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An Assessment of Gender Discrimination in Household Expenditure on Education in India

AMITAVA SAHA

ABSTRACT *Gender discrimination in household expenditure on education has led to unsatisfactory progress in educational attainment for women in many countries across the world. It has been observed that households across different states in rural and urban India prefer to incur more expenditure on education for male members than for females. Kingdon (2005) [Where has all the bias gone? Detecting gender bias in the intra-household allocation of educational expenditure,* Economic Development and Cultural Change*, 53(2), 409–452] has observed significant gender bias in household educational expenditure in a number of Indian states utilizing the household survey data of the National Council of Applied Economic Research, New Delhi. Other researchers, such as Chaudhuri & Roy (2006) [Do parents spread educational expenditure evenly across the two genders? Evidence from two North Indian states,* Economic and Political Weekly*, 41, pp. 5276–5282] and Lancaster* et al. *(2008) [Household expenditure patterns and gender bias: evidence from selected Indian states,* Oxford Development Studies*, 36(2), 133–157], have also confirmed the presence of significant gender bias in the expenses incurred on education by households in India. However, few of these studies are based on the analysis of sufficiently large, contemporary datasets, and hence they are unable to provide a picture of gender discrimination at the disaggregated level, i.e. at the state level. Since there is wide variation in social, cultural, anthropometrical, economic and many other factors among Indian states, it is important to analyse gender disparity in India at the level of the state. Here, utilizing individual-level data on educational expenditure from the 64th round of the National Sample Survey, an attempt is made to assess the current scenario in gender inequality in household educational expenditure in India at both the national and state level. It is observed that significant gender disparity exists in intra-household educational expenses and that this discrimination is not confined to the "backward" or developing states in India.*

1. Introduction

Education plays an important role in ensuring comprehensive and sustainable development of a country, particularly of developing countries. The importance of education in the overall development of a nation is now recognized by the international community, and, as a consequence, significant achievements have been made in the

Amitava Saha, Directorate General of Commercial Intelligence & Statistics, Vanijya Tathya Sadan, 565, Anandapur, ECADP, Kolkata 700107, India. Email: saha_amitava@hotmail.com

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universalization of primary education throughout the world. Government expenditure on education across the world has increased steadily over the years, and private participation in education has also grown significantly.

India has achieved substantial progress in a number of important areas since independence. Growth in gross domestic product (GDP) increased from a nominal 2.3% in 1951–1952 to 9.7% in 2006–2007 (both at 1999–2000 prices).[1] India has also made considerable progress in the reduction of infant mortality, maternal mortality and total fertility rates since independence. The infant mortality rate has come down to 53 per 1000 live births in 2008 from 123 in 1972, and the total fertility rate has registered a decline of about 50% during the same period (from 5.2% in 1972 to 2.6% in 2008).

However, India's progress in education has been less impressive than its achievements during the past six decades. The picture is even less positive when one considers the education and literacy of girl children and women in India. Even today, after more than 60 years of independence and when India's economy is growing rapidly, the attainment of education for women has remained an area of great concern.

The statistics on literacy from the seven decadal population censuses conducted since independence show that India's overall literacy rate has increased from 18.3% in 1951 to 74.0% in 2011. During this period, the male literacy has increased more than threefold (from 27.2% in 1951 to 82.1% in 2011), whereas the female literacy rate has risen to 65.5% in 2011 from a meagre 8.9% in 1951.[2] Despite this phenomenal improvement, the gap between male and female literacy remained more or less at the same level throughout the period 1951–2001 (see Figure 1) and, although it narrowed sharply during the period 2001–2011, remains high in comparison to developed countries and lags behind many developing countries.

The existence of gender disparity in the allocation of household resources to its members has been documented in studies since as early as 1974 by Bardhan (1974). Deaton (1989) uses household survey data for Côte d'Ivoire and Thailand to test for discrimination in the allocation of goods between boys and girls. However, he finds no evidence of gender discrimination in Côte d'Ivoire and observed a statistically insignificant bias in favour of boys in Thailand. Gong *et al.* (2005) found evidence for parents' preference for education of boys and that expenditure on a boy who goes to school is greater than for a school-going girl of the same age in rural China. Li & Tsang (2003), utilizing household-level data from rural China, studied the implications of various socio-economic factors on gender inequality in education. They noted significant gender gaps in household educational spending in rural China. Aslam & Kingdon (2008) exploited

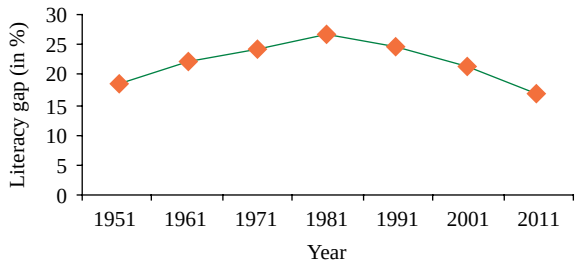

Figure 1. Trend in male–female gap in literacy.

individual-level household data on educational expenditure from the Pakistan Integrated Household Survey 2001–2002 and adopted an Engel curve method to detect intra-household differentials in the allocation of household educational expenditure between male and female members. In a recent study, Masterson (2012) identified pro-male bias in household spending on education in Paraguay, although this was not consistent across areas and age groups.

Kingdon (2005) used household survey data from the National Council of Applied Economic Research, New Delhi, and found significant gender bias in household educational expenditure in a number of Indian states. Chaudhuri & Roy (2006) suitably modified the specification of the Engel curve as proposed in Deaton (1989) and used data from the 1997 Living Standard Measurement Survey for Bihar and Uttar Pradesh to estimate an individual-level educational expenditure function. Their study confirmed the presence of significant gender bias in the expenses incurred by households in the two states. In a more recent study, Lancaster *et al.* (2008) utilized two different data sets: (i) the Survey of Living Conditions conducted in 1997–1998 in Bihar and Uttar Pradesh and (ii) the Household Consumption Expenditure Survey of the National Sample Survey (NSS) in its 50th round (1993–1994), to detect gender bias in household spending on education. Like many other researchers, Lancaster *et al.* (2008) also made use of the Engel curve approach and applied a three-stage least squares estimation method. This study also found evidence of significant gender bias in educational expenditure in underdeveloped rural India. Himaz (2009) analysed data from the second round of the Young Lives Survey conducted in 2006 in Andhra Pradesh, India, and made an assessment of boy bias in household-level educational expenditure for children aged 5–19 years. The study revealed parents' preference for ensuring better-quality education for boys than girls, leading to gender disparity in spending on schooling for their children. Thus, there is considerable evidence that documents discrimination in household educational expenditure between males and females in India. However, few of these studies are based on the analysis of sufficiently large, contemporary datasets to offer a picture of gender discrimination at disaggregated levels, i.e. at state levels. Since there is wide variation in social, cultural, anthropometrical and economic factors, as well as many others, among Indian states, it is important to analyse gender disparities in India at the level of the state.

In the 64th round of the NSS conducted in July 2007–June 2008, detailed information was collected on the private expenditure incurred by households towards the educational expenses of each currently enrolled member in the age group 5–29 years. This provides an opportunity to investigate gender bias in household expenditure on education. Oaxaca (1973) and Blinder (1973) estimated the average extent of the wage gap between male and female workers by applying regression techniques. Researchers have utilized this seminal work extensively to study gender discrimination in wages, intra-household gender inequality and in many other related areas. Recently, Del Río *et al.* (2011) developed a methodology following the pioneering work of Oaxaca (1973) and Blinder (1973) for quantifying absolute and relative discrimination in wages between male and female workers in the Spanish labour market. Here, utilizing the current NSS data, an attempt is made to assess gender inequality in household educational expenditure in India at the national and also at state levels by adopting the methodology developed in Del Río *et al.* (2011). The data used for the study are described briefly in Section 2. Section 3 explains the methods adopted for the analysis. The findings are included in Section 4 and the conclusions are presented in Section 5.

2. A Brief Description of the Data

The NSS conducted by the National Sample Survey Office in its 64th round collected detailed information on participation in and expenditure on education from 63 318 rural and 37 263 urban households covering a total of 7953 villages and 4682 urban blocks from all over the country. However, because of unfavourable sociopolitical factors and difficult field conditions (i) Leh (Ladakh) and Kargil districts of Jammu and Kashmir, (ii) interior villages of Nagaland situated beyond 5 km of a bus route and (iii) villages in Andaman and Nicobar Islands which remain inaccessible throughout the year were not covered by the survey.

The NSS 64th round is a multi-subject household survey. In this round, along with a host of other things, information on (a) persons aged 5–29 years currently attending an educational institution at primary level and above, (b) private expenditure incurred by households on the education of each member and (c) dropout and discontinuance from educational institutions along with their causes, etc. are collected through a structured questionnaire (Schedule 25.2). In addition, some socio-demographic particulars, such as the religion, social group, household size and total monthly consumption expenditure of the household, and the age, sex, marital status and educational status of each member of the household, are also gathered.

Continuing the tradition of the NSS, the survey once again used a stratified multi-stage sampling design, treating the 2001 census villages and urban blocks as the first-stage units (FSUs) respectively for rural and urban areas. Large villages and blocks are again sub-divided into a number of specified hamlet groups or sub-blocks. The ultimate stage units (USUs) are the households for both the sectors. For the purpose of stratification, in general, each district of a state/UT is split into two strata: (i) a rural stratum consisting of all rural areas of the district and (ii) an urban stratum consisting of all the urban areas. From each rural sub-stratum, using the 2001 population figures as size, four villages are selected with probability proportional to size with replacement, whereas for urban areas, four FSUs were chosen from a sub-stratum with simple random sampling without replacement (SRSWOR). Within each sub-stratum, samples are drawn in the form of two independent sub-samples for both the rural and urban sectors.

Large FSUs with an approximate population of 1200 or more are divided into a suitable number of "hamlet-groups" in the rural sector and "sub-blocks" in the urban sector. Two hamlet-groups or sub-blocks are selected from a large FSU by SRSWOR wherever hamlet-groups/sub-blocks are formed. The USUs, i.e. the households from the selected FSUs, are chosen using the SRSWOR technique for both rural and urban areas. For details on the concepts, definitions, sampling design and estimation methodology, refer to NSS Report No. 532 (Government of India, 2010).

3. Methodology

In studies devoted to the identification of gender discrimination in wages, the most common and extensively applied method of decomposing the gender gap has been the Oaxaca–Blinder decomposition method, which typically conducts the decomposition analysis at the mean of the wage distribution. The classical approach of Oaxaca (1973) and Blinder (1973) explains wage differentials in terms of differences in individual productive characteristics, or the endowment effect, and differences in the coefficients of the earnings

Equations (coefficients effect), known as the discrimination effect. Following the standard Oaxaca–Blinder decomposition, two separate equations of the semi-log functional form for household educational expenditure for males and females are estimated based on ordinary least squares (OLS):

$$e_{mi} = \ln(y_{mi}) = \beta_m \mathbf{X}_{mi} + \varepsilon_i, \tag{1}$$

$$e_{fi} = \ln(y_{fi}) = \beta_f \mathbf{X}_{fi} + \varepsilon_i, \tag{2}$$

where y_{ji} is the expenditure on education for jth type, ($j \in (m,f)$, m denoting a male member and f a female one) of ith member, $\mathbf{X}_i$ is a vector consisting of other socio-demographic characteristics, like size, social group, religion, occupation of the head of the household, monthly per capita consumption expenditure (MPCE), etc. corresponding to the member i.

Then, the average gender gap in household educational expenditure can be divided into explained and unexplained components as:

$$\bar{e}_m - \bar{e}_f = \left(\bar{\mathbf{X}}_m - \bar{\mathbf{X}}_f\right)\hat{\beta}_m + \bar{\mathbf{X}}_f\left(\hat{\beta}_m - \hat{\beta}_f\right) = \mathrm{E} + \mathrm{D},$$

where the first component (E) of the decomposition represents the component of the gender gap in educational expenditure due to gender differences in the characteristics of male and female members, whereas the second one (D) is the component of the gender gap explained by gender differences in the rewards received by male and female students with the same characteristics. It should be noted that the second component of the Oaxaca–Blinder decomposition exists only because of a household's differential treatment of a male and a female student possessing identical characteristics, and this is a reflection of discrimination. Also note that

$$\mathrm{D} = \bar{\mathbf{X}}_f\hat{\beta}_m - \bar{\mathbf{X}}_f\hat{\beta}_f = \sum_i \left(\mathbf{X}_{fi}\hat{\beta}_m - \mathbf{X}_{fi}\hat{\beta}_f\right)/n, \tag{3}$$

n being the total number of female students, and thus, a measure of gender discrimination in household educational expenditure can be developed as the average of the individual differences between predicted male and female (log) expenditure estimated for each female student.

Assume that $\hat{y}_{fi}$ is the OLS estimate of household educational expenditure incurred for the female member and $\hat{r}_{fi}$ is the predicted expenditure for the corresponding female member if her attributes were identical to a male member. Then, the conditional gap in expenditure, i.e. $(\hat{r}_{fi} - \hat{y}_{fi})$, is the estimated discrimination experienced by a female student i and $(\hat{r}_f - \hat{y}_f)$ is the estimated average discrimination for a female member, provided that two female students with identical observed characteristic are subject to equal levels of discrimination. However, in this approach, the positive gaps may be neutralized by the negative gaps, leading to a distorted picture of gender discrimination. Thus, following Del Río *et al.* (2011), the negative gaps are regarded here as zero for the computation of the gender gaps.

As an alternative, we apply quantile regression to estimate the individual gaps in household educational expenditure. The semi-logarithmic functional form for household educational expenditure for males and females is estimated by quantile regressions in the

form:

$$\hat{y}_{fi}^{q} = \exp\left(\mathbf{X}_{fi}\hat{\beta}_{f}^{q}\right),$$

$$\hat{r}_{fi}^{q} = \exp\left(X_{fi}\hat{\beta}_{m}^{q}\right).$$

Note that the above two equations can be estimated using several quantiles, i.e. $q_1, q_2, \ldots, q_N$. Thus, for computational convenience, we first determine the quantile, say, $q_i^* \in (q_1, q_2, \ldots, q_N)$, that minimizes the expenditure residual, i.e. $(y_{fi} - \hat{y}_{fi}^{q})$ for the ith female member. Then, the estimated household expenditure for the ith female student will be $\hat{y}_{fi}^{q^*} = \exp(X_{fi}\hat{\beta}_{f}^{q^*})$, and for this female member, we compute $\hat{r}_{fi}^{q^*} = \exp(X_{fi}\hat{\beta}_{m}^{q^*})$ utilizing the coefficients for males corresponding to the same conditional quantile q_i^*. This is essentially comparing the best-predicted value of household expenditure on education for a female student with that of a male one having similar characteristics and the same relative rank in the conditional distribution of household expenditure for male students. Thus, denoting $\hat{y}_f^q$ and $\hat{r}_f^q$, respectively, the quantile regression estimates for the household expenditure for a female student with and without discrimination, the absolute and relative discrimination can be measured using $(\hat{r}_f^q - \hat{y}_f^q)$ and $(1 - \hat{y}_f^q/\hat{r}_f^q)$, respectively.

A more precise picture of the degree of discrimination can be achieved through comparison of discrimination indices as demonstrated in Del Río *et al.* (2011) based on the family of poverty indices developed by Foster *et al.* (1984). Following Foster *et al.* (1984) and defining $x_{fi} = \max\{(r_{fi} - y_{fi}), 0\}, \quad i = 1, 2, \ldots, n$, absolute discrimination indices can be computed using:

$$\Delta_\alpha = \frac{1}{n}\sum_{i=1}^{k^*}(x_{fi})^\alpha, \quad \alpha \geq 0,$$

where k^* is the number of discriminated girl students and α is the discrimination aversion parameter. The corresponding indices for relative discrimination are easy to compute by replacing x_{fi} with $(1 - y_{fi}/r_{fi})$.

It is interesting to note that for $\alpha = 0$, the discrimination index (Δ_0) is a headcount measure that gives the percentage of girl students who are subject to discrimination irrespective of its extent. On the other hand, Δ_1 accounts for the average level of discrimination per girl student and can be regarded as an indicator of discrimination suffered by a girl student on average. Δ_2 quantifies the inequality among the discriminated girl students and can be regarded as a measure of the severity of discrimination. It combines two different dimensions of discrimination, namely the average level and unevenness of the distribution. If two groups of girl students with the same level of average discrimination (Δ_1) are compared, the group with more inequality among the discriminated girls will have a higher value of Δ_2. Thus, the greater the value of Δ_2, the more extreme the situation.

4. Evidence of Gender Inequality

A significant difference is found in the average annual household expenditure incurred on the education of male and female members. In line with expectations, the average annual

expenditure is the highest for male students in urban areas and the lowest for females in rural areas. Average annual educational expenditure for male and female students in rural areas was 2032 and 1531 Indian rupees (INR), respectively (approximately US$50.47 and 38.03, respectively, considering the average annual rupee–dollar exchange rate for April 2007 to March 2008 as 1$ = 40.2067 INR), and 6900 INR (≅ US$171.38) and 6164 INR (≅ US$ 153.10), respectively in urban India. Among the major Indian states, rural and urban households in Punjab incurred the highest expenses per female student to meet educational requirements. The average annual household spending on male members' education in rural areas was also the highest in Punjab.

The percentage relative gap (PRG) in average annual educational expenses, which is a naïve measure of gender disparity in household educational expenditure, defined as the difference between the per student annual expenditure for males and females relative to that of a male student has been computed and is presented in Table 1 for different social groups, namely scheduled caste (SC), scheduled tribe (ST), other backward class (OBC) and others. A positive value of PRG is indicative of gender bias in favour of males, whereas a negative value suggests the presence of female gender bias in household educational spending.

On the basis of the PRGs, we can see that gender discrimination in household educational expenditure is more evident in rural than in urban areas. Table 1 shows that the gender gap in educational spending is prevalent across different social groups in the country. Similarly, the PRG values computed and presented in Table 2 for different types of household in rural and urban areas also indicate the existence of gender discrimination in household expenditure on education.

These heuristic observations are more than sufficient to encourage an investigation into the prevalence of gender discrimination in household educational expenditure by applying a well-defined methodology for measuring such discrimination in tangible quantified terms.

Information on total expenditure on education for each person in the household in the age group 5–29 years currently enrolled in an educational institution at the level of primary or above is available for 60 090 persons in rural areas and 34 045 in urban areas. The natural logarithm of this expenditure ($ln(teduex)$) is considered as the dependant variable. Expenditure incurred for the purpose of education of the household member is

Table 1. Average annual expenditure (in INR) per student pursuing any education by social group

	Rural			Urban		
	Amount of expenditure (in INR)			Amount of expenditure (in INR)		
Social group	Male	Female	PRG	Male	Female	PRG
ST	1064	869	18	4782	4174	13
SC	1371	1104	19	4047	3253	20
OBC	1941	1356	30	5310	4356	18
Others	3201	2483	22	9457	8855	6
All	2032	1531	25	6900	6164	11

Note: PRG, percentage relative gap in educational expenditure.

Table 2. Average annual expenditure (in INR) per student pursuing any education by household type

Household type	Amount of expenditure (in INR)		PRG
	Male	Female	
Rural			
Self-employed in non-agriculture	2124	1719	19
Agricultural labour	955	787	18
Other labour	1483	1359	8
Self-employed in agriculture	1969	1537	22
Others	4956	3013	39
All	2032	1531	25
Urban			
Self-employed	5966	5669	5
Regular wage/salary earning	7978	7197	10
Casual labour	2137	1860	13
Others	13 542	11 061	18
All	6900	6164	11

likely to be affected by the income of the household and also its demography, i.e. the size of the household. Thus, it is desirable to consider both household size and its total income as independent variables. Information on the monthly consumption expenditure of the household was also collected in the 64th round, and exploiting this, the MPCE is derived. The natural logarithms of MPCE (*LMPCE*) and the household size (*Lsize*) are included as explanatory variables.

It is demonstrated in Lillard & Willis (1994), Drèze & Kingdon (2001), Holmes (2003), Jerrim & Micklewright (2009) and Maitra & Sharma (2009) that parental education plays a definite role in the progress of children's educational attainment and also in gender bias in educational spending. In view of this, a variable is defined to account for the educational qualification of the head of the household and the spouse of the head of the household on a scale of 1 to 14[3] and its natural logarithm (*Ledu*) is also included as an explanatory variable.

Drèze & Kingdon (2001) have noted that in India, school participation among girls varies widely across different social groups. Tilak (2002) has also observed that caste and religion are important determinants of educational expenditure for rural Indian households. Therefore, it is also necessary to investigate the impact of these factors on household educational spending vis-à-vis gender bias in such expenses. In order to account for the effect of these factors, two dummy variables, namely *dsg* and *drlg*, are defined where *dsg* is assigned a value of "1" if the household belongs to either SC or ST and "0" for others while *drlg* takes a value of "1" for households belonging to the Hindu community and "0" for others. Along with these, the *age* of the students and type of the household (*htype*) are also included in the list of explanatory variables.

The quantile regression estimates for the parameters are computed for 10 different quantiles, namely 5th, 15th, 25th, 35th, 45th, 55th, 65th, 75th, 85th and 95th. Regression equations using OLS and quantile regression have been estimated for all-India as well as 16 selected major Indian states. In addition, regression equations for different types of

Table 3. Estimated household educational expenditure (in INR) and gender discrimination—social groups

	Rural					Urban				
Social group	$\hat{y}_f^q$	$\hat{r}_f^q$	Δ_0	Δ_1	Δ_2	$\hat{y}_f^q$	$\hat{r}_f^q$	Δ_0	Δ_1	Δ_2
ST	841.20	890.19	78.05	8.96	0.77	3927.75	4183.99	74.38	5.92	0.36
SC	1016.82	1088.71	92.48	8.85	0.89	2924.82	3142.13	92.95	6.95	0.56
OBC	1198.41	1348.20	98.38	12.88	1.86	3916.36	4434.86	99.33	11.17	1.34
Others	2143.55	2382.39	97.26	10.97	1.40	7789.29	8732.77	98.47	10.05	1.08
All	1357.58	1503.33	93.33	9.69	1.42	5482.74	6136.00	95.66	10.65	1.06

social groups and household types for both rural and urban areas are also estimated applying the OLS and quantile regression methodology. The estimated coefficients for all-India along with various social groups and household types are presented in the Appendix. The state-level analysis of the data was also carried out applying both OLS and quantile regression. However, in view of the sheer volume, detailed state-level coefficients are not presented here.

The results of the regression analysis indicate that all the explanatory variables considered are statistically significant predictors of expenditure on education for both rural and urban households. In addition to MPCE, variables such as household size, the educational status of the head and the spouse of the head of the household, the age of the student, the social group and the type of household are also shown to be significant determinants of the expenditure incurred on the education of household members.

A comparison of the estimated non-parametric kernel density functions reveals that the quantile regression method results in a more accurate fit to the log of observed educational expenditure for female students for both rural and urban areas, and hence the discussion from now onwards will be focused only on the results of the quantile regression method. Tables 3 and 4 show the estimated expenditure (in INR) on education of female students' vis-à-vis measures of relative gender discrimination for different types of households and social groups. These tables clearly illustrate that rural as well as urban households discriminate between male and female members in respect of educational spending.[4]

The discrimination indices for different household sizes in rural as well as urban India are shown in Table 5, and those corresponding to different types of educational status of the parents are given in Table A1 in the Appendix.[5]

Also in the country as a whole, gender discrimination has been detected in rural and urban areas in all the 16 major states considered here. The proportion of discriminated girl students (Δ_0) in urban areas varies within a very narrow range of 96–99% across the states, although in rural areas a wide variation is observed. Among the 16 major states, the incidence of gender discrimination (Δ_0) among girl students has been found to be highest in Bihar and Uttar Pradesh and lowest in rural Punjab, closely followed by Kerala.

Table 4. Estimated household educational expenditure (in INR) and gender discrimination—household types

Household type	$\hat{y}_f$	$\hat{r}_f$	Δ_0	Δ_1	Δ_2
Rural					
Self-employed in non-agriculture	1500.13	1667.61	95.26	11.12	1.37
Agricultural labour	718.23	792.90	96.15	10.55	1.27
Other labour	1221.82	1333.92	94.32	9.58	1.06
Self-employed in agriculture	1334.73	1507.24	95.55	12.89	1.82
Others	2737.61	2938.57	79.47	8.09	0.68
All	1357.58	1503.33	93.33	9.69	1.42
Urban					
Self-employed	4989.99	5628.30	98.32	10.42	1.16
Regular wage/salary earning	6555.29	7218.12	91.65	8.12	0.68
Casual labour	1652.74	1909.89	99.29	11.95	1.54
Others	9195.99	10 545.39	98.04	12.58	1.64
All	5482.74	6136.00	95.66	10.65	1.06

Table 5. Discrimination indices by household size

	Rural			Urban		
Household size	Δ_0	Δ_1	Δ_2	Δ_0	Δ_1	Δ_2
≤ 3	78.06	5.96	0.60	91.10	8.87	0.95
3–5	91.30	8.76	1.01	95.13	8.67	0.89
5–10	96.29	11.86	1.67	97.07	10.42	1.24
>10	99.48	16.07	2.85	98.63	12.71	1.73
All	93.33	9.69	1.42	95.66	10.65	1.06

A wide variation in the prevalence of relative discrimination (Δ_1) is observed across the states. In the rural sector, Kerala has the lowest gender discrimination, whereas in urban areas, Assam has the lowest. The prevalence of relative gender discrimination in household educational expenses is relatively lower in Punjab, Jharkhand, Maharashtra and West Bengal in rural areas. In urban areas, the prevalence is more or less the same across the states. It is interesting to note that gender discrimination in household educational expenditure is not only confined to the socially and economically backward states, such as Bihar, Madhya Pradesh, Rajasthan, Uttar Pradesh, Andhra Pradesh, but also found in the progressive states such as Gujarat, Tamil Nadu, Karnataka and Kerala. The states with a significant concentration of tribal populations, such as Orissa and Jharkhand, have a relatively lower prevalence of gender bias (Table 6).

The incidence of gender disparity (Δ_0) is found to be highest in urban Bihar followed by Uttar Pradesh and Rajasthan and lowest in rural Punjab, whereas Kerala in rural India and Assam in urban areas have the lowest level of relative discrimination (Δ_1). Consistent with the findings of many other researchers, the highest level of inequality (Δ_2) among discriminated female students is observed in the most backward state of Bihar, closely followed by Rajasthan, Uttar Pradesh and Madhya Pradesh. The high values of Δ_2 in these states clearly indicate significant gender bias. The study demonstrates that in states considered "progressive", namely Maharashtra, Karnataka, Gujarat and Tamil Nadu, a significant degree of inequality among girl students still persists. Figure 2 presents a graphical representation of the magnitude of inequality among discriminated girls in the rural and urban areas of selected major states in India.

Although no very significant difference is observed in the head count measure (Δ_0), we find a gradual decrease in the values of Δ_1 and a steeper decline in Δ_2 with increasing levels of parental education (see Figure 3).

The most severe level of inequality among discriminated girl students is observed in families in which both parents are illiterate, and it decreases with an increase in the combined educational status of the parents.

A comparison of the distribution of per capita educational expenditure on male and female students by deciles in Figures 4 and 5 clearly shows the tendency of parents to incur greater expenditure on the education of male children. They also depict the pattern of discrimination between male and female students along the expenditure scale.

Thus, the results obtained by analysing the individual-level data collected in the 64th round clearly demonstrate the presence of widespread gender bias in household educational spending both at the all-India level and for a number of major states in India.

Table 6. Gender discrimination in educational expenditure (in INR) in selected Indian states

State	Rural					Urban				
	$\hat{y}_f^q$	$\hat{r}_f^q$	Δ_0	Δ_1	Δ_2	$\hat{y}_f^q$	$\hat{r}_f^q$	Δ_0	Δ_1	Δ_2
Andhra Pradesh	1445.28	1622.62	95.66	10.93	1.50	5961.83	6658.87	96.34	10.47	1.16
Assam	1517.28	1655.62	96.11	8.36	1.00	4961.99	5379.46	95.85	7.76	0.98
Bihar	683.43	767.99	98.62	11.01	1.82	4169.33	4642.61	99.18	10.19	1.31
Gujarat	1009.66	1125.81	97.09	10.32	1.60	4955.11	5545.42	98.63	10.64	1.10
Haryana	2812.04	3175.52	96.95	11.45	1.46	6771.23	7526.80	96.88	10.04	1.15
Jharkhand	769.40	845.82	94.11	9.04	1.34	4001.11	4462.97	98.00	10.35	1.13
Karnataka	953.64	1064.91	97.62	10.45	1.55	6307.87	7074.22	98.38	10.83	1.02
Kerala	3904.85	4203.24	87.26	7.10	0.68	6221.52	6956.65	96.19	10.57	0.91
Madhya Pradesh	594.80	666.20	97.71	10.72	1.60	3925.59	4387.17	97.88	10.52	1.14
Maharashtra	1237.11	1356.39	95.25	8.79	1.26	5804.57	6567.28	97.29	11.61	0.95
Orissa	876.21	978.32	96.08	10.44	1.39	7781.08	8866.16	96.88	12.24	1.13
Punjab	4519.37	4907.98	86.39	7.92	0.77	7507.80	8286.31	96.01	9.40	0.92
Rajasthan	1243.68	1414.23	98.45	12.06	1.81	4924.37	5524.49	98.75	10.86	1.22
Tamil Nadu	1639.16	1833.71	95.46	10.61	1.04	5215.22	5846.63	97.23	10.80	1.00
Uttar Pradesh	1054.97	1184.03	98.83	10.90	1.80	4282.26	4823.13	99.02	11.21	1.27
West Bengal	1527.58	1673.29	94.69	8.71	1.09	6407.01	7108.61	96.68	9.87	1.01
All India	1357.58	1503.33	93.33	9.69	1.42	5482.74	6136.00	95.66	10.65	1.06

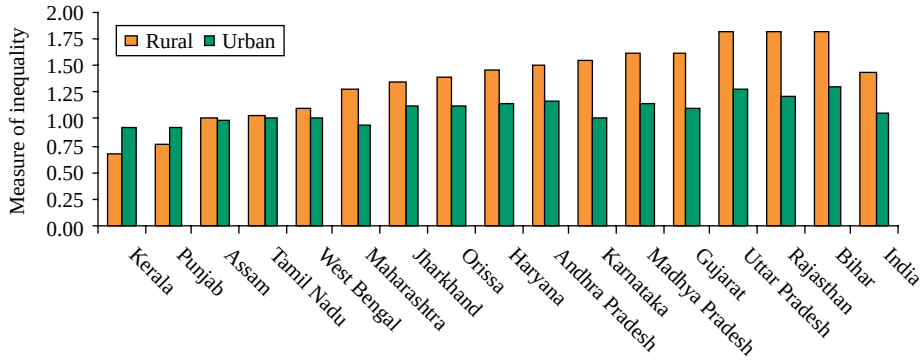

Figure 2. Inequality among the discriminated girl students.

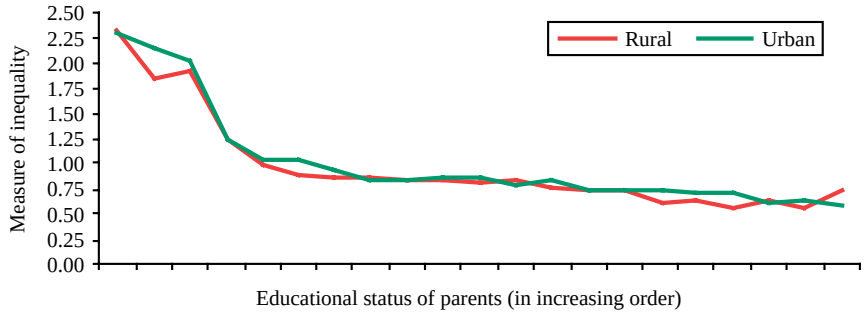

Figure 3. Inequality vis-à-vis parental education.

5. Conclusions

The analysis of the individual-level data establishes the presence of significant gender discrimination in household expenditure on education in India as well as across different Indian states. No significant difference in the prevalence of gender bias has been found between rural and urban India. This exercise shows that households across both rural and urban sectors of the country prefer to spend more on their male members in comparison to females. Inequality among discriminated female students is found to be lower in urban areas than in the rural sector of the country. The results also reveal sharp differences in the nature and degree of gender bias between the two sectors in different states in India. The findings of this study are consistent with those of Chaudhuri & Roy (2006) and Kingdon (2005), and the results strengthen the claim of Kingdon (2005) with regard to the usefulness of individual-level data in detecting gender bias in household educational expenditure.

Among the 16 major states considered here, gender bias is detected in the intra-household allocation of educational expenditure in all states, but the magnitude of discrimination as well as inequality among the discriminated girl students shows wide variation across the states. It is interesting to note that gender discrimination in household spending on education is least prevalent among the tribal communities across different

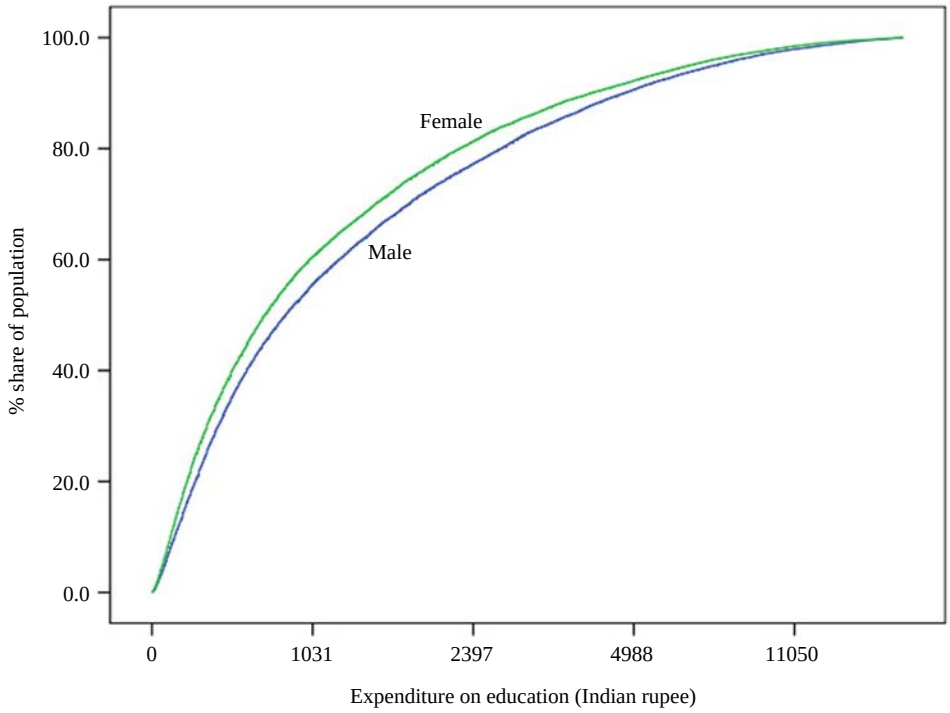

Figure 4. Comparison of male and female education expenditure—rural.

states in rural as well as urban India, and inequality among the discriminated girls is also lowest in this category. This may be due to the fact that a large number of the tribal communities in India have a matriarchal structure. Discrimination between boys and girls is also relatively lower among the SCs in comparison to the so-called progressive communities. The most extreme gender discrimination is observed in the state of Bihar, with the highest level of Δ_2 and the other two measures hovering very near to their highest values. The scenario appears to be similar in Rajasthan, Uttar Pradesh and Madhya Pradesh.

The coefficient corresponding to the explanatory variable (*Ledu*), representing the educational status of the head and spouse of the head of the household, is uniformly positive and significant across the states, confirming the view that the importance of education is acknowledged more in households with higher educational status: the more educated the parents/guardians, the greater the spending on education for their offspring. It is interesting to note a gradual decline in the measures of discrimination, Δ_0 and Δ_1, with an increase in parental educational status. In fact, the inequality among discriminated female students is significantly lower in households in which parents are more educationally qualified. A steady decline in the values of Δ_2 with increasing levels of parental education (see Table A1 in Appendix) confirms the positive impact of education not only on spending on the education of the girl children but also on narrowing inequality among discriminated girl students. An awareness of the importance of education in these households perhaps acts as a deterrent towards pro-male bias.

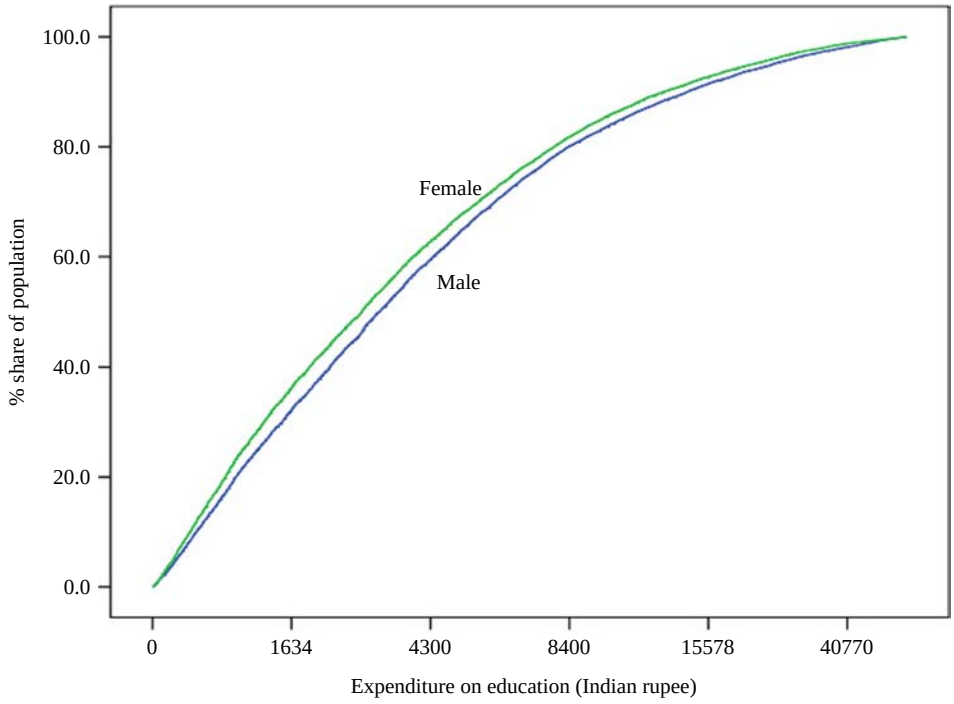

Figure 5. Comparison of male and female education expenditure—urban.

In addition, the negative coefficient for the size of the household (*lsize*) brings out the fact that households with more members prefer to spend less on the education of female members (see the tables in the Appendix). Households with more members tend to discriminate against girls more, and inequality among these girl students is highest in families with 10 or more members. By contrast, households with five or fewer members are observed to show less favouritism to male students. The severity of discrimination (Δ_2) increases with an increase in household size. Thus, females in households with more members are subjected to a higher degree of discrimination in rural as well as urban areas. However, females from large families in urban areas experience relatively less severe gender bias.

Kingdon (2005) has noted the presence of pro-male bias in household expenditure on education in the Indian states with skewed sex-ratios, i.e. having a lower number of females per 1000 males. The present study, while confirming the findings of Kingdon (2005), also reveals the startling fact that gender bias in household educational expenditure is equally prevalent in many developed and progressive states in India. Contrary to the findings of Lancaster *et al.* (2008), gender disparity in household spending on education is detected in Kerala. But the extent of inequality (Δ_2) among the discriminated female students is lowest in this state. Chaudhuri & Roy (2006), utilizing information collected more than a decade ago,[6] detected the existence of a gender gap in the intra-household allocation of educational expenditure in the states of Bihar and Uttar Pradesh. The present

study, using a contemporary dataset, also reveals gender discrimination in these two North-Indian states.

The comparison of per capita expenditure on education for male and female students by deciles as shown in Figures 4 and 5 clearly demonstrates widespread gender bias in household expenditure in education in rural as well as urban India. The gender gap is more pronounced in the middle of the expenditure scale. Almost negligible gender bias is detected at the beginning of the scale, where household spending on education itself is not very significant. A similar pattern also prevails in the higher expenditure classes. The graphical comparison of per capita educational expenditure on male and female students also confirms the widespread presence of gender disparity in urban areas.

Although the application of quantile regression in conjunction with the Oaxaca–Blinder decomposition has made it possible to detect the presence of gender discrimination, it fails to portray a full picture of gender discrimination in states because it fails to consider severity in gender bias among the discriminated female students. Thus, in a number of states, where the head count ratio (Δ_0) as well as the measure of relative discrimination (Δ_1) differs by a very narrow margin, the glaring gap in gender discrimination becomes prominent when one considers Δ_2 together with Δ_0 and Δ_1. This, in particular, is observed to be reasonably valid for a number of states in the urban areas. Thus, the application of discrimination indices following Foster *et al.* (1984) and Del Río *et al.* (2011), together with the O–B decomposition, is shown to provide a fuller analysis of gender discrimination in household educational expenses.

Households' decisions to allocate fewer resources to meet educational expenditure for females are likely to be influenced by the differential returns to such investment for males and females. The explanations for this differential treatment are not investigated here. Although MPCE, the size of the household, its educational status and the religion and social group of the household are found to be significant determinants of its spending on education, the effect of these factors on gender discrimination has not been studied here.

Gender discrimination in the intra-household allocation of educational expenditure creates serious impediments to the educational attainments of female members. This is likely to affect India's overall literacy, and in the long run, it will hamper India's economic development. More and more women are now joining the workforce, and there is, therefore, an urgent need to enhance women's skills and knowledge, which can be achieved through adequate education. Since gender bias towards male members in the allocation of households' resources is strongly embedded in Indian culture, concerted efforts need to be initiated to raise awareness of the importance of providing equal status to women in society.

Notes

[1] Although the GDP growth rate slowed considerably (to 6.7%) in 2008–2009, it has started showing signs of recovery and the latest figures released by the Central Statistical Office (formerly the Central Statistical Organization) pegs India's GDP growth rate during 2009–2010 at 7.4% (2004–2005 prices).

[2] According to report no. 6 "State of Literacy" based on the Provisional Population Total, Census 2011, the male–female literacy gap in 1951 was about 18.30, falling to 16.68 in 2011. Overall literacy in 2007–2008 was 64.5% and was 72.1% and 56.3% for the male and female population, respectively (Statement 20, State of Literacy, Provisional Population Total, Census 2011).

[3] The head and the spouse of the head of the household are assigned scores according to his/her educational qualifications following the criteria adopted in the 64th round of NSS: not literate *-1;*

literate without any schooling: *2;* literate without formal schooling*: through NFEC/AIEP -3, through TLC/AEC -4, others -5;* literate with formal schooling including *EGS*: *below primary -6, primary -7, upper primary/middle -8, secondary -10, higher secondary -11, diploma/certificate course -12, graduate -13, postgraduate and above -14.* The two scores are then added to arrive at a measure of the variable representing the overall educational status of the household.

[4] The results of the OLS as well as quantile regression demonstrate that household spending for male members in rural India is around 10% more than the expenditure incurred for female members, and this appears to be true for urban India also. However, gender bias in household educational expenditure has been found to be more prevalent in rural areas of the states when compared using the relative measure of discrimination. The OLS estimates for incidence of gender discrimination (Δ_0) for rural and urban India (98.23% and 97.67%, respectively) are observed to be marginally higher than those in the QR method (93.33% and 95.66%, respectively). The OLS estimates of Δ_1 for rural and urban sectors are, respectively, 10.98% and 9.81%.

[5] Appendix Tables A3 to A15 are available in the online version of this article.

[6] Chaudhuri & Roy (2006) examined the gender gap in educational expenditure in two backward North-Indian states, Bihar and Uttar Pradesh, using the data from the Living Standard Measurement Survey conducted in 1997–1998.

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Appendix

Table A1. Discrimination indices by educational status of parents

	Rural			Urban		
Educational status of parents	Δ_0	Δ_1	Δ_2	Δ_0	Δ_1	Δ_2
Both illiterate	99.28	14.49	2.32	99.63	14.91	2.30
One literate without any schooling and other illiterate	94.82	12.61	1.86	98.81	14.29	2.13
Both literate but without any schooling	96.40	12.59	1.91	97.92	13.92	2.01
One primary and the other literate without any formal schooling	94.49	10.00	1.25	97.65	10.61	1.22
Both qualified below primary level	90.65	8.58	0.98	99.10	9.72	1.04
One qualified below primary and the other primary	89.62	8.10	0.88	98.63	9.73	1.05
Both qualified primary level	90.09	8.05	0.87	97.90	9.16	0.94
One qualified middle and the other primary	89.27	7.95	0.86	96.09	8.53	0.84
Both qualified middle level	87.96	7.80	0.83	94.49	8.45	0.84
One qualified primary and the other secondary	91.62	7.91	0.83	96.42	8.73	0.87
One qualified middle level and the other secondary	84.51	7.53	0.80	94.21	8.65	0.87
One qualified middle level and the other higher secondary	86.05	7.57	0.82	91.06	7.94	0.78
Both qualified secondary	84.91	7.30	0.77	94.39	8.34	0.82
One qualified secondary and the other higher secondary	83.10	6.96	0.72	91.49	7.76	0.72
Both qualified higher secondary	84.06	6.92	0.73	93.93	7.86	0.74
One diploma holder and the other qualified higher secondary	81.82	6.51	0.61	92.95	7.82	0.72
Both diploma holder	78.26	6.43	0.63	90.70	7.58	0.70
One graduate and the other diploma holder	73.97	5.87	0.57	92.23	7.65	0.70
Both graduate	77.08	6.24	0.62	91.61	7.17	0.61
One graduate and the other postgraduate	79.63	6.22	0.57	92.28	7.26	0.62
Both above postgraduate	92.86	7.56	0.75	93.96	7.15	0.58
All	93.33	9.69	1.42	95.66	10.65	1.06

Table A2. OLS and quantile regression estimates for educational expenditure

Explanatory variable	Females							Males						
		QR at percentiles							QR at percentiles					
	OLS	5	25	45	65	75	95	OLS	5	25	45	65	75	95
Rural														
LMPCE	1.026	0.991	0.973	0.954	0.980	1.034	1.101	1.029	0.957	0.947	0.963	1.014	1.061	1.109
Lsize	−0.834	−0.768	−0.818	−0.816	−0.816	−0.851	−0.896	−0.782	−0.669	−0.726	−0.739	−0.791	−0.837	−0.874
Ledu	0.197	0.204	0.187	0.178	0.182	0.190	0.203	0.163	0.158	0.149	0.155	0.157	0.155	0.173
age	0.156	0.203	0.183	0.167	0.152	0.141	0.101	0.155	0.196	0.178	0.164	0.149	0.138	0.108
Dsg	−0.101	−0.106	−0.076	−0.062	−0.088	−0.112	−0.160	−0.156	−0.170	−0.133	−0.114	−0.142	−0.163	−0.229
Dht	−0.028	−0.040	−0.025	−0.020	−0.023	−0.025	−0.032	−0.021	0.003	−0.008	−0.018	−0.025	−0.028	−0.026
Drlg	−0.198	−0.089	−0.205	−0.227	−0.232	−0.223	−0.161	−0.142	−0.062	−0.159	−0.157	−0.187	−0.180	−0.067
Constant	−2.119	−4.184	−2.614	−1.749	−1.308	−1.299	−0.443	−2.080	−3.975	−2.401	−1.814	−1.451	−1.322	−0.501
R^2 or pseudo R^2	0.458	0.228	0.268	0.253	0.289	0.286	0.256	0.456	0.220	0.268	0.283	0.286	0.282	0.265
Observations	26 543							33 547						
Urban														
LMPCE	1.161	1.128	1.222	1.220	1.165	1.117	0.985	1.165	1.226	1.264	1.228	1.131	1.079	0.970
Lsize	−1.008	−0.880	−1.112	−1.122	−1.048	−1.005	−0.835	−0.985	−1.036	−1.086	−1.039	−0.982	−0.931	−0.837
Ledu	0.323	0.290	0.353	0.326	0.297	0.292	0.281	0.287	0.303	0.315	0.293	0.273	0.272	0.250
age	0.075	0.118	0.081	0.064	0.057	0.058	0.067	0.078	0.107	0.080	0.068	0.059	0.061	0.080
Dsg	−0.210	−0.230	−0.216	−0.250	−0.204	−0.213	−0.133	−0.268	−0.310	−0.275	−0.284	−0.285	−0.259	−0.209
Dht	0.060	0.070	0.046	0.059	0.055	0.056	0.030	0.042	0.032	0.038	0.026	0.026	0.031	0.030
Drlg	0.041	0.011	0.047	0.055	0.040	0.047	0.068	0.077	0.065	0.076	0.098	0.066	0.071	0.117
Constant	−2.411	−4.590	−3.494	−2.625	−1.614	−1.031	0.545	−2.288	−4.876	−3.650	−2.623	−1.223	−0.667	0.666
R^2 or pseudo R^2	0.474	0.251	0.276	0.287	0.288	0.289	0.310	0.467	0.247	0.274	0.278	0.280	0.283	0.319
Observations	15 599							18 446						

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