

The Differential Effects of the Determinants of Household Education Expenditure in India : Quantile Regression Estimation

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Abstract

Despite substantial government expenditure on education, scholarships, and financial aid to students to provide affordable education, the household education expenditure on children is sizable and varies widely on account of gross differences in the socioeconomic, demographic, religious, and cultural factors. This paper attempted to identify such determinants and analyze the differential effects of the determinants of household education expenditure on children in India using the 2014 NSSO 71st Round survey data by applying the quantile regression method. Unlike the standard regression method, the quantile regression method allows estimation beyond the average effects at different points of the distribution of household expenditure on education. The quantile regression estimates revealed that low-income households were more sensitive to changes in household income and government programmes than upper-income households. The proportion of household income spent on the education of children increased more in the lower quantiles than in the higher quantiles. Gender bias existed at the lower quantiles and was considerably less at the higher quantiles. The SC/ST households spent less than the non-SC/ST communities at the lower quantiles and the difference got reduced at higher quantiles. Compared to scholarships, the provision of educational materials had a higher impact on household education expenditure. More children from lower quantiles attended government institutions, and a substantial difference existed in household education expenditure between the students attending government and private educational institutions. Despite government policies and programmes for affordable education, the study observed that the lower-income households still incurred a considerable proportion of their income on the education of their children.

Keywords : household education expenditure, socioeconomic determinants, differential effects, gender bias, quantile regression

JEL Classification : B23, C21, C31, C61, H52, I22

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The essence of human development is education that is a significant factor in balancing the socioeconomic fabric of a country. Quality education is the main foundation for furthering knowledge, discoveries, innovation, and entrepreneurship that triggers growth and prosperity of an individual as well as of a nation. Therefore, both individuals and governments invest heavily in education. Individual investment refers to the investment made by the students and/or their parents on their education and is referred to as the household investment in education or private expenditure on education. The government's investment in education is mostly on institutional investment and is referred to as government or public investment in education. Both public and household investments in education are highly significant not only because of their magnitudes, but also because of their nature and characteristics. While public investment provides educational facilities, only

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Table 1. Distribution of Students in Education in India by Gender (%)

Education Stream	General Education		Education Stream	Technical/Professional Education	
	Male	Female		Male	Female
Upto Class 10 th	54.2	45.8	Medicine	35.3	64.7
Humanities	49.9	50.1	Engineering	75.2	24.8
Science	59.5	40.5	Management	62.3	37.7
Commerce	56.6	43.4	Law	63.9	36.2
Others	51.1	48.9	Vocational	82.8	17.2

Source : Author's calculations from NSSO (2014).

household investment enables its utilization. Though at lower levels of education, considering its publicness, the public expenditure needs to be higher than the household expenditure ; the pattern gets reversed at the higher levels of education. However, either in the absence of adequate government expenditure in school education and/or the ability of the households to pay for school education necessitates the substitutability between the two sources of expenditure on education.

Recognizing that a good start or foundation is essential in strengthening higher education, India has made significant progress with the goal of 'education for all' over the years through various government policies and programmes. The public expenditure on education in India for 2013 – 2014 stood at 4.3% of the GDP. The adult literacy rate in India increased from 61% to 69.5% during the period from 2001– 2011. The 71st Round of the National Sample Survey Office estimated the literacy rate (age 5 and above) of 76%, 71% in rural, and 86% in urban India for the year 2014. In India, as of 2014–2015, the number of recognized schools, universities, colleges, and stand-alone institutions stood at 1,516, 865, 760, 38,498 and 12,276, respectively. The gross enrolment ratio (GER) was 101.4, 89.3, 62.5, and 23.0, respectively for primary, lower secondary, higher secondary, and tertiary education. Despite the various measures taken by the governments and vast improvements, the Indian educational system has not managed to increase the proportion of individuals from the higher secondary level.

In India, as of 2014, free education was offered to nearly 60% of the students at the primary and upper primary level and 40% of students at the secondary and higher secondary level. In government institutions, 94% and 89% of students studying at the primary level, respectively in rural and urban areas were getting free education. The average private expenditure of education in 2014 was ₹ 6,788 per student for general education and ₹ 2,781 for vocational education. The private expenditure on general primary education was ₹ 4,610, upper primary was ₹ 5,386, secondary education was ₹ 7,459, higher secondary was ₹12,619, graduate education was ₹ 13,478, and post graduate education was ₹ 15,999 per student. The private expenditure on medical education was ₹ 64,968 and that of engineering education was ₹ 42,401 on average. Course fee accounted for 46% of the private expenditure on general education and 73% of the private expenditure. There are substantial variations across regions, locations, community, institutions, and gender in private education expenditure in India.

Table 1 presents the gender-wise distribution of students in various educational streams in India. It can be observed that the majority of students were males and were in science and commerce courses. In technical education, the participation of female students was significantly relative to males ; naturally, only medicine including nursing had a better proportion of female participation.

Table 2 presents the distribution of students by institutions and residence. It is observed that the majority of the students, predominantly up to higher secondary levels, were in government institutions in rural areas ; in urban areas, about 69% of the students attended private (aided and unaided) institutions even at the primary level. This trend of private institutional dominance was followed at the higher secondary level also in comparison to the rural sector.

Table 2. Distribution of Students in Education in India by Institution (%)

Institution	Rural	Urban	Rural & Urban	Rural	Urban	Rural & Urban
	Primary			Upper Primary		
Government	73.2	30.9	62.0	75.8	38.0	66.0
Private Aided	5.0	17.5	8.1	7.9	20.2	11.1
Private Unaided	22.5	51.4	29.7	16.2	41.5	22.8
	Secondary & Higher Secondary			Graduation and Above		
Government	63.5	37.5	55.8	47.9	38.0	43.5
Private Aided	15.5	25.6	18.5	22.5	28.0	24.9
Private Unaided	20.9	36.5	25.5	29.1	33.5	31.1
	Diploma and Certificate					
Government	35.6	28.9	32.8			
Private Aided	24.7	29.6	26.8			
Private Unaided	39.3	40.5	39.8			

Source : Author's calculations from NSSO (2014).

The lack of significant progress in Indian education is widely explained in terms of financial constraints both public and private resources and by the opportunity cost of time of the households. Though household investment in the education of children is influenced by a wide variety of factors, primarily households invest in education with the anticipation of economic and non-economic benefits from education. The economic benefits of education are measured familiarly in terms of internal rates of return to education. There are several other household characteristics such as income, religion, community, household size, parental education and occupation, place of residence, etc. There are also a host of social, cultural, demographic, and other environmental factors that influence the quantum of expenditure that households make in the education of their children. The supply-side factors like nearness of educational institutions, type of institutions, type of courses pursued by the pupil, fee structure, and placement facilities also have an impact.

Empirical research on the determinants of household expenditure on education in India is very limited, especially research examining the differential effects of the determinants of household expenditure on education is extremely scanty. The lack of empirical studies on household expenditures on education, more specifically on determinants of household expenditures on education and their differential effects in India warrant a deeper study in a period when public budgets for education are dwindling, and household and private finances are cast as alternative avenues. This paper tries to identify the determinants of and their heterogeneous effects on household expenditure on the education of children in India. In order to estimate the differential effects of the factors on the quantum of educational expenditure at different points of the household education expenditure distribution, this paper follows the quantile regression method. The quantile regression estimation allows looking beyond the average effects and describes the whole conditional distribution of household expenditure on education in terms of the determining variables. The pattern of household expenditure on children's education is analyzed by gender, type of institution, type of courses, and household characteristics. The cross-section data of the 71st Round (January – June 2014) NSSO survey were used in the empirical analysis.

Review of Literature

Generally, at the household level, the private expenditure on education is influenced by a wide variety of socioeconomic and demographic factors. It has been widely recognized that the household decision-making for investment in education can be understood at least partly in terms of economic factors. However, there is

not much research on the extent of household expenditure on education and determinants of household expenditure on education due to limited information on household expenditure, especially in developing countries including India.

Rajalakshmy (2012) outlined the problems of higher education in India in the context of globalization and the entry of the private sector in higher education in India. The study found that higher education spending has not increased commensurately with the requirements of global standards and needs in India. The study emphasized the crucial role of the public sector in the face of resource crunch in facilitating equity and inclusive growth and the provision of research, vocational, and quality education. The coordination of the private sector with the public sector is important to fill the gaps in higher education, especially with respect to excellence and high-quality education. Public-private participation should also improve the monitoring and regulating aspects to improve quality education to make India a world-class educational hub.

At the macro level, Chatterji et al. (2015) analyzed the determinants of per capita education expenditure of State governments in India during 2000–2010. The states of Bihar and Madhya Pradesh spent the lowest on education, while Kerala and Himachal Pradesh were found to be the high performing states. Quantitative analysis showed that richer states spent more on education as compared to the poorer states. A lower share of child population and higher tax revenue and grants from the central government significantly enhanced the education expenditure of the states.

Khan (2013) observed that though the public expenditure on education in Karnataka increased at an annual growth rate of 29.8% in nominal terms accounting for 2 – 4% of net state domestic product, in real terms, public expenditure on education in Karnataka had decreased significantly over time.

Jana and Maiti (2019) analyzed state-wise disparity in public expenditure on higher education in Indian states. The study noted that the budgetary allocations to higher education have squeezed in the post-economic reform era since 1991, and are less than 1% of the gross domestic product in India. The elasticity of higher education expenditure to gross state domestic product in many Indian states is less than unity.

At the household level, Tilak (1996), analyzing the NSSO data on household expenditure on education, found that households incurred large sums of money on education, even on primary education. The public provision of financial and material incentives is available only to a small fraction of pupils in India. There exist large scale inter-state and inter-group variations in several aspects of public provision of incentives and the levels of household education expenditure.

Tilak (2002) investigated the determinants of family expenditure on education using the 1994 NCAER survey data on human development in rural India, supplemented by other sources. The elasticity of household expenditure on education to changes in household income on the one hand and the government expenditure on education on the other for different groups of the population were calculated. The results showed that household expenditures on education are sizeable and there is nothing like free education in India. Households from even lower socioeconomic strata, SC/ST, low-income groups – all spend considerable amounts on acquiring education. Also, households were not found to discriminate much against spending on girls' education. However, substantial differences existed in household expenditures between children attending government schools, government-aided schools, and private schools. Among the determinants of household expenditure on education of children, household characteristics, particularly household income and the education level of the head of the household were important. Further, the coefficients of elasticity showed that government expenditures and household expenditures did not substitute each other, instead, they complemented each other.

Ota and Moffatt (2007), using micro-data from a field survey of children in rural Andhra Pradesh, attempted to identify the key factors that influenced the decision on schooling, a binary choice. The focus was on the effects of sibling competition within the household with a hypothesis that the child's position within the household is the key to capturing sibling rivalry. The many factors that affected the schooling decision were grouped into three sets of variables : characteristics of the child, characteristics of the household, and features of the community in which

the child lives. The probit estimates of the schooling decision showed that the child's characteristics, age, and gender were the most important determinants of the schooling decision. The first-born children were less likely to attend school irrespective of gender, controlling for age. The presence of elder sisters increased the probability of schooling ; whereas, the presence of younger brothers decreased the probability of attending school. The boys competed within the same sex, while girls faced double competition.

Motiram and Osberg (2012) analyzed school attendance and the total time spent in acquiring human capital (time in school plus travel time plus in-home instructional time) using the 1998–99 India time use survey and the 7th All India School Educational Survey. The estimated probit and selectivity bias correction regression estimates indicated that the inequality in human capital investment time in rural India could be explained more by the poor quality and availability of schooling to potential students than by parental education, income, or barriers of SC/ST background.

Steinberg (2015) studied the impact of NREGA, one of the largest workfare programs in the world introduced in 2008, on human capital outcomes of children aged 5–16 years. The paper used the data of the NGO Pratham's survey on the educational achievement of primary school children in India for cognitive testing, the Annual Status of Education Report (ASER) for 2005 – 2009, and the data from the NSSO Rounds 60, 61, 62, 64, and 66 collected between 2004 and 2009. The results showed that children scored significantly low in mathematics and reading tests and more children were likely to drop out and less likely to both attend and be on track in school once the NREGA enters their district, primarily caused by increases in the opportunity cost of schooling for children. These results were primarily driven by children aged 13 – 17 years, which is precisely the age group that is most likely to enter the labour market. Though the results on human capital were similar for both boys and girls, girls were more likely to substitute for their mothers in domestic work, while boys were more likely to work outside the home for pay.

Sarkar (2017) examined the determinants of household expenditure on higher education in India using the 64th Round National Sample Survey unit-level data. The study found gender bias in the household expenditure on higher education. Parental education and household income were the important determinants of household educational expenditure along with the community background. Households belonging to the backward caste groups spent less than the general category households.

Chandrasekhar et al. (2019), using the 2013 and 2014 NSSO survey data, estimated that urban households in India spent 18.4% of their total expenditure on higher education ; whereas, in rural areas of India, 15.3% of total household expenditure was on higher education. The share of higher education expenditure in the mean annual household expenditure was 27% in rural and 30% in urban India. The share of higher education expenditure in household expenditure was larger in rural south Indian states, where the enrollment in technical education in private unaided institutions was higher. The average household education expenditure per student was ₹ 36,063 in rural and ₹ 49, 690 in urban south India.

In another developing country context, Bayar and Ilhan (2016) examined the determinants of education expenditure of Turkish households using 2002, 2010, and 2013 Household Budget surveys. The paper especially estimated the effects of different income groups on the education expenditure by the Tobit method. The estimated results showed that higher household income levels were associated with higher educational expenditure; higher income groups spent more on education, and the poor spent less on education. Also, parents with higher human capital spent more on their children's education; families whose household heads and mothers had higher education level were likely to invest more in education than the others. The paper observed that not only intergenerational educational mobility, but also intergenerational income mobility was low in Turkey.

Data and Methodology

The data used to analyze the household expenditure on education were derived from the 71st Round NSSO

(January – June 2014) data. The NSSO 71st Round covered a sample of 36,479 households from 4,577 villages in rural India and 29,447 households from 3,720 blocks in urban India. The stratification of the households was on the basis of having any student (aged 5–29 years) currently attending formal education at primary level or above. The NSSO data contains information on the participation of individuals aged 5–29 years in pursuit of education in the country during the period from January – June 2014, the extent of use of educational infrastructure, facilities, and incentives provided by the government and private sectors and their impact on current attendance status of the population in the educational institutions ; the private expenditure incurred by households on education ; and the extent of educational wastage in terms of dropping-out and discontinuance and its causes. For each student in the survey household, the private expenditure on payment of course fees, including tuition fees, examination fees ; purchase of books, stationery, and uniforms ; expenses on conveyance, private coaching, etc. are related to the current academic session of study of a student for the basic course.

Panel Quantile Regression Method

In the empirical estimation of the household expenditure on education, this paper follows the quantile regression method. The classical linear regression model estimates only the conditional mean response of the outcome variable $E(y/x)$ to each fixed value of the covariates. The conditional mean model cannot be extended to non-central locations of the response variable. It restricts the effect exclusively on the specific location of the outcome variable : conditional distribution and does not capture the differential impact of the covariates at other locations across the different levels of the outcome variable. The quantile regression extends the linear regression approach allowing effects to differ at different locations of the conditional distribution of the outcome variable. The quantiles are cut points where a sample is divided into equal-sized, two or more subgroups. The 50th quantile is also the median value, one that describes the central location of a distribution. The θ^{th} quantile denotes the value of the response below which the proportion of the population is p and above which the proportion of the population is $(1-p)$. The quantile regression estimates the conditional quantile functions. In analogy with classical linear regression methods which are based on minimizing sums of squared residuals and meant to estimate models for conditional mean functions, the quantile regression method is based on minimizing asymmetrically weighted absolute residuals giving differential weights to positive and negative residuals and intend to estimate conditional median function and a full range of other conditional quantile functions. While the ordinary least squares minimize the sum of the squares of the errors, $\sum u_i^2$, the quantile regression minimizes $\sum \theta |u_i| + \sum (1-\theta) |u_i|$ a sum that gives the asymmetric penalties $\theta |u_i|$ for underprediction and $(1-\theta) |u_i|$ for overprediction.

In the quantile regression model introduced by Koenker and Bassett (1978) as an extension from the notion of ordinary quantile to a more general class of linear models, the conditional quantiles have a linear form. The quantile regression model is specified as :

$$y_i = \beta_0 x_i + u_{0i} \quad \theta \in (0,1) \quad (1)$$

where, θ denotes the quantiles. The θ^{th} unconditional quantile is obtained by optimizing :

$$\text{Min} \sum \rho_{\theta}(y_i - u_{\theta}) \quad (2)$$

where, the function $\rho_{\theta}(\cdot)$ is the absolute value function. Given a random sample of observations, estimates of conditional quantile functions are obtained by solving :

$$\text{Min} \sum \rho_{\theta} [y_i - u(x, \beta)] \quad (3)$$

The resulting minimization problem is formulated as a linear function of the parameters and is solved by the linear programming methods (Koenker & Hallock, 2001).

Consider a real-valued random variable y characterized by the distribution function :

$$f(y) = P(y \leq y_0) \quad (4)$$

Then, the θ^{th} quantile of y is defined as :

$$Q_\theta = \inf[y : f(y) \geq \theta] \quad (5)$$

Given a set of regressors, x_i , the quantile regression can be specified as :

$$f_\theta = (\theta - \beta_\theta x_i | x_i) = P(y_i < \theta | x_i) \quad (6)$$

which is essentially a different form of equation (5), where the distribution of the error term $u_{\theta i}$ is unspecified and the only constraint being the quantile restriction :

$$Q_\theta(u_{\theta i} | x_i) = 0 \quad (7)$$

The estimate of conditional mean function is specified as :

$$\hat{\beta} = \arg \min_{\beta} \sum_{i=1}^N (y_i - \beta x_i)^2 \quad (8)$$

The linear conditional quantile function is specified as :

$$Q_y(\theta | x_i = x_0) = \beta_\theta x_i \quad (9)$$

which can be estimated by solving the equivalent of expression :

$$\hat{\beta}_\theta = \arg \min_{\beta} \sum_{i=1}^N \gamma_\theta(y_i - \beta x_i) \quad (10)$$

where, $\rho_\theta(u)$ is the so-called check function defined as :

$$\rho_\theta(u) = \begin{cases} \theta u & \text{if } u \geq 0 \\ (\theta - 1)u & \text{if } u < 0 \end{cases} \quad (11)$$

Assuming that y is linearly dependent on a vector of exogenous variables x , the conditional quantile function can be specified as :

$$Q_y(\theta | x_i) = \min[\Sigma \theta | y_i - u_\theta | + \Sigma (1 - \theta) | y_i - u_\theta |] \quad (0 < \theta < 1) \quad (12)$$

The expanded version of the quantile regression is specified as :

$$\min_{\beta} [\sum_{i: y_i \geq \beta x_i} \theta | y_i - \beta x_i | + \sum_{i: y_i < \beta x_i} (1 - \theta) | y_i - \beta x_i |] = \min \sum \rho_\theta(y_i - u_{\theta i}) \quad (13)$$

For a unit change in a regressor, the marginal effect is the coefficient for the θ^{th} quantile :

$$\frac{\partial Q_y(\theta | x_i)}{\partial x_i} = \beta_0 \quad (14)$$

Thus, a quantile regression parameter β_0 estimates the change at the specified quantile of the response variable y produced by a unit change in the independent variable x , that is, the marginal effect.

The empirical quantile regression equation for estimating the effects of the determinants on the private household education expenditure is specified as :

$$\begin{aligned} InHHEDExp = & \beta_0 + \beta_1 HHIncome + \beta_2 Age + \beta_3 Gender + \beta_4 Mother Education + \\ & \beta_5 Residence + \beta_6 Community + \beta_7 Religion + \beta_8 Father Occupation + \\ & \beta_9 Coursestudying + \beta_{10} Educationinstitution + u_i \end{aligned} \quad (15)$$

Empirical Analysis and Results

Table 3 presents the average private expenditure on education for different levels of education and different types of institutions. It is observed that with an increase in the level of current attendance, the expenditure on education increases. The rural-urban difference narrows down at higher levels of general education. At the primary level, education expenditure in urban areas is more than four times that in rural areas. At the graduation and post-graduation levels, the average expenditure on female students is more than their male counterparts in rural areas. The average expenditure for different levels of study in different types of institutions shows a

Table 3. Average Private Expenditure on Education in India (₹ Per Student)

Educational Level	Rural				Urban			
	General Education		Technical/Professional		General Education		Technical/Professional	
	Male	Female	Male	Female	Male	Female	Male	Female
Primary	3,061	2,512	-	-	10,604	9,489	-	-
Upper Primary	3,603	2,813	-	-	11,864	10,940	-	-
Secondary	5,568	4,534	29,861	14,200	13,781	13,284	16,500	18,000
Higher Secondary	9,820	8,012	7,383	5,446	21,681	18,442	24,703	13,521
Graduate	11,306	11,813	59,979	62,201	17,480	16,161	82,298	77,224
Post Graduate	13,017	16,715	50,067	56,526	19,090	16,565	80,391	84,262
Diploma	15,209	10,706	61,515	45,621	23,040	21,249	70,189	70,990
All	4,854	4,042	-	-	13,426	12,323	-	-
	Government		Private Aided	Private Unaided	Government		Private Aided	Private Unaided
Primary		965	6,452	7,907	2,149	11,881		14,242
Upper Primary		1,605	6,013	9,514	3,356	12,074		18,553
Secondary		3,328	5,896	11,222	5,540	14,096		21,565
Higher Secondary		6,056	10,803	13,988	9,668	20,066		30,810
Graduate		8,753	11,730	17,093	11,560	16,993		26,380
Post Graduate		11,403	14,224	25,372	13,580	20,978		29,661
Diploma		10,603	14,935	20,976	12,184	19,059		46,445
Upto X		1,552	6,140	8,807	3,291	12,487		16,536
Humanities		6,666	8,619	11,044	8,725	11,345		16,758

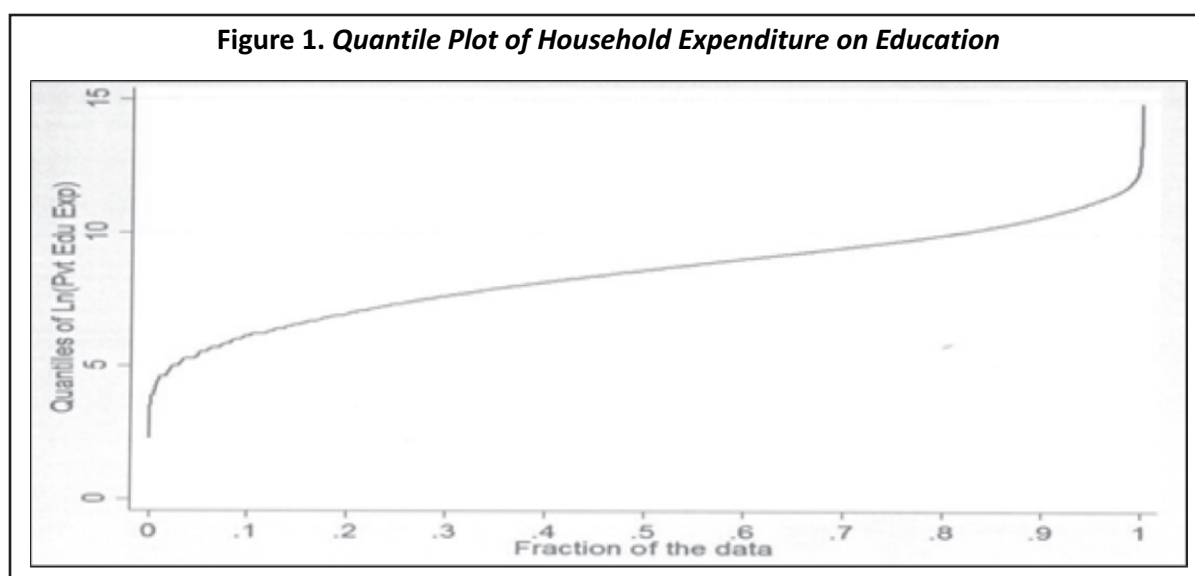
Science	9,302	15,594	18,828	14,489	24,419	37,158
Commerce	7,592	14,814	21,397	11,586	15,254	28,573
Medicine	57,292	76,383	91,391	72,636	99,468	148,510
Engineering	40,828	61,516	69,439	43,418	74,291	83,448
Management	39,511	60,548	69,473	46,050	62,124	121,150
IT/Computer Science	27,094	36,401	43,453	29,718	54,976	59,626
ITI/Vocational	13,675	30,872	30,598	14,508	33,567	39,166

Source : NSSO (2014).

Table 4. Average Private Expenditure on Education per Student by Quantile Class

Education Level	Rural					Urban				
	1 st Quantile	2 nd Quantile	3 rd Quantile	4 th Quantile	5 th Quantile	1 st Quantile	2 nd Quantile	3 rd Quantile	4 th Quantile	5 th Quantile
General Education										
Primary	1,027	1,667	2,462	3,375	7,595	3,465	6,213	9,095	14,936	28,658
Upper Primary	1,281	1,950	2,793	3,241	8,044	3,677	6,436	8,754	15,659	30,211
Secondary	2,801	3,573	4,260	4,675	9,618	5,417	8,010	9,829	15,759	30,815
Higher Secondary	5,095	6,596	7,681	8,205	13,353	7,472	9,869	13,548	20,588	38,663
Graduate	6,868	8,539	9,258	10,357	15,577	8,672	10,063	13,470	16,019	27,761
Technical/Professional Education										
Higher Secondary	4,254	3,977	5,991	5,841	11,170	8,826	14,456	17,009	20,545	30,019
Graduate	26,209	25,156	30,784	50,500	73,051	43,110	63,788	54,023	66,250	94,299
Post Graduate	48,650	41,204	38,953	30,850	61,507	23,553	51,557	49,376	55,821	100,798
Diploma (Graduate)	45,652	29,021	43,940	52,812	63,071	40,379	37,950	70,566	49,541	88,249

Source : NSSO (2014).



substantial huge difference. At all levels of education, both in rural and urban areas, the household educational expenditure is invariably higher at private aided and unaided institutions than government institutions. Even at the primary level, the average educational expenditure is about six times higher even in private aided schools and seven times higher in private unaided institutions both in urban and rural sectors.

Table 4 presents the average private expenditure on education for different levels of education by income classes. It is to be noted that higher income classes both in rural and urban areas incur higher levels of education expenditure in both rural and urban areas and for all levels and types of education. The top income quantile classes spent more on the technical and professional education of their children.

The quantile regression estimation in this paper captures the effects of the determinants of private household education expenditure at different quantiles along with its distribution. The quantiles considered in this paper are the 10th, 25th, 50th, 75th, and 90th quantiles. Figure 1 shows the quantile regression plots of household expenditure on education. The graph shows that the distribution of the private/household expenditure on education varies at the tails of the expenditure distribution where the expenditure is at the extremes. This is the reason to use quantile regression to study the determinants of private expenditure on education across the entire distribution for a given set of regressors.

Table 5 presents the descriptive statistics of all variables used in the study. Table 6 presents the OLS and the quantile regression estimates of household expenditure on education per student. The *R*-square and Pseudo *R*-squares values indicate better explanatory power of the included variables in explaining the variations in private education expenditure across households in India. It is also to be noted that almost all the regression

Table 5. Descriptive Statistics of Variables

Variable	Description	Mean	Std. Dev.
<i>InHHEDExp</i>	Per capita private household expenditure on education (₹).	8.476	1.713
<i>InPCE</i>	Per capita consumption expenditure, a proxy for household income (₹).	9.860	0.612
<i>Age</i>	Age (years).	13.80	5.06
<i>MEducation</i>	Mother's education (years).	7.09	5.08
<i>Male</i>	If male = 1, 0 otherwise.	0.56	0.49
<i>Rural</i>	If rural = 1, 0 otherwise.	0.57	0.49
<i>FSelfEmp</i>	If father is self-employed = 1, 0 otherwise.	0.53	0.49
<i>Hindu</i>	If Hindu = 1, 0 otherwise.	0.79	0.40
<i>SC/ST</i>	If SC/ST = 1, 0 otherwise.	0.30	0.46
<i>School10</i>	If attending upto class X = 1, 0 otherwise.	0.66	0.47
<i>Commerce</i>	If studying in commerce or humanities streams = 1, 0 otherwise.	0.13	0.33
<i>Science</i>	If studying in science streams = 1, 0 otherwise.	0.06	0.24
<i>Professional</i>	If studying in medicine or engineering streams = 1, 0 otherwise.	0.07	0.26
<i>Vocational</i>	If studying in vocational streams = 1, 0 otherwise.	0.03	0.18
<i>GovtSchool</i>	If studying in government institution = 1, 0 otherwise.	0.53	0.49
<i>EngMedium</i>	If English medium education = 1, 0 otherwise.	0.41	0.49
<i>InsChange</i>	If change of education institution = 1, 0 otherwise.	0.17	0.37
<i>Scholarship</i>	If receiving scholarship = 1, 0 otherwise.	0.18	0.38
<i>Aid</i>	If received books and stationary = 1, 0 otherwise.	0.03	0.18
Obs.	93,446		

Table 6. Quantile Regression Estimates of Household Education Expenditure in India

Variable	Dependent Variable : <i>ln(HHEDExp)</i>					
	OLS	Q10	Q25	Q50	Q75	Q90
<i>lnPCE</i>	0.601*** (0.006)	0.625*** (0.011)	0.631*** (0.009)	0.612*** (0.008)	0.573*** (0.007)	0.550*** (0.008)
<i>Age</i>	0.082*** (0.001)	0.082*** (0.002)	0.079*** (0.001)	0.074*** (0.001)	0.070*** (0.001)	0.068*** (0.001)
<i>Meducation</i>	0.024*** (0.0006)	0.024*** (0.001)	0.023*** (0.0008)	0.023*** (0.0008)	0.023*** (0.0008)	0.068*** (0.0009)
<i>FSelfEmp</i>	0.039*** (0.006)	0.045*** (0.011)	0.049*** (0.011)	0.039*** (0.007)	0.044*** (0.007)	0.036*** (0.008)
<i>Male</i>	0.069*** (0.006)	0.083*** (0.011)	0.077*** (0.009)	0.067*** (0.007)	0.062*** (0.007)	0.056*** (0.008)
<i>Rural</i>	-0.163*** (0.007)	-0.170*** (0.013)	-0.150*** (0.010)	-0.150*** (0.008)	-0.153*** (0.008)	-0.141*** (0.009)
<i>Hindu</i>	0.084*** (0.008)	0.108*** (0.014)	0.094*** (0.001)	0.091*** (0.009)	0.093*** (0.009)	0.110*** (0.010)
<i>SC/ST</i>	-0.135*** (0.007)	-0.180*** (0.013)	0.156*** (0.010)	-0.128*** (0.008)	-0.103*** (0.008)	-0.095*** (0.009)
<i>School10</i>	-0.591*** (0.018)	-0.290*** (0.033)	-0.455*** (0.023)	-0.654*** (0.021)	-0.772*** (0.021)	-0.872*** (0.024)
<i>Commerce</i>	-0.358*** (0.016)	-0.087*** (0.031)	-0.234*** (0.024)	-0.409*** (0.020)	-0.561*** (0.019)	-0.669*** (0.022)
<i>Science</i>	-0.259*** (0.018)	-0.059 (0.034)	-0.180*** (0.027)	-0.331*** (0.022)	-0.412*** (0.022)	-0.468*** (0.025)
<i>Professional</i>	0.413*** (0.017)	0.663*** (0.033)	0.482*** (0.026)	0.349*** (0.021)	0.284*** (0.021)	0.247*** (0.024)
<i>Vocational</i>	0.014*** (0.021)	0.230*** (0.040)	0.086*** (0.031)	-0.023*** (0.026)	-0.080*** (0.026)	-0.120*** (0.029)
<i>GovtSchool</i>	-0.971*** (0.007)	-1.291*** (0.013)	-1.161*** (0.010)	-0.954*** (0.008)	-0.772*** (0.008)	-0.678*** (0.009)
<i>EngMedium</i>	0.679*** (0.007)	0.801*** (0.014)	0.741*** (0.011)	0.695*** (0.009)	0.648*** (0.009)	0.611*** (0.010)
<i>InsChange</i>	0.051*** (0.008)	0.061*** (0.015)	0.051*** (0.012)	0.055*** (0.010)	0.037*** (0.009)	0.026*** (0.011)
<i>Scholarship</i>	-0.190*** (0.008)	-0.239*** (0.015)	-0.193*** (0.012)	-0.195*** (0.010)	-0.178*** (0.009)	-0.145*** (0.011)
<i>Aid</i>	-0.737*** (0.007)	-0.941*** (0.032)	-0.922*** (0.025)	-0.799*** (0.021)	-0.596*** (0.021)	-0.383*** (0.233)
<i>Constant</i>	1.069*** (0.068)	0.408*** (0.127)	1.062*** (0.101)	2.051*** (0.082)	3.092*** (0.081)	3.829*** (0.092)
Pseudo R-square	-	0.461	0.483	0.483	0.479	0.480
R-square	0.71					
F-value	12996.91					

Note. Standard errors in parentheses. ***, **, * significant at the 1% level.

coefficients are statistically significant and in the expected direction. The empirical estimates show that household income, age of the child, male child, mother's education, father's occupation, Hindu religion, English medium education, change of institution, and professional education have positive effects ; whereas, below 10th education level ; rural background ; socially backward community ; government educational institutions ; science, commerce, and vocational subjects ; and scholarships and aid in the form of books and stationaries have a negative impact on household expenditure on education. In fact, the in-kind aid substantially reduces household expenditure on the education of children than the financial aid and scholarships. Households spent significantly on medical and engineering education and for English medium institutions. Rural households and SC/ST groups spent less on the education of children.

In the quantile regression estimates (Table 6), which describe the effects at different points of the distribution of household educational expenditure, a percentage increase in consumption expenditure monotonically decreases the education expenditure from 6.2% at the lower quantile to 5.5% at the higher quantile. This shows that the proportion of household income spent on education is higher at the lower quantile and is decreasing at the higher quantiles, a result similar to the findings in Turkey by Bayar and Ilhan (2016). The OLS regression coefficient of per capita consumption expenditure is also 0.60, showing that on an average, the households spent about 6% on the education of children with a 1% increase in the per capita household income.

The education of the mother has a positive and statistically significant effect on the household education expenditure and the effect is almost a constant 2% throughout the expenditure distribution, similar to the OLS result. The self-employment of the father also has a similar positive effect on higher education distribution. Irrespective of the quantiles, self-employed parents spent about 4% more relative to other occupations on the education of their children. Though households spent about 7% higher on the education of male children as compared to female children, the marginal effect declines throughout the education expenditure. At the 10th and the 25th quantiles, the gender coefficients are 0.082% and 0.077%, respectively and at the 75th and 90th quantiles, the gender coefficients are 0.062% and 0.056% , respectively. This shows that at the higher quantiles, the gender bias in educational investments is significantly low than the lower quantiles. Religion has a positive effect on private education expenditure. The estimated coefficients suggest that households belonging to the Hindu religion tended to spend nearly 8–10% more on the education of their children. The rural dummy has a negative sign and its impact is decreasing across the quantiles. The coefficients at 10th and 90th quantiles have a significant difference – about 3% – in spending than the middle quantiles. This shows that households in rural areas spent about 16% less on education compared to urban households and households in the lower quantiles in rural areas also spent considerably less on education than the rural households at the higher quantiles.

The social group dummy (SC/ST) has a negative effect but a decreasing trend across the quantiles. The scheduled caste/tribe households spent less than the other communities on education. The gap between the education expenditure of the two groups is narrow both at the higher quantiles compared to the lower quantiles, but at the middle quantiles, the gap is slightly larger. The OLS estimate of –0.135 shows that the SC/ST groups spent on an average 13% less than the non-SC/ST communities. These results imply that households at both ends of expenditure distribution were able to better utilize the benefits extended to the SC/ST students both at the lower and higher levels of education, especially the scholarships and tuition fees waiver schemes, especially in government institutions. These results are also confirmed by the negative coefficients of scholarship, aid provision, and government institution dummies. In fact, the effect of studying in government institutions and getting free books and stationaries are larger at all quantiles than the 1 – 2% effect of scholarships on reducing the household educational expenditure.

Though scholarships are given to non-SC/ST communities also by many state governments, like backward class scholarships, the number of beneficiaries and the amount of benefit are low and are restricted to poor and within certain limits, compared to SC/ST scholarships for which all SC/ST students are eligible. The scholarship dummy shows a negative effect on private expenditure on education, indicating the wards of

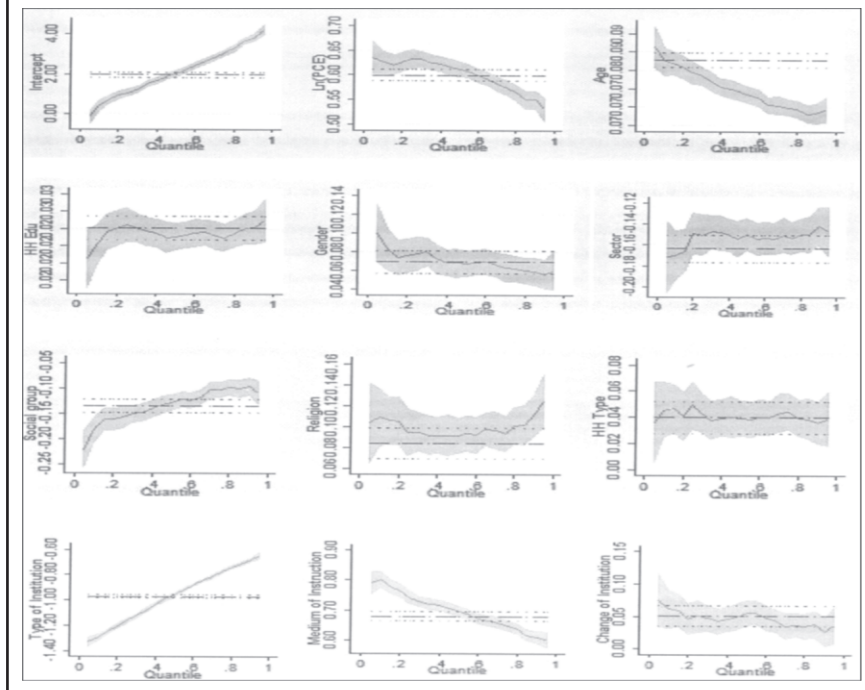
households who had scholarship spent less on education expenditure. It has a decreasing effect across the quantiles, a significant difference between the 10th and 90th quantiles from 2.4% to 1.4%. Thus, the scholarship schemes of the governments have more effect on the lower quantile than at the higher quantiles. Similarly, the in-kind aid dummy, free books and stationery provisions have a negative effect on the private expenditure on education, showing less need for the purchase of educational materials. There is a significant difference between the coefficients of the lower quantiles and the higher quantiles, from more than 90% at the 10th to about 80% at the median quantile to 38% at the 90th quantile. Similarly, the type of institution the student attends, that is, whether the student went to a government or a private institution matters. The household expenditure is significantly higher when the student is enrolled in a private institution and less if enrolled in a government institution. The regression coefficient of the dummy of enrollment in government institution is negative and has a decreasing impact across the quantiles. The OLS coefficient shows a significant 97% less expenditure in government institutions relative to enrollment in private educational institutions. At the 10th and 25th quantiles, the effects are larger, the coefficients being -1.29 and -1.16, respectively and at the 75th and 90th quantiles -0.95, -0.77, and -0.68, respectively, which are considerably less compared to the lower quantiles. Also, the increase in the proportion of the education expenditure in the government institution as the level of education increases is lesser compared to the proportion of education expenditure in private institutions. Hence, the students at the lower quantiles tend to enrol in government institutions and get the incentives and the students at the higher quantiles are likely to enrol mostly in private institutions and the incentives may not necessarily be available in private institutions (Tilak, 2002).

Among the other education-related variables, the English medium of instruction has a significant positive effect on the private education expenditure as compared to vernacular medium institutions and its effects are decreasing across the quantiles. The percentage amount spent was high in English medium institutions at the lower quantiles than at the higher quantiles, from 80% to 60%. Most of the English medium institutions are private educational institutions and hence they charge high fees and many of the government schemes for weaker sections are not available in these private institutions. However, at higher education levels, some benefits are available even to the meritorious poor students in the form of institutional concessions and the slightly better off households among the poor are able to tap these avenues. School education is less costly for households as its coefficients are negative – on average 60% – and increasing – from 30% to 80% – over the private education expenditure distribution. Obviously, such an education expenditure pattern shows that the students from the lower quantiles are mostly attending the government institutions and the students from the higher quantiles are most likely in private institutions.

In addition, the estimated coefficients of commerce, humanities, and science dummies show that the proportion of household education expenses incurred for commerce or humanities courses are lesser than the professional courses like medicine or engineering. The coefficients are decreasing over the quantiles. On an average, the household expenditure on these educational streams is lower by 25% to 35%. The professional education expenditure has a positive effect on private expenditure on education. The students who were pursuing medicine or engineering spent more than 40% on education than others. The coefficients of the quantiles have a decreasing trend across the quantiles. The proportion of education expenditure spent by the lower quantile households are almost 50% greater than the higher quantile households. The vocational education dummy has a positive effect at the lower quantiles and a negative effect from the median quantile. This implies that a significant number of students from the lower quantiles pursued vocational studies than children at higher quantiles of private/household educational expenditure.

Figure 2 plots the OLS and quantile regression coefficients of the determinants of private education expenditure across the distribution. The dotted lines are the OLS coefficients which are average and constant across the distribution of private education expenditure. The quantile regression coefficients plots show that the effect of the determinants on the educational expenditure of households is not the same across the distribution.

Figure 2. Quantile Regression Plots of the Determinants of Household Education Expenditure in India



Compared to the constant marginal effects of the OLS estimates, the plots of the marginal effects on expenditure on education show a continuous decline with an increase in income and age, and for the medium of instruction, below 10th school, science, professional, and vocation education streams of education. The plots of the effects of the social background, type of institution, scholarships, and aid for books and stationaries show a continuous rise in marginal effects and the plots of the male child, mother's education, father's self-employment, rural background, and change of institution coefficients reflect differential effects at different quantiles, crossing over the OLS coefficients generally at the median values. The quantile plots also show the opposite effects at the extreme ends of the educational expenditure distribution for income, age, gender, social group, institution type, medium of instruction, change of institution, scholarships and aid, and course of the study compared to the average OLS effects throughout the distribution.

To further investigate the gender and community differences in private expenditure on education in India, the quantile regression is estimated for male and female students and SC/ST and non-SC/ST communities separately. Table 7 reports the estimates for 10th and 90th quantiles for each of the sub-samples. The effect of household income on the educational expenditure of households is much higher at the lower quantiles compared to higher quantiles for both males and females as well as in SC/ST and non-SC/ST households. The self-employment of the father has a significant negative effect in non-SC/ST households ; whereas, its effect on educational expenditure is positive in SC/ST households. The non-SC/ST self-employed fathers spent less, almost double the amount, on education at the 10th quantile than at the 90th quantile of the expenditure distribution. Similarly, the SC/ST households spent less on students at the lower quantile than at the higher quantile. The negative effect of school education is much strong at the 90th quantile compared to the 10th quantile. The household expenditure on professional education at the bottom quantiles is also much higher than that at the upper quantiles. The same is the case with non-financial aid except for male students at the 10th quantile.

Table 7. Quantile Regression Estimates of Household Education Expenditure in India by Gender and Community

Variable	Dependent Variable : <i>ln(HHEDExp)</i>							
	Males		Females		SC/ST		Non-SC/ST	
	Q10	Q90	Q10	Q90	Q10	Q90	Q10	Q90
<i>lnPCE</i>	0.61*** (0.015)	0.53*** (0.011)	0.65*** (0.018)	0.57*** (0.012)	0.67*** (0.024)	0.57*** (0.017)	0.61*** (0.013)	0.54*** (0.010)
<i>Age</i>	0.08*** (0.001)	0.07*** (0.002)	0.08*** (0.003)	0.07*** (0.002)	0.10*** (0.003)	0.08*** (0.002)	0.076*** (0.002)	0.063*** (0.001)
<i>MEducation</i>	0.02*** (0.001)	0.024** (0.001)	0.02*** (0.002)	0.02*** (0.001)	0.02*** (0.022)	0.02*** (0.001)	0.02*** (0.001)	0.03*** (0.001)
<i>FSelfEmp</i>	0.06*** (0.014)	0.04*** (0.012)	0.03*** (0.021)	0.03*** (0.012)	0.02 (0.023)	0.05*** (0.016)	-1.30*** (0.015)	-0.64*** (0.010)
<i>Male</i>	-	-	-	-	0.07*** (0.022)	0.04*** (0.016)	0.08*** (0.013)	0.06*** (0.010)
<i>Rural</i>	-0.16*** (0.016)	-0.12*** (0.013)	-0.19*** (0.020)	-0.17*** (0.013)	-0.15*** (0.026)	-0.18*** (0.018)	-0.17*** (0.014)	-0.12*** (0.010)
<i>Hindu</i>	0.14*** (0.018)	0.11*** (0.014)	0.09*** (0.022)	0.09*** (0.015)	0.05*** (0.033)	0.17*** (0.023)	0.14*** (0.016)	0.08*** (0.012)
<i>SC/ST</i>	-0.18*** (0.017)	-0.10*** (0.013)	-0.17*** (0.020)	-0.10*** (0.013)	-	-	-	-
<i>School10</i>	-0.23*** (0.041)	-0.10*** (0.033)	-0.40*** (0.054)	-0.85*** (0.037)	-0.34*** (0.071)	-0.88*** (0.049)	-0.30*** (0.038)	-0.86*** (0.029)
<i>Commerce</i>	-0.03*** (0.038)	-0.68*** (0.030)	-0.20*** (0.050)	-0.64*** (0.033)	-0.01*** (0.067)	-0.65*** (0.047)	-0.13*** (0.035)	-0.70*** (0.029)
<i>Science</i>	-0.04*** (0.042)	-0.44 (0.033)	-0.20*** (0.056)	-0.49*** (0.037)	-0.47*** (0.078)	-0.44*** (0.054)	0.08*** (0.039)	-0.48*** (0.029)
<i>Professional</i>	0.72*** (0.034)	0.22*** (0.031)	0.55*** (0.059)	0.37*** (0.040)	0.66*** (0.077)	0.30*** (0.053)	0.67*** (0.037)	0.24*** (0.028)
<i>Vocational</i>	0.36*** (0.046)	-0.13*** (0.036)	-0.07*** (0.077)	-0.10*** (0.052)	-0.24*** (0.084)	-0.18*** (0.058)	0.22*** (0.046)	-0.09*** (0.035)
<i>GovtSchool</i>	-1.31*** (0.017)	-1.19*** (0.013)	-1.26*** (0.021)	-0.69*** (0.014)	-1.24*** (0.027)	-0.72*** (0.019)	-1.30*** (0.015)	-0.64*** (0.011)
<i>EngMedium</i>	0.79*** (0.018)	0.72*** (0.015)	0.81*** (0.022)	0.60*** (0.015)	0.72*** (0.031)	0.59*** (0.022)	0.82*** (0.016)	0.62*** (0.013)
<i>InsChange</i>	0.07*** (0.018)	0.04*** (0.015)	0.05*** (0.024)	0.002*** (0.017)	0.07** (0.034)	0.04* (0.024)	0.05*** (0.017)	0.03*** (0.013)
<i>Scholarship</i>	-0.22*** (0.020)	-0.15*** (0.015)	-0.25*** (0.023)	-0.15*** (0.016)	-0.19*** (0.025)	-0.11*** (0.017)	-0.30*** (0.021)	-0.21*** (0.015)
<i>Aid</i>	-0.74*** (0.007)	-0.94*** (0.032)	-0.86*** (0.049)	-0.31*** (0.031)	-0.90*** (0.052)	-0.42*** (0.036)	-0.96*** (0.042)	-0.33*** (0.032)
<i>Constant</i>	0.52*** (0.161)	4.06*** (0.127)	0.34*** (0.200)	3.57*** (0.134)	0.40*** (0.262)	3.33*** (0.183)	0.67*** (0.147)	3.99*** (0.111)
Pseudo R-square	0.47	0.48	0.44	0.47	0.40	0.47	0.47	0.48
Obs.	52,239		41,207		27,832		65,614	

Note. Standard errors in parentheses. ***, **, * significant at 1%, 5% and 10% levels, respectively.

Conclusion and Policy Implications

Households spend a substantial part of their income on the education of their children in India. This private expenditure is increasing despite the subsidized education system with substantial government spending and various financial aid programmes. Households incur expenditure on education as an investment with sizable returns for various levels of education. Apart from the private returns, human capital investments have social returns also. Hence, the overall benefits of investing in education are well recognized and, therefore, household expenditure on education is worthy. However, there exist other barriers to education such as availability, access, and quality of education, and infrastructure and location of educational facilities. There are socioeconomic, demographic, and regional issues in the provision and utilization of educational services also. The main aim of this paper is to identify the differential effects of the determinants of private household expenditure on education in India using the 2014 NSSO 71st Round survey data and applying the quantile regression method. The paper focused on the socioeconomic characteristics of the students currently attending an educational institution. The quantile regression is used to capture the differential impacts across the distribution of private education expenditure.

The quantile regression estimates show consumption expenditure (a proxy for income), social group, type of institution, scholarship, and in-kind incentives and course the student is currently attending have significant effects on the household education expenditure. The proportion of income spent on the education of children increases more in the lower quantiles than in the higher quantiles. In other words, lower quantile households are more sensitive to the changes in household income than the higher quantile households. The general observation of gender differences in the educational expenditure by the households is not borne out in this study. The gender bias does exist only at the lower quantiles but is considerably less at the higher quantiles. From the social group perspectives, the SC/ST households spent less than the non-SC/ST groups at the lower quantiles and the difference gets reduced at higher quantiles, probably due to the access to community-specific scholarships and other incentives, especially free education and tuition fees waiver schemes. Compared to scholarships, the provision of educational materials such as books and stationaries has a higher impact on household expenditure on education. The type of institution the student goes to and the English medium of education are the important determinants of the private education expenditure. The proportion of expenditure spent on the government institution is a lot lesser than the expenditure spends on the private institution. It holds true across the quantiles especially for the lower quantiles, since more students from the lower quantiles attend the government institution. In addition, substantial differences exist in private expenditure on education on students attending government institutions and private institutions. The students from higher income groups tend to attend private institutions. The results of this paper reveal that despite the government policies and programmes to provide educational facilities such as free education, scholarships, and incentives to make education affordable, the lower-income groups still spend a considerable amount of their income on the education of children.

The quantile results of this paper show that government expenditures and household expenditures do not substitute each other; on the other hand, they complement each other. Therefore, to increase household financing of education, it is important that the government also increases its own allocation to education considerably. The policies, schemes, and programmes towards promoting gender equality and reducing gender bias in education need to be streamlined and strengthened in consideration of their differentials effects on different segments of the income classes. The policies should place more emphasis on providing educational materials than subsidizing education altogether. Especially, the lower income households require more incentives and information on the available educational incentives and financial supports. Perhaps, a direct money transfer programme to the households with enrolled children, as is the case with research fellowships and the central government general welfare programmes, or a voucher scheme, generally followed in Western countries, would enable the lower income households to cope up with the financial burden of educating children. Fine-tuning the schemes towards

girl's education would also reduce the gender gap and gender bias in household education expenditure. The government educational institutions where most lower income households send children to study should be improved both in terms of infrastructure and qualified teachers to improve educational standards.

Limitations of the Study and Scope for Future Research

The paper is based on the 2014 NSSO 71st Round survey data, a limitation of the study. This data set is used in view of the availability of certain data on the household level matched samples and its amenability to the quantile regression analysis. The use of recent data from the 2018 NSSO 75th Round survey data should give more insights. Apart from quantile level analysis, more disaggregated analysis at the state and rural-urban levels is not attempted in this paper. This study is based on cross sectional evidence. Econometric analysis over time using the various NSSO surveys will shed more light on the changes in the differential effects of the determinants as well as the gender gap of the household expenditure on education of children. Though, to some extent, the analysis of household education expenditure suggests the demand for education, closely related dimensions like participation and non-participation in schooling due to financial constraints are not examined here. A further limitation of this study is the omission of the impact of educational loans at the higher education level, which is not available in the data set.

Future research on the gender gap and gender disparity in education should aim to delineate the heterogeneity of the effects of the determinants of household education expenditure by socioeconomic and demographic status of the households. More research should also examine the differential effects of the institution and course of study and financial as well as educational material aids on household expenditure on education. Research should also identify the effects of alternative financing methods on household expenditure on education. An important area of future research is on the differential effects of the educational loans on household expenditure on education at the higher educational level. A comparative analysis over time should throw more light on the dynamics of the effects of policies and programmes on the household expenditure on education of children and the changes in the gender gap and gender disparity in education in India.

Author's Contribution

T. Lakshmanasamy, the sole author of this paper, singularly conceived, designed, developed, prepared, and wrote the whole paper.

Conflict of Interest

The author certifies that he has no affiliation with or involvement in any organization or entity with any financial interest, or non-financial interest in the subject matter, or materials discussed in this manuscript.

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