partner for women based on ordered logit model, DLHS-3, India, 2007-08.

Women's education	Husbands highest standard of Schooling				
	No education	Primary	Middle & high school	Higher secondary	Graduate & above
No education	0.01	0.54	0.40	0.03	0.02
Primary	0.00	0.35	0.54	0.06	0.04
Middle & high school	0.00	0.12	0.56	0.17	0.15
Higher secondary	0.00	0.03	0.29	0.24	0.44
Graduate & above	0.00	0.01	0.10	0.14	0.75

* All estimated probabilities are significant at 1% level of significance.

mother's education are shown in Figure 1. The percentage of children who were born to illiterate women, and who remained illiterate themselves, declined from 5 percent in the observed distribution to one percent in the estimated distribution. Similarly, when the mother had primary education, then the percentage of children who had a high school education increased from 49 percent (observed) to 55 percent (estimated). The results on the comparison of the model from two randomly selected subsamples are given in Figure 2 (Table 9 of the Appendix). Sample 1 in the figure represents the distribution of children's education obtained from the first random sample and Sample 2 represents the distribution for the second random sample. The percentage of children with higher secondary education increased from one percent to 15 percent, 28 percent, and 56 percent, respectively, with a corresponding increase in mothers' education from primary to graduate (in both Sample 1 & Sample 2). Similarly, the percentage of graduate children increased from less than one percent to 8 percent (7 percent), 19 percent (17 percent), and 72 percent (75 percent) in Sample 1 (Sample 2) corresponding to changes in mothers' education from primary to graduate.

6. Discussion

In a country like India where literacy levels are low and gender disparity in education is high, it is important to examine how women transfer their educational qualities to the next generation. In India, education is a fundamental right of every child, but the focus of policymakers and researchers has been on the primary level [22]. The Right to Education (RTE, 2010) act covers children in the 6 to 14 years' age group. The policies and programmes will be effective in bringing children to school by increasing enrolment, but there is no mechanism to monitor completion of education. The government spending on education can have a positive

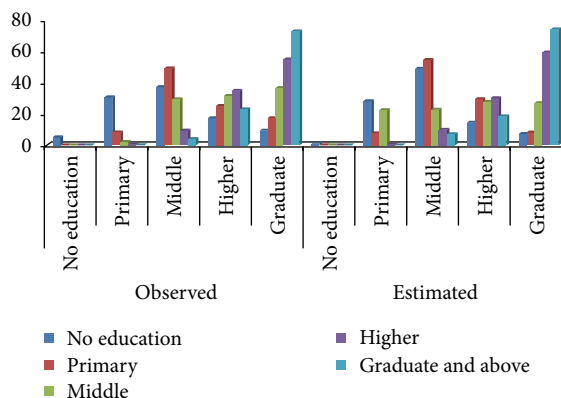


FIGURE 1: Comparison of observed and estimated distributions of children's education, 2007-08.

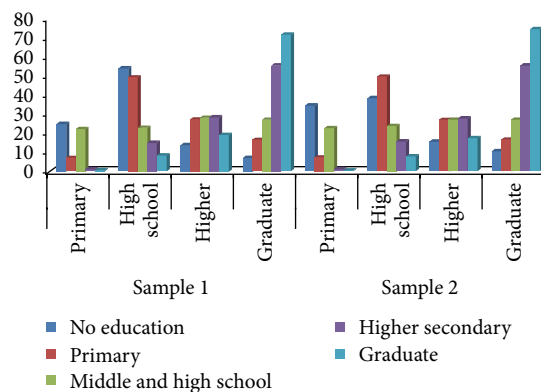


FIGURE 2: Comparison of the distributions of children's education from randomly selected sample.

TABLE 5: Number of children ever Born (CEB) and Maximum years of schooling for children according to education of parents, DLHS-3, India, 2007-08.

Education level of husband & wife	Average number of CEB	Highest years of schooling
Illiterate wife/illiterate husband	6.21	3
Primary educated wife/illiterate husband	5.21	9
High school educated wife/illiterate husband	4.12	12
Higher secondary educated wife/illiterate husband	5.00	
Illiterate wife/primary educated husband	5.46	10
Primary educated wife/primary educated husband	4.63	17
High school educated wife/primary educated husband	3.98	17
Higher secondary educated wife/primary educated husband	3.53	14
Graduate wife/primary educated husband	3.33	12
Illiterate wife/high school educated husband	5.34	15
Primary educated wife/high school educated husband	4.39	19
High school educated wife/high school educated husband	3.69	20
Higher secondary educated wife/high school educated husband	2.98	18
Graduate wife/high school educated husband	2.72	16
Illiterate wife/higher secondary educated husband	4.78	12
Primary educated wife/higher secondary educated husband	4.38	17
High school educated wife/higher secondary educated husband	3.59	19
Higher secondary educated wife/higher secondary educated husband	2.99	17
Graduate wife/higher secondary educated husband	2.62	17
Illiterate wife/graduate husband	5.10	12
Primary educated wife/graduate husband	4.49	16
High school educated wife/graduate husband	3.59	17
Higher secondary educated wife/graduate husband	2.96	17
Graduate wife/graduate husband	2.45	18

impact on educational attainment of a population, but the impact will be different in different countries [23, 24]. The influence of government policies on schooling is much more ambiguous in the context of developing countries [25]. The government policies may influence the teacher-student ratio, but after controlling for individual-level factors, the school characteristics had no impact on educational attainment [26]. Thus, education of parents will play a major role in determining the highest level of education of children.

The earlier studies on intergenerational transmission addressed many important questions about the linkages between parental educations with educational attainment of children, but none of the studies had examined the parameters discussed in this study. The selection of the determinants for intergenerational educational transmission has particular significance in Indian context. Gender disparity in enrolment has declined over time in India, but it persists at higher levels of education. School dropout of girls is one major factor leading to the gender disparity in educational attainment. Many other sociocultural factors like early marriage of girls, low participation in the decision-making process, cultural taboos regarding menarche and restrictions on movement of girls after menarche, preference for son in providing better education than daughter, and opportunity cost for girls schooling are some of the factors that obstruct women's educational attainment in India [27–36]. Moreover, under the patriarchal system, girls are less likely to decide upon

their age at marriage and family size. Although, impact of all these factors has reduced over time, but this study considered women above 35 years of age at the time of the survey (2005-06) with at least one child aged 20 years or more. On the background of the above mentioned points, it is important to examine the role of women's education on the educational attainment of next generation. Therefore, this study considered all the available information on education of women and husband, age at marriage, and first birth to examine the correlations first and then applied them in the intergenerational transmission model.

The model of intergenerational transmission used in this study has been applied in developed countries, but we couldnot find application of this model to Indian data. The main advantage of intergenerational transmission model is that it takes into consideration different intergenerational pathways, heterogeneity, and selection simultaneously. The model includes both the direct and indirect pathways of association for analysis: (a) the direct effect of mother's schooling on children's schooling and (b) the indirect effects that accrue through differential marriage and differential fertility [7]. The study first examined the association of women's education with age at marriage and choice of marriage partner. Then the study examined the number of children ever born to parents with different levels of education. Finally, educational attainment of children was examined with the intergenerational transmission model by

TABLE 6: Probability of children's education based on parents' education estimated using ordered logit model, DLHS-3, India, 2007-08.

Education of parents	No education	Primary	Middle & high school	Higher secondary	Graduate
Illiterate wife/illiterate husband	0.50	0.49	0.01	0.00	0.00
Wife with primary education/illiterate husband	0.00	0.20	0.63	0.12	0.05
Wife with high school education/illiterate husband	0.00	0.09	0.56	0.24	0.11
Wife with higher secondary education/illiterate husband	0.00	0.00	0.06	0.17	0.76
Illiterate wife/husband with primary education	0.01	0.45	0.48	0.04	0.01
Wife with primary education/husband with primary education	0.00	0.11	0.60	0.20	0.08
Wife with high school education/husband with primary education	0.00	0.06	0.51	0.28	0.15
Wife with higher secondary education/husband with primary education	0.00	0.02	0.25	0.34	0.39
Graduate wife/husband with primary education	0.00	0.12	0.60	0.19	0.08
Illiterate wife/high school husband	0.00	0.07	0.52	0.27	0.14
Wife with primary education/high school husband	0.00	0.05	0.46	0.30	0.18
Wife with high school education/high school husband	0.00	0.03	0.31	0.35	0.32
Wife with higher secondary education/high school husband	0.00	0.01	0.19	0.32	0.48
Graduate wife/high school husband	0.00	0.01	0.15	0.29	0.55
Illiterate wife/higher secondary husband	0.00	0.04	0.42	0.32	0.21
Wife with primary education/higher secondary husband	0.00	0.03	0.32	0.35	0.31
Wife with high school education/higher secondary husband	0.00	0.01	0.21	0.33	0.45
Wife with higher secondary education/higher secondary husband	0.00	0.01	0.14	0.27	0.58
Graduate wife/higher secondary husband	0.00	0.00	0.07	0.18	0.74
Illiterate wife/graduate husband	0.00	0.02	0.30	0.35	0.33
Wife with primary education/graduate husband	0.00	0.02	0.25	0.34	0.39
Wife with high school education/graduate husband	0.00	0.01	0.16	0.30	0.53
Wife with higher secondary education/graduate husband	0.00	0.01	0.12	0.26	0.61
Graduate wife/graduate husband	0.00	0.00	0.06	0.17	0.76

* All estimated probabilities are significant at 1% level of significance.

TABLE 7: Educational attainment of children by levels of women's education estimated from the model of intergenerational transmission, DLHS-3, India, 2007-08.

Mother's education	Children education					Total
	No education	Primary	Middle & high school	Higher secondary	Graduate	
No education	1.13	28.24	48.82	14.48	7.32	100
Primary	0.00	7.67	54.56	29.58	8.18	100
Middle & high school	0.00	22.39	22.91	27.73	26.97	100
Higher secondary	0.00	0.73	10.06	30.01	59.20	100
Graduate	0.00	0.11	7.20	18.63	74.06	100

using estimated marriage probabilities and differential fertility. The reliability of the results was tested by comparing the observed and estimated distributions of children's education and by applying the model to randomly selected subsamples of the original sample.

The findings suggest a positive correlation of female education with age at marriage and first birth and negative correlation with average number of children ever born, which is supported by results of few other studies [37–43]. The study also observed educational hypergamy for women; that is, women marry men with higher educational attainments than themselves. This indicates that improvement in the educational levels empowers women to select their marriage

partner. Marriage may directly influence the educational attainment of the next generation through the combined distribution of parents' education and indirectly through the differentials in fertility [39]. The results also prove that education of wife has a more significant association than education of husband in reducing the number of children born. Parental education also had a direct relationship with the highest years of schooling of their children. The children whose parents are highly educated have more schooling than those children with less educated parents. The results show that the probability of children attaining higher education increases substantially for each successive level of mother's education, irrespective of educational attainment of husband.

TABLE 8: Educational attainment of son and daughter by mothers education from the model of intergenerational transmission, 2007-08.

Mother's education	No education	Primary	Middle & high school	Higher secondary	Graduate	Total
Education of son						
No education	1.43	8.51	69.76	14.08	6.22	100
Primary	0.00	7.98	54.99	30.02	7.01	100
Middle & high school	0.00	22.57	24.93	29.26	23.23	100
Higher secondary	0.00	1.05	16.06	32.84	50.05	100
Graduate	0.00	0.36	9.76	23.54	66.34	100
Education of daughter						
No education	0.55	37.70	29.77	14.80	17.18	100
Primary	0.00	6.86	47.04	26.32	19.78	100
Middle & high school	0.00	19.81	18.19	20.60	41.40	100
Higher secondary	0.00	0.44	16.64	18.91	64.01	100
Graduate	0.00	0.40	6.86	14.16	78.57	100

TABLE 9: Educational attainment of children obtained from two randomly selected samples using the model of intergenerational transmission, 2007-08.

Mother's education	Primary	Middle & high school	Higher secondary	Graduate & above
Sample 1				
No education	24.84	54.26	13.64	6.69
Primary	7.20	49.34	27.19	16.28
Middle & high school	22.16	22.85	28.08	26.91
Higher secondary	1.00	14.95	28.31	55.75
Graduate	0.51	8.37	19.07	72.06
Sample 2				
No education	34.74	38.31	15.52	10.45
Primary	6.84	49.72	26.93	16.51
Middle & high school	22.56	23.54	27.03	26.87
Higher secondary	1.04	15.33	28.02	55.61
Graduate	0.22	7.63	17.26	74.89

Additionally, it was observed that children born to less educated women attain higher educational levels, indicating a positive upward mobility of education from the mother to child.

The results also indicate that the percentage of uneducated children declined between the observed and estimated distributions of children, and none of the children born to educated mothers remained illiterate. Earlier research suggests that after controlling for all other unobservable attributes, the mother's education has little impact on the educational attainment of her child [44]. Contrary to this, some studies suggested that better education of parents increases the educational attainment of their children [20, 45]. This study also witnessed that sometimes children born to higher educated women do not report a higher level of education than their mothers. These findings are similar to the study done by Mare [18]. It is already seen that women with high education marry late, have high age at first birth, and have fewer children than their less educated counterpart. Therefore, the educational attainment reported in the data may not be the highest education for those children. Another

significant finding is that mothers with higher secondary or above levels of education have an important positive association with the higher education of their daughters. Chevalier [46] also reported similar findings where it was observed that the effect of maternal education is high for daughters while paternal education matters for the son's educational decisions. This result indicates that more educated mothers will give equal opportunity of higher education to both daughters and son.

The distribution of children's education obtained directly from the sample and the other one by applying the model of intergenerational transmission showed similar patterns. Both the observed and estimated distribution show improvement in educational attainment of children compared to mother's education. The comparisons based on the complete sample and two random samples also show similar improvement in educational attainment of children compared to mother's education. While comparing the results graphically from the random samples, the category of illiterate children was excluded because only a few of the children with illiterate mothers remained illiterate in both the samples.

TABLE 10: Average number of children ever born to parents with different level of education based on Poisson regression, DLHS-3, India, 2007-08.

Education level of husband & wife	Mean CEB
Illiterate husband/illiterate wife	6.21
Primary educated husband/illiterate wife	5.46
High school educated husband/illiterate wife	5.34
Higher secondary educated husband/illiterate wife	4.78
Graduate husband/illiterate wife	5.10
Illiterate husband/primary educated wife	5.21
Primary educated husband/primary educated wife	4.63
High school educated husband/primary educated wife	4.39
Higher secondary educated husband/primary educated wife	4.38
Graduate husband/primary educated wife	4.49
Illiterate husband/high school educated wife	4.12
Primary educated husband/high school educated wife	3.98
High school educated husband/high school educated wife	3.69
Higher secondary educated husband/high school educated wife	3.59
Graduate husband/high school educated wife	3.59
Higher secondary educated wife/illiterate husband	5.00
Higher secondary educated wife/primary educated husband	3.53
Higher secondary educated wife/high school educated husband	2.98
Higher secondary educated wife/higher secondary educated husband	2.99
Higher secondary educated wife/graduate husband	2.96
Graduate wife/primary educated husband	3.33
Graduate wife/high school educated husband	2.72
Graduate wife/higher secondary educated husband	2.62
Graduate wife/graduate husband	2.45

7. Conclusions

The study concludes that improvement in female education has both an immediate and a long-term effect. As the immediate impact, increase in women's education increases age at marriage and control of family size by reducing the number of children ever born. In addition, as a long-term impact, improvement in women's education will increase the educational attainment of their children. Not only those children of uneducated women will be educated, but some of the children born to illiterate parents are also likely to attain higher education levels. Moreover, better educated mothers do not discriminate on the basis of sex of the child in providing educational opportunities to their children. Hence, better education of women and women empowerment should be emphasised, since women motivate the society for girls to be married at an older age, have fewer children at large intervals, which contributes to population control.

The intergenerational transmission model considers both the direct and indirect pathways that might influence educational attainment of women, their age at marriage, age at first birth, and choice of marriage partner in estimating distribution of children's education. It is also proved that the model of intergenerational transmission is applicable in the Indian context to examine the transmission of education between generations. This model can be used to examine

intergenerational transmission of education using the existing information of female literacy levels and fertility at the national level. Government policies aimed at providing incentives either in cash or kinds to the families with better educated girls may encourage parents to send their daughters for higher education. These initiatives will reduce gender disparity in higher education and, simultaneously, ensure better education for their next generation.

Limitations of the Study

The main limitation of this study may be the cross-sectional nature of the data, which constrained the ability to capture completed years of schooling for all children. Therefore, the study was restricted to women aged 35 years and above and children above 20 years of age assuming that they have completed their education at that age. The intergenerational transmission model may give more accurate estimates if it is applied to longitudinal data. Also, the data did not provide any information on the socioeconomic condition of parents which is likely to affect their educational attainment.

Appendix

See Tables 9 and 10.

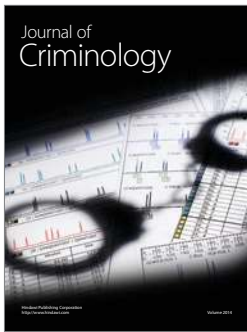
Conflict of Interests

The authors declare that there is no conflict of interests regarding the publication of this paper.

References

- [1] S. Baum and J. Ma, *Education Pays: The Benefits of Higher Education for Individuals and Society*, College Board, Washington, DC, USA, 2007.
- [2] R. Haveman and B. Wolfe, "The determinants of children's attainments: a review of methods and findings," *Journal of Economic Literature*, vol. 33, pp. 1829–1878, 1995.
- [3] T. J. Kane, "College-going and inequality," in *Social Inequality*, K. M. Neckerman, Ed., pp. 319–354, Sage Publications, New York, NY, USA, 2004.
- [4] B. Kye, "Intergenerational transmission of women's educational attainment in South Korea: an application of a multi-group population projection model," *Demographic Research*, vol. 24, pp. 79–112, 2011.
- [5] P. N. M. Bhat, "India's changing dates with replacement fertility: a review of recent fertility trends and future prospects," in *Proceedings of the Expert Group Meeting on Completing the Fertility Transition*, United Nations Population Division, New York, NY, USA, March 2002.
- [6] D. Mare, "How do Women's Educational Attainments Affect the Educational Attainment of the Next Generation?", Carolina Centre for Population Research, 2005, <http://papers.ccpr.ucla.edu/papers/PWP-CCPR-2005-018/PWP-CCPR-2005-018.pdf>.
- [7] V. Maralani and D. R. Mare, "Unobserved heterogeneity, demographic mechanisms and the intergenerational effects of increasing women's schooling," in *Proceedings of the Population Association of America Annual Meeting*, New Orleans, La, USA, 2008.
- [8] R. F. Corwyn and R. H. Bradley, "Socioeconomic status, poverty status and childhood externalizing behaviors: theoretical and methodological considerations within a structural equation modeling framework," in *Sourcebook of Family Theories and Methods: An Interactive Approach*, V. Bengtson, A. Acock, K. Allen, P. D. Anderson, and D. Klein, Eds., National Council on Family Relations, Minneapolis, Minn, USA, 2003.
- [9] P. E. Davis-Kean, "The influence of parent education and family income on child achievement: the indirect role of parental expectations and the home environment," *Journal of Family Psychology*, vol. 19, no. 2, pp. 294–304, 2005.
- [10] E. Plug, "Estimating the effect of mother's schooling on children's schooling using a sample of adoptees," *American Economic Review*, vol. 94, no. 1, pp. 358–368, 2004.
- [11] A. Björklund, M. Lindahl, and E. Plug, "The origins of intergenerational associations: lessons from Swedish adoption data," *The Quarterly Journal of Economics*, vol. 121, no. 3, pp. 999–1028, 2006.
- [12] H. Holmlund, M. Lindahl, and P. Erik, "The causal effect of parents schooling on children's schooling: a comparison of estimation methods," IZA Discussion Paper 3630, IZA, 2008.
- [13] S. E. Black, P. J. Devereux, and K. G. Salvanes, "Why the apple doesn't fall far: understanding intergenerational transmission of human capital," *The American Economic Review*, vol. 95, no. 1, pp. 437–449, 2005.
- [14] T. P. Pedro, "Higher education attainment: the case of intergenerational transmission of education in Portugal," IZA Discussion Paper No. 4813, 2010.
- [15] A. Tansel, "Schooling attainment, parental education, and gender in Côte d'Ivoire and Ghana," *Economic Development and Cultural Change*, vol. 45, no. 4, pp. 824–856, 1997.
- [16] A. Björklund, M. Lindahl, and P. Erik, "The origins of intergenerational associations: lessons from Swedish adoption data," IZA Discussion Papers No. 1739, 2005.
- [17] C. Pronzato, "An examination of paternal and maternal intergenerational transmission of schooling," *Journal of Population Economics*, vol. 25, no. 2, pp. 591–608, 2012.
- [18] D. R. Mare, "Assortative Mating, Intergenerational Mobility and Educational Inequality," On-Line Working Paper Series, California Center for Population Research, 2000.
- [19] International Institute for Population Sciences (IIPS), *District Level Household and Facility Survey (DLHS-3), 2007-08*, IIPS, Mumbai, India, 2010.
- [20] R. D. Mare and V. Maralani, "The intergenerational effects of changes in women's educational attainments," *American Sociological Review*, vol. 71, no. 4, pp. 542–564, 2006.
- [21] Y. Barlas, "Model validation in system dynamics," in *Proceedings of the 12th International Conference of the System Dynamics Society*, Stirling, Scotland, 1994.
- [22] Z. Hussain, "Gender disparities in completing school education in India: analyzing regional variations," MPRA Paper, 2010, <http://mpra.ub.uni-muenchen.de/25748/>.
- [23] E. M. King and L. A. Lillard, "Education policy and schooling attainment in Malaysia and Philippines," *Economics of Education Review*, vol. 6, no. 2, pp. 167–181, 1987.
- [24] S. Gupta, M. Verhoeven, and E. R. Tiongson, "The effectiveness of government spending on education and health care in developing and transition economies," *European Journal of Political Economy*, vol. 18, no. 4, pp. 717–737, 2002.
- [25] S. K. Bhaumik and M. Chakrabarty, "Mother or motherland: can a government have an impact on educational attainment of the population? Preliminary evidence from India," IZA DP 4954, 2010.
- [26] L. Dearden, J. Ferri, and C. Meghir, "The effect of school quality on educational attainment and wages," *Review of Economics and Statistics*, vol. 84, no. 1, pp. 1–20, 2002.
- [27] J. C. Caldwell, P. H. Reddy, and P. Caldwell, "Educational transition in rural south India," *Population and Development Review*, vol. 11, no. 1, pp. 29–51, 1985.
- [28] G. Oonk, "Child Labour, Education and International Donor Policies: A Challenge to Conventional Wisdom," India Committee in the Netherlands, 1998, <http://www.stopchild-labour.eu/>.
- [29] U. Nayar, *Universal Primary Education of Rural Girls in India National Council of Educational Research and Training (NCERT)*, National Council of Educational Research and Training, New Delhi, India, 1993.
- [30] U. Nayar, "Planning for universalization of primary education of girls and women empowerment. Gender studies in Haryana," *Journal of Indian Education*, vol. 21, no. 3, pp. 22–29, 1995.
- [31] A. R. Vasavi and K. Chamraj, *Community-School Interlink. Preliminary Report of a Socio Anthropological Study of Primary Education in Five Districts of Karnataka*, National Institute of Advanced Studies, Karnataka, India, 2000.
- [32] P. Sengupta and J. Guha, "Enrolment, dropout and grade completion of girl children in west Bengal," *Economic and Political Weekly*, vol. 37, no. 17, pp. 1621–1637, 2002.
- [33] J. Jha and D. Jningran, *Elementary Education for the Poorest and Other Deprived Groups*, Centre for Policy Research, New Delhi, India, 2002.

- [34] V. Ramachandran, "Backward and forward linkages that strengthen primary education," *Economic and Political Weekly*, vol. 38, no. 10, pp. 959–968, 2003.
- [35] Azim Premji Foundation, *The Social Context of Elementary Education in Rural India*, 2004, <http://www.azimpremjifoundation.org/pdf/TheSocialContextofElementaryEducationin-RuralIndia.pdf>.
- [36] U. R. Rani, "Reasons for rising school dropout rates of rural girls in India—an analysis using soft computing approach," *International Journal of Current Research*, vol. 3, no. 9, pp. 140–143, 2011.
- [37] C. Hirschman and P. Guest, "The emerging demographic transitions of Southeast Asia," *Population & Development Review*, vol. 16, no. 1, pp. 121–152, 1990.
- [38] M. J. Brien and L. A. Lillard, "Education, marriage, and first conception in Malaysia," *Journal of Human Resources*, vol. 29, no. 4, pp. 1167–1204, 1994.
- [39] S. Singh and R. Samara, "Early marriage among women in developing countries," *International Family Planning Perspectives*, vol. 22, no. 4, pp. 148–175, 1996.
- [40] L. Gangadharan and P. Maitra, "The effect of education on the timing of marriage and first birth in Pakistan," *Journal of Quantitative Economics*, vol. 1, no. 1, pp. 114–133, 2003.
- [41] S. Klasen and A. Launov, "Analysis of the determinants of fertility decline in the Czech Republic," *Journal of Population Economics*, vol. 19, no. 1, pp. 25–54, 2006.
- [42] M. D. Tayfur, M. G. Kirdar, and I. Koc, "The impact of schooling on the timing of marriage and fertility: evidence from a change in compulsory schooling law," in *Proceedings of the 15th Annual Conference of Economic Research Forum (ERF '08)*, Cairo, Egypt, 2008.
- [43] A. Isen and B. Stevenson, "Women's education and family behavior: trends in marriage, divorce and fertility," in *Demography and the Economy*, J. Shoven, Ed., University of Chicago Press, Chicago, Ill, USA, 2010.
- [44] J. R. Behrman and M. R. Rosenzweig, "Does increasing women's schooling raise the schooling of the next generation?" *American Economic Review*, vol. 92, no. 1, pp. 323–334, 2002.
- [45] E. Plug, "How do parents raise the educational attainment of future generations?" IZA Discussion Paper No. 652, 2002.
- [46] A. Chevalier, "Parental education and child's education: a natural experiment," IZA Discussion Paper 1153, IZA, 2004.



Hindawi

Submit your manuscripts at
<http://www.hindawi.com>

