Private Returns to Education in India by Gender and Location: A Pseudo-Panel Approach

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Abstract

This study employs the pseudo-panel approach for estimating returns to education in India. Literature on returns to education highlights a problem of endogeneity of schooling variable which is found to be correlated with unobservables in error term of earnings function. One method for correcting this bias is to use panel estimation with individual fixed effects. The main limitation associated with this methodology is the lack of longitudinal data in developing countries. The average return to education comes at around 15% per year of education while OLS underestimates the returns at 10.8%. Higher education in India proves to be very rewarding.

Keywords: private returns; higher education; pseudo panel; schooling; endogeniety; spatial

JEL Code: *I21, J24*

1. Introduction

Education is often used to refer to formal learning. Its broader meaning covers a range of experiences including the building of understanding and knowledge through day to day experiences. The idea of considering expenditure on education as an investment instead of a part of consumption came in the 1960s. Becker (1962) presented a lengthy discussion of on-the-job training as another form of education. Some economists like Spence (1973) believe

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that education does not lead to higher wages (and productivity), it has a signalling effect only. Shultz (1975) showed that education was linked to the ability to relocate resources in disequilibrium situations.

In order to measure the impact of education on income, an important tool used is "rate of return" [2]. The rate of return to education can be evaluated based on private cost and social cost of education. A social rate of return (narrow concept) calculation covers the full resource cost of an individual's education including not only what the individual pays, but also what it really costs society to educate one person. Similarly, the earnings of educated individuals do not reflect the external benefits that affect society as a whole. Once externalities are added to the private benefits, we get social rate of return wide (which includes subsidies as well to treat costs as social costs). Human capital externalities are believed to cause a differential between private and social returns to education. A review of literature by Venniker (2000) finds weak support in favour of human capital externalities.(McMahon, W. W. (2010) and many others (including Sen),argue the opposite.)

There have been attempts to estimate private returns to education in India. Azam (2012) found an increase in returns to secondary and tertiary education in the 1990s. According to Duraisamy (2000), the private rate of return for the period 1993-94 increased as the level of education increased up to the secondary level and declined thereafter. Kingdon and Theopold (2005) estimated the mean returns to education during 1999-00 to be 8.34% and 7.81% during 1993-94. Foster and Rosenzweig (1996) find that the returns to (primary) schooling increased during a period of rapid technical progress at the time of green revolution, particularly in areas with the highest growth rates.

This paper, using more recent data from the 61st(2004-05)and 66th(2009-10) round of the National Sample Survey Organisation (NSSO),finds that education is more rewarding at higher levels(unlike Duraisamy) and returns to education do not decline after secondary level. The figures show that returns to higher education in India are generally high.

The purpose of this paper is to estimate private rate of return to education in India on the basis of gender and location. The pseudo panel approach is used to account for unobserved

[2] "Rate of return" is typically understood as the gain or loss on an investment over a specific period, expressed as a percent increase over the initial investment cost. Several economists have used this term to measure the impact of education on income or to show return on investment in human capital.

variables such as parental education, individual ability and motivational factors. The remainder of this paper is developed as follows: section 2 provides literature review, section 3 gives a brief discussion of data and modeling the impact of education on income of individuals; section 4 estimates returns to education and the conclusion and policy recommendations constitute section 5.

2. Literature

For the Indian scenario, Kijima (2006) attributes the increase in wage inequality in urban India (before 1991) to increase in the returns to skills. Fulford (2012) finds that in India both men and women with more education live in households with greater consumption per capita. Psacharopoulos and Patrinos (2002) made an international comparison of returns to education covering Asia, Europe / Middle East / North Africa, Latin America / Caribbean, OECD and Sub Saharan Africa region and found a negative relation between returns to education and level of economic development. They find that, the average rate of return to another year of schooling is 10%. The highest returns are recorded for low and middle-income countries. Tilak (2005) examines the relationship between higher education and economic development in India and finds it to be significant. Aggarwal (2012) findings indicate that returns to education increase with the level of education and differ for rural and urban residents. Private rates of return are higher for graduation level in both the sectors. In general, the disadvantaged social groups of the society tend to earn lower wages and family background is an important determinant affecting the earnings of individuals.

The literature on returns to education highlights a problem of endogeneity of the schooling variable. The individual choice of years of schooling is not exogenous and is found to be correlated with unobservables in the error term of the earnings function. These unobservables have been identified as 'ability' and 'motivation' which are correlated with years of education and earnings. This gives rise to an upward bias termed as an 'ability bias" (Card, 1999). Ashenfelter et al. (1999) indicates other omitted factors that may cause a downward bias. In fact in Becker 1975, ability and funding are the two crucial determinants of rate of return in his demand supply model which is widely quoted and discussed. Theoretically therefore ability was recognized to be one of the crucial determinants of the rate of return. The method for correcting this bias caused by unobserved heterogeneity across

individuals is to use panel estimation with individual fixed effects. The main limitation associated with this methodology is the lack of longitudinal data in developing countries.

Several studies from developing countries have overcome this limitation by using a pseudo-panel approach or instrumental variable techniques to estimate the rate of return to education (Bourguignon et al., 2004). Using a pseudo panel (also called synthetic cohort data set) from repeated cross sectional surveys, Warunsiri and McNown (2010) got higher estimates of returns to education in Thai workers born between 1946 and 1967 as compared to OLS. The previous studies on returns to education in India have not dealt with the problem of omitted variable bias. Hence, a re-examination of the returns to education in India is in order. Towards this end this study builds synthetic cohorts, controlling for cohort-specific effects, to deal with the problem of omitted variable bias.

3. The Models

3.1 Model 1: Standard Earnings Equation

This study begins with the modeling of private returns to education as done by the earning function method[3]. This method is also known as the 'Mincerian' method (Mincer 1974) and involves fitting a function of log-wages (ln(W)), using years of schooling (S), years of work experience (X) and its square (X^2) as independent variables. This function is called a "basic earnings function".

$$ln[W(S,X)]=\alpha_0+\beta S+\rho_0 X+\rho_1 X^2+\varepsilon \quad (1)$$

In this semi-log specification the coefficient of years of schooling (β) is the growth rate of wage with respect to S and hence, can be interpreted as the average private rate of return to one additional year of schooling.

People of different ages are members of different cohorts and may have been shaped by different experiences and influences. For example, labor market conditions and quality of schooling may vary overtime. This is the problem of unobserved individual heterogeneity. As pointed by Warunsiri and Mcnown (2010), 'individual workers in different cohorts have different opportunities, attitudes, and behavior'. The schooling variable is therefore endogenous as it is affected by differing ability, opportunity etc. For instance, high ability

[3] The 'earnings function approach' is distinct from Becker's approach to rate of return and 'Investment in Human Capital'.

people have higher wages for same level of education than low ability people. So leaving out a variable measuring 'ability' can create a problem.

There can also be a problem of omitted variable bias. This problem of omitted variable bias can be dealt with Instrument Variable method. Two such variables that can be used to measure ability are 'distance from school' and 'parental education'. We will not use IV method since data on such variables is not provided by NSS employment and unemployment survey.

3.2 Model 2: Pseudo Panel Approach

We need a panel data approach to account for heterogeneity at individual level. However, due to lack of longitudinal data for Indian households, we have to resort to pseudo panel approach[4]. As Verbeek (2008) explains, estimation techniques based on grouping individual data into cohorts are identical to instrumental variables approaches where the group indicators are used as instruments. Consequently, the grouping variables should satisfy the appropriate conditions for an instrumental variables estimator to be consistent. This not only requires that the instruments are valid (in the sense of being uncorrelated to the unobservables in the equation of interest), but also relevant, i.e. appropriately correlated with the explanatory variables in the model. Deaton (1985) suggests the use of age cohorts to obtain consistent estimators for β in (1) when repeated cross-sections are available. Let us define C cohorts, which are groups of individuals sharing some common characteristics. It is important to realize that the variables on which cohorts are defined should be observed for all individuals in the sample. This rules out time-varying variables (e.g. earnings), because these variables are observed at different points in time for the individuals in the sample.

Since the two rounds of National Sample Survey do not consist of same set of individuals, we cannot create a panel out of the two rounds. Instead, we define a set of C $(c=1, \ldots C)$ cohorts, based on year of birth. Taking average over the cohort members and obtaining an equation expressed in terms of cohort means will give us the units of observation in the pseudo – panel estimation. Averaging over the cohort members eliminates the individual heterogeneity such as the differing abilities or motivations across individuals. The resulting model can be written as:

$$ln[\bar{W}_{ct}]=\bar{\alpha_{ct}}+\beta\bar{S}_{ct}+\rho_0\bar{X}_{ct}+\rho_1\bar{X}_{ct}^2+\varepsilon \qquad c=1,\ldots C;\ t=1\ldots T \qquad (2)$$

[4] Appendix to the paper explains pseudo panel approach in detail.

where $\bar{W}_{ct}$ is the average value of all observed wages in cohort *c* in period *t* and similarly for the other variables in the model. Verbeek (2008) points out that "the main problem with estimating β from model (2) is that $\bar{\alpha}_{ct}$ depends on *t*, is unobserved, and is likely to be correlated with $\bar{X}_{ct}$. Therefore, treating $\bar{\alpha}_{ct}$ as part of the random error term is likely to lead to inconsistent estimators. Alternatively, one can treat $\bar{\alpha}_{ct}$ as fixed unknown parameters assuming that variation over time can be ignored *($\bar{\alpha}_{ct}=\alpha_c$)*. If cohort averages are based on a large number of individual observations, this assumption seems reasonable". Table1 depicts the size of cohort groups being large enough for this assumption to hold true.

Table 1: Cohort Size

Age	Observations	Age	Observations	Age	Observations
7	21,804	35	35,425	65	14,428
8	26,622	36	17,491	66	2,742
9	18,286	37	10,383	67	1,951
10	29,230	38	23,130	68	3,977
11	17,114	39	8,972	69	1,331
12	29,409	40	36,287	70	10,122
13	21,617	41	6,018	71	793
14	24,491	42	20,118	72	2,702
15	24,419	43	8,406	73	913
16	25,034	44	7,655	74	961
17	19,732	45	30,879	75	4,406
18	31,012	46	10,222	76	1,054
19	16,616	49	5,625	77	451
20	30,996	50	25,520	78	1,087
21	15,370	51	4,098	79	368
22	26,211	52	11,779	80	2,928
23	16,709	53	4,757	81	241
24	19,837	54	5,908	82	546
25	29,023	55	18,928	83	213
26	19,926	56	6,740	84	245
27	15,493	57	3,947	85	1,063
28	26,091	58	8,909		
29	10,606	59	2,969		
30	35,567	60	18,425		
31	9,930	61	2,731		
32	26,613	62	7,608		
33	11,082	63	2,860		
34	13,005	64	2,884		

Since the number of observations per cell varies substantially, the disturbance term is heteroskedastic, leading to biased standard errors. We correct this heteroskedasticity using weighted least squares (WLS) estimation by weighing each cell with the square root of the number of observations in each cell (Dargay, 2007). We present estimates based on a pseudo-panel data set with one year cohorts. One year cohort is a group of observations who share the same year of birth. 79 age cohorts are taken starting from the age of 7 years to 85 years.

In order to account for gender and location differences in returns to education, model (2) is also estimated separately for rural male, rural female, rural (both sexes), urban male, urban female and urban (both sexes).

3.3 Model 3: Earnings Equation with Education Level Dummies

The earnings function method can be used to estimate returns to education at different levels by converting the continuous years of schooling variable (S) into a series of dummy variables, say D_P, D_M, D_S, D_{SS}, D_G, D_{PG} and D_D, to denote the fact that a person has completed the primary, middle, secondary, senior secondary, graduation, post-graduation and technical diploma/certificate course respectively. Of course, there are also people in the sample with no education. This group is taken as the control group. This function known as an "extended earnings function" can be specified as:

$$ln[W(S,X)]=\alpha_0+\beta_P D_P+\beta_M D_M+\beta_S D_S+\beta_{SS} D_{SS}+\beta_G D_G+\beta_{PG} D_{PG}+\beta_D D_D+\rho_0 X+\rho_1 X^2+\varepsilon \qquad (3)$$

where $\beta_{P,}\ \beta_{M}.....\beta_D$ are educational levels dummy coefficients.

The private rate of return to different levels of education can be derived from the following formula:

$$RR_j= (\beta_j - \beta_{j-1}) / (S_j - S_{j-1}),$$

where S stand for the total number of years of schooling for each successive level of education (j=primary, middle, secondary, senior secondary, graduation, post-graduation and Diploma/certificate course respectively) and $j-1$ refers to previous level of education.

In order to account for gender and location differences in returns to education, model (3) is estimated separately for rural male, rural female, rural (both sexes), urban male, urban female and urban (both sexes).Since we cannot introduce individual dummies in pseudo panel, we estimate model (3) using Ordinary least squares (OLS) technique on each cross sectional data set. We find that though the OLS technique underestimates the average returns to education

(Table 3), it can be used to compare the returns for different levels of education. Comparison of coefficients over different rounds is also done and statistically tested.

Data on wage and salary earnings are collected for regular salaried/wage employees and casual wage labor. Daily wages in each activity are obtained by dividing weekly wages by total number of days in each activity. Potential experience refers to the number of years a person is likely to be in labor force having completing education. Data on potential experience was obtained by using the formula:

Potential experience = Age – years of education – 5

It is assumed that an individual starts to work immediately after completing his/her education and education starts after the age of 5.

4. Estimates of Returns to Education

According to our estimates 27.7% of India's population was illiterate in 2009-10 (Table 2). A large portion of India's population (33%[5]) has acquired only primary education or else literate through means other than formal schooling and 77.65% of them reside in rural areas. Around 16.06% of population has acquired education till middle level. Only 6.25% of India's population has completed senior secondary education. The situation worsens when we look at higher education as only 4.3% of India's population has completed graduation and only 1.26% has education at post graduate level. The situation has improved overtime if we compare education attainment in 2004-05 but there is still much to achieve. Around 64.3% of the illiterate population are females and 85.7% of the illiterate population resides in rural areas in2009-10.

If we look at age composition of the Indian population, around 20% of the population constitutes children below or up to 10 years of age and about half of the population is up to 25 years of age. The mean age of the Indian population is 28.5 years with standard deviation 18.8 years (source: NSSO 66thround).It is not incorrect to say that “the heart of India lies in its villages” as majority of Indian population (73.9%) resides in rural areas.

[5]The figures are of effective literacy rates i.e. for age 7 and above. Estimates may vary depending on definition of literacy, for example youth literacy rate or adult literacy rate.

Table 2: Percentage distribution of population according to education levels

Education level	**Percent of population**	
	2004-05	**2009-10**
Illiterate	34.9	27.8
Literate through means other than formal schooling	17.3	16.2
Primary	16	16.7
Middle	14.7	16
Secondary	7.7	10.5
Higher secondary	4.3	6.2
Graduate	3.2	4.3
Diploma / certificate course	0.94	.86
Post graduate and above	0.9	1.26

On looking at the descriptive statistics (Table 3), we find that the mean of total daily wages (cash and kind) is Rs 172 and that of total weekly wages is Rs 1078. The values of respective standard deviations indicate that data is highly dispersed. The number of observations for "total daily wages/total weekly wages" is less than the total number of observations in the data set as the data on wage and salary earnings are collected only for regular salaried/wage employees and casual wage labour. Such data represented more than 190 million of India's population in 2009-10 and more than 166 million in 2004-05.

Table 3: Summary statistics of quantity variables, 2009-10

Variable	**Observations**	**Mean**	**Standard Deviation**	**Min**	**Max**
Total daily wages (cash and kind) in rupees	75518	172	243	0	9857
Total weekly wages (cash and kind) in rupees	75518	1078	1661	0	69000
Potential experience[3] in years	500262	18.6	19.2	-5	115
Age in years	500262	28.5	18.8	0	120
Years of education	500262	5	4.6	0	17
Female population dummy	500262	.48	0.5	0	1
Rural population dummy	75518	.74	0.44	0	1

[3] The values for potential experience (min and max) are extreme due to the fact that these are calculated values from the data on age and years of education.

4.1 Estimates of Private Return to Education

The average return to education is found to be around 11.7% and 10.76% per year of education for the periods 2004-05 and 2009-10 respectively (Table 4) while the pseudo panel estimates for returns to education according to weighted least squares are 15%. The coefficient of experience and square of experience is positive and negative respectively and significant at 1% level of significance indicating that age earning profile is upward sloping and concave, as pointed out by Becker(1960).

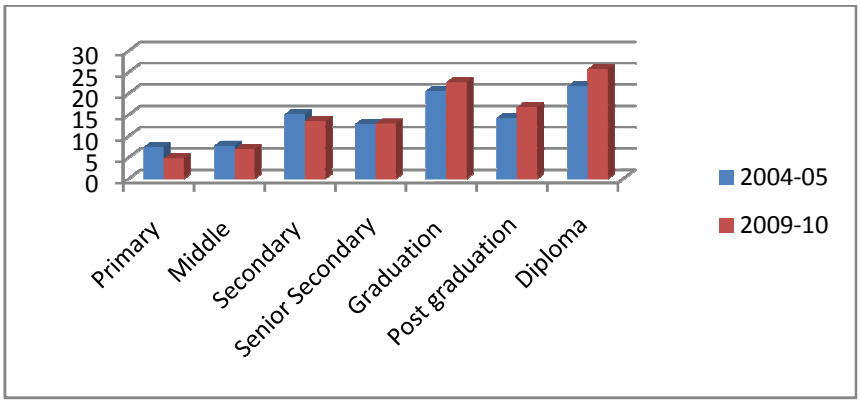
The estimated return to primary education is 7.35% whereas returns to middle, secondary and senior secondary levels are 7.68%, 15.13% and 12.82% respectively for the year 2004-05. Similarly for 2009-10, estimated returns to primary education is 4.75% and 6.89%, 13.5% and 12.9% for middle, secondary and senior secondary levels respectively (figure 1).Returns to school education were higher in 2004-05 whereas, for higher education returns are higher for the recent period 2009-10. School education has become relatively less rewarding and higher education more rewarding over the years. On statistically testing the difference in returns overtime, it is observed that fall in returns to primary education is significant at 5% level of significance and returns to technical education have increased with 10% level of significance.

Table 4: Estimated earnings equation (log of total daily wages as dependent variable)

Independent variables	**Coefficients**		
	2004-05	**2009-10**	**Pseudo-Panel (WLS)**
Years of education	0.1167***(0.0004)	0.1076*** (0.0005)	0.1504*** (0.0002)
Potential experience	0.057***(0.0005)	0.0418*** (0.0006)	0.0553*** (0.0000)
Potential experience square	-0.0007***(0.0000)	-0.0005*** (0.0000)	-0.0006*** (0.0000)
Constant	2.7*** (0.0080)	3.4548*** (0.0093)	2.7767*** (0.0015)
R^2	0.4409	0.3811	-

*Note: *** means significant at 1% level of significance. Values in parenthesis are standard errors of respective coefficients.*

Figure 1 Education level wise private returns to education



In India, around 28.9% of the population had acquired education only till primary/middle level in 2009-10. The returns to secondary education are twice as large as those of primary/middle level education. Hence, it pays to acquire secondary education for those who have acquired education till primary/middle level. The returns to college education stand at 22.6% and university education at 16.81%. Returns to technical diploma/certificate stand highest at 25.69%. These figures imply that returns to higher education in India are generally high. It is evident that returns to school education are convex in India for both the periods under study. Returns are not only convex but downward sloping after a level. This may be because of the fact that possible opportunities are more once you attain a certain level of education and obtaining a higher level of education does not lead to a higher return on it.

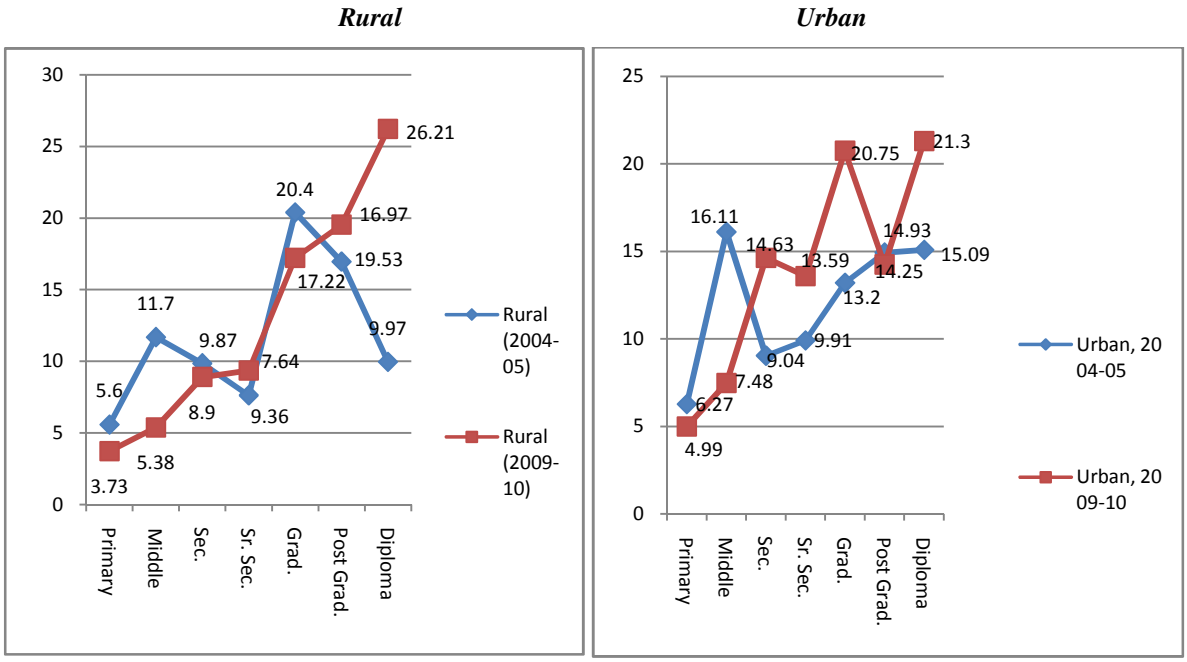
Table 5: Estimated earnings equation for levels of education(log of total daily wages as dependent variable) and returns to education in India

Independent variables	**Coefficients 2004-05**	**Returns to education 2004-05 (%)**	**Coefficients 2009-10**	**Returns to education 2009-10(%)**
Primary	0.3675 (0.0065)	7.35	0.2374 (0.0070)	4.75
Middle	0.5979 (0.0065)	7.68	0.4442 (0.0070)	6.89
Secondary	0.9005 (0.0081)	15.13	0.7143 (0.0081)	13.5
Senior Secondary	1.1569 (0.0105)	12.82	0.9724 (0.0106)	12.9
Graduation	1.7750 (0.0093)	20.60	1.6502 (0.0093)	22.6
Post-graduation	2.0598 (0.0143)	14.24	1.9864 (0.0136)	16.81
Diploma/certificate course	1.5898 (0.0141)	21.64	1.4861 (0.0167)	25.69
Potential experience	0.0533 (0.0005)	-	0.0417 (0.0006)	-
potential experience square	-0.0007 (0.0000)	-	-0.0005 (0.0000)	-
Constant	2.9496 (0.0080)	-	3.71 (0.0090)	-
R^2	0.4431	-	0.4213	-

Note: All the coefficients are significant at 1% level of significance. Values in parenthesis are standard errors of respective coefficients.

Returns to education have risen overtime for higher education; this is particularly true for urban areas in comparison to rural areas. Returns have increased in 2009-10 from secondary level onwards in urban areas and the difference is also substantial (Figure 2). In fact in rural areas, return to education has declined overtime except for post-graduation and technical diploma courses. It can be concluded that education has become more rewarding in urban areas than in rural areas in recent years.

Figure 2: Location Wise Returns to Education in 2004-05 and 2009-10



4.3 Gender and Spatial Comparison of Returns to Education

Pseudo panel estimates using weighted least square technique (Table 6) depict that overall returns to male education is higher (13.5%) than female education (12.6%) and z test confirms the finding as the difference comes out to be significant at 1% level of significance.

Returns are generally higher in urban areas (except for post-graduation and diploma courses) because of greater job opportunities. There is a sharp increase in return for secondary level in urban areas in comparison to rural areas. It further rises for college education and falls for university education in urban areas but continue to rise in rural areas. This could be because of supply and demand mismatch in rural areas. Returns to technical diploma/certificate courses are highest in both rural and urban areas. Again, this could be because of higher

employability of vocational courses in both rural and urban areas. Pseudo panel estimates using weighted least square technique (Table 6) also depict that overall returns to education in urban areas is little higher (15.08%) than in rural areas (15.04%), but the difference does not comes out to be significant.

Table 6: Gender Wise and Location Wise Estimated earnings equation (log of total daily wages as dependent variable), Pseudo Panel (WLS)

Independent variables	**Coefficients**			
	Rural	**Urban**	**Male**	**Female**
Years of education	0.1504***(0.0002)	0.1508*** (0.0004)	0.1353*** (0.0003)	0.126*** (0.0003)
Potential experience	0.0423***(0.0000)	0.0763*** (0.0001)	0.056*** (0.0001)	0.0425*** (0.0001)
Potential experience square	-0.0004***(0.0000)	-0.0010*** (0.0000)	-0.0007*** (0.0000)	-0.0005*** (0.0000)
Constant	2.819*** (0.0014)	2.688*** (0.0030)	2.903*** (0.0019)	2.8197*** (0.0018)

*Note: *** means significant at 1% level of significance. Values in parenthesis are standard errors of respective coefficients.*

Figure 3: Returns to different levels of education (Location wise), 2009-10

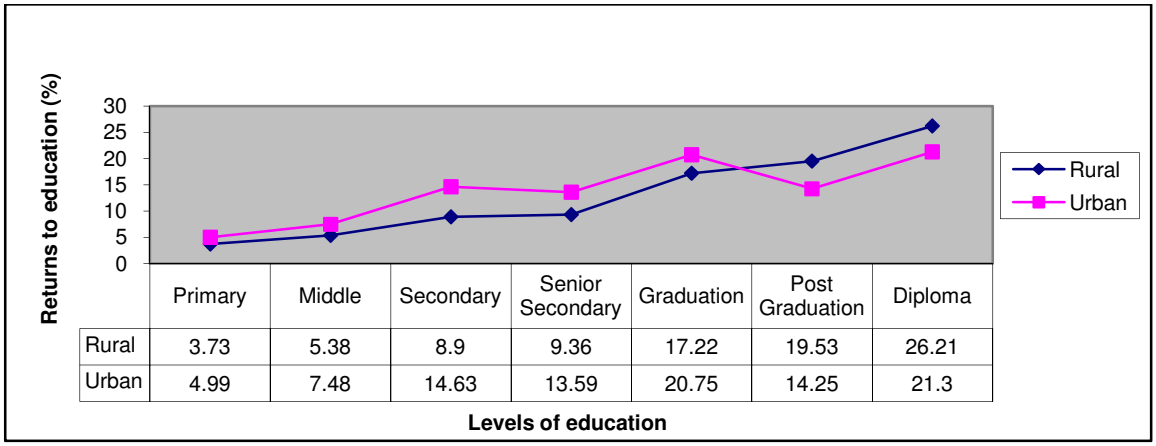


Figure 4 reveals gender differences in rural areas. It is observed that the returns to female education at primary level are lower than male education and the gap further increases for middle level. The situation gets completely reversed for further levels of education till college education. Returns to female education for secondary, senior secondary, technical diploma / certificate and graduation are greater than male education. There is a fall in returns for rural females at post graduate level.

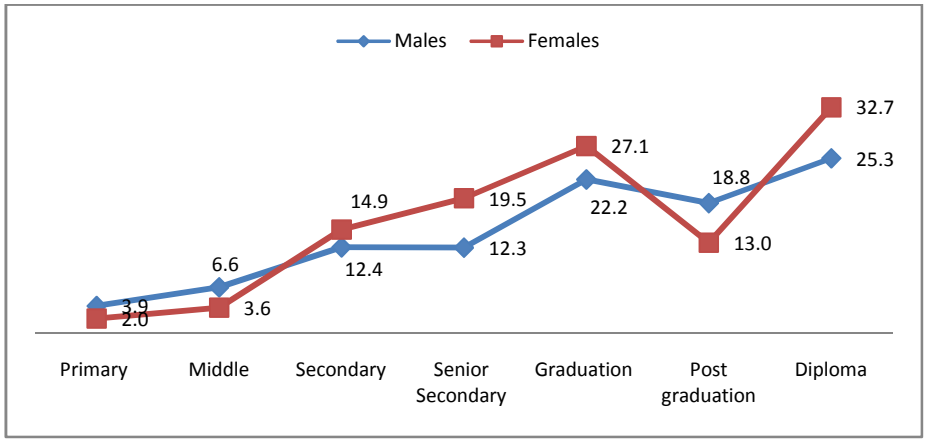
Table 7: Gender wise estimated earnings equation for levels of education (log of total wages as dependent variable) and returns to education in India

Independent variables	Returns to Education (%) 2004-05		Returns to Education (%) 2009-10	
	Males	**Females**	**Males**	**Females**
Primary	0.2825 (5.65)	0.2046 (4.09)	0.1934 (3.87)	0.1017 (2.03)
Middle	0.5053 (7.43)	0.3247 (4.00)	0.3904 (6.57)	0.2103 (3.62)
Secondary	0.7960 (14.53)	0.7044 (18.98)	0.6381 (12.38)	0.5092 (14.94)
Senior Secondary	1.0393 (12.17)	1.0911 (19.34)	0.8847 (12.33)	0.899 (19.49)
Graduation	1.6527 (20.45)	1.8126 (24.05)	1.5509 (22.21)	1.7114 (27.08)
Post-graduation	1.9684 (15.78)	2.0311 (10.93)	1.9265 (18.78)	1.972 (13.03)
Diploma/certificate course	1.4506 (20.56)	1.7173 (31.31)	1.3903 (25.28)	1.553 (32.7)
Potential experience	0.0560	0.0404	0.0427	0.0348
Potential experience square	-0.0008	-0.0006	-0.0005	-0.0005
Constant	3.0799	2.8674	3.8221	3.6024
R^2	0.4505	0.4255	0.4182	0.4311

Note: All the coefficients are significant at 1% level of significance. Values in parenthesis are returns to education at that level of education.

Returns to female education for technical diploma / certificate are as high as 37.13% whereas it is 24.55% for male education. This may be because of scarcity premium on female workers, as very few women attain higher levels of education and this constrains labor supply. Similar results are also found for Pakistan, China and Malavi (Aslam, 2007, Zhang et al, 2005 and Chirwa and Matita, 2009).

Figure 4: Gender wise returns to education in India (2009-10)



Pseudo panel estimates using weighted least square technique (Table 8) depict that overall returns to education in rural areas is higher for males (14.9%) in comparison to females (12%) and the difference is significant at 1% level of significance.

In contrast to rural areas, returns to female education are higher than returns to male education in urban areas except for middle level and post-graduation. This tells us that

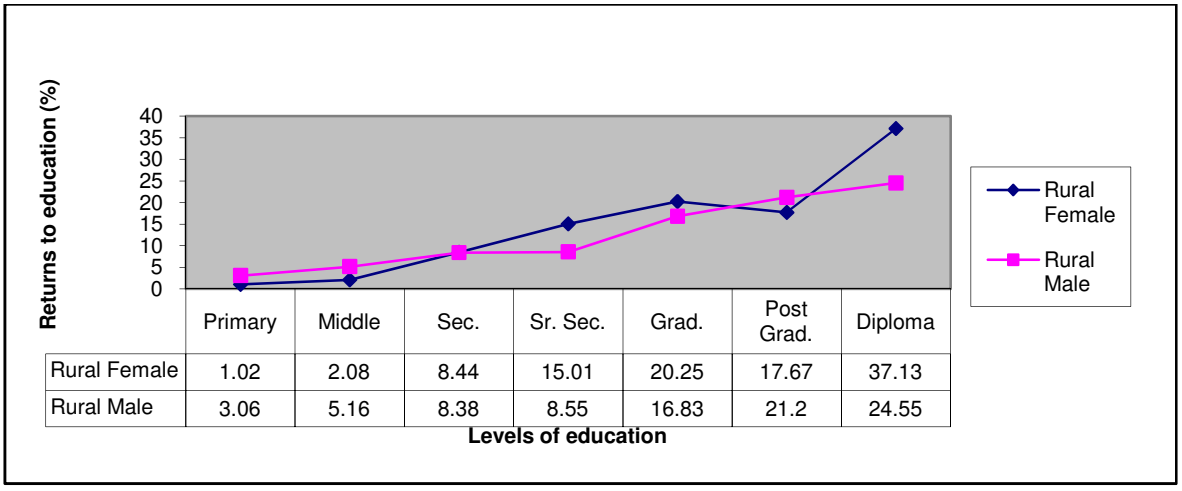
secondary education proves to be very rewarding for urban females. Returns to education for urban males are highest for technical diploma / certificate courses, whereas in case of females they are highest for Secondary education followed by college education. This indicates that secondary education and graduation prove to be rewarding for urban females in labour market. Pseudo panel estimates (Table 8) depict that overall returns to education in urban areas is higher for females (18.75%) in comparison to males (14%)and the difference is significant at 1% level of significance.

Table 8: Gender Wise and Location Wise Estimated earnings equation (log of total daily wages as dependent variable), Pseudo Panel (WLS)

Independent variables	**Coefficients**			
	Rural Male	**Rural Female**	**Urban Male**	**Urban Female**
Years of education	0.1495***(0.0003)	0.1197*** (0.0003)	0.1399*** (0.0005)	0.1875*** (0.0005)
Potential experience	0.0424***(0.0000)	0.0342*** (0.0000)	0.0796*** (0.0001)	0.0707*** (0.0001)
Potential experience square	-0.0004***(0.0000)	-0.0003*** (0.0000)	-0.0011*** (0.0000)	-0.0009*** (0.0000)
Constant	2.8262*** (0.0019)	2.8915*** (0.0021)	2.7889*** (0.0035)	2.1894*** (0.0043)

*Note: *** means significant at 1% level of significance. Values in parenthesis are standard errors of respective coefficients.*

Figure 5: Returns to different levels of education in rural areas (gender wise), 2009-10

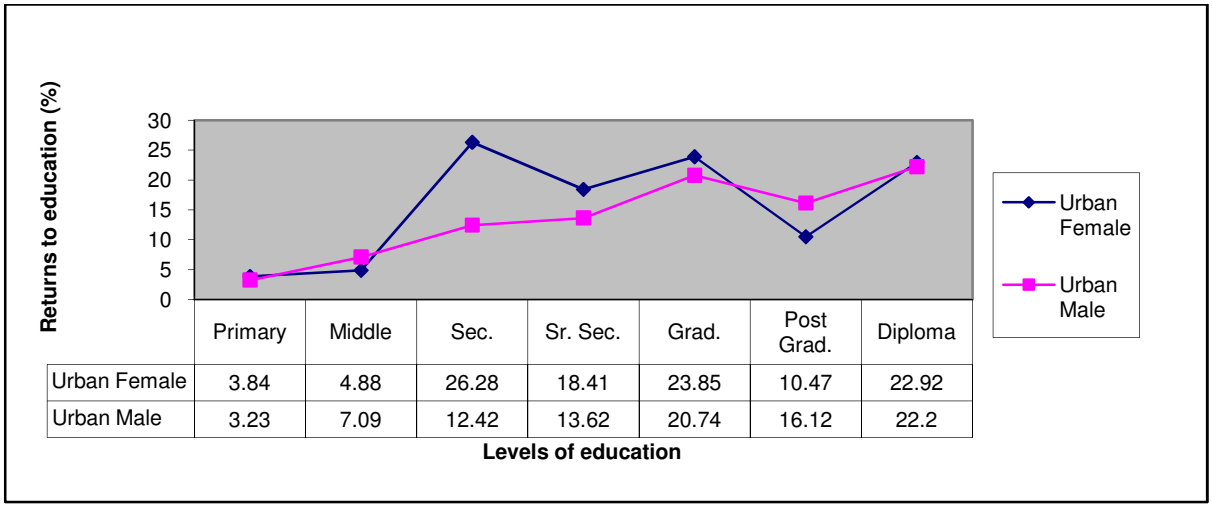


	Primary	Middle	Sec.	Sr. Sec.	Grad.	Post Grad.	Diploma
Rural Female	1.02	2.08	8.44	15.01	20.25	17.67	37.13
Rural Male	3.06	5.16	8.38	8.55	16.83	21.2	24.55

On comparing the returns to education for females in rural and urban areas (Figure 7), we observe that returns to school education are higher for urban females for all levels of schooling and the gap is largest for secondary level followed by middle level. As far as

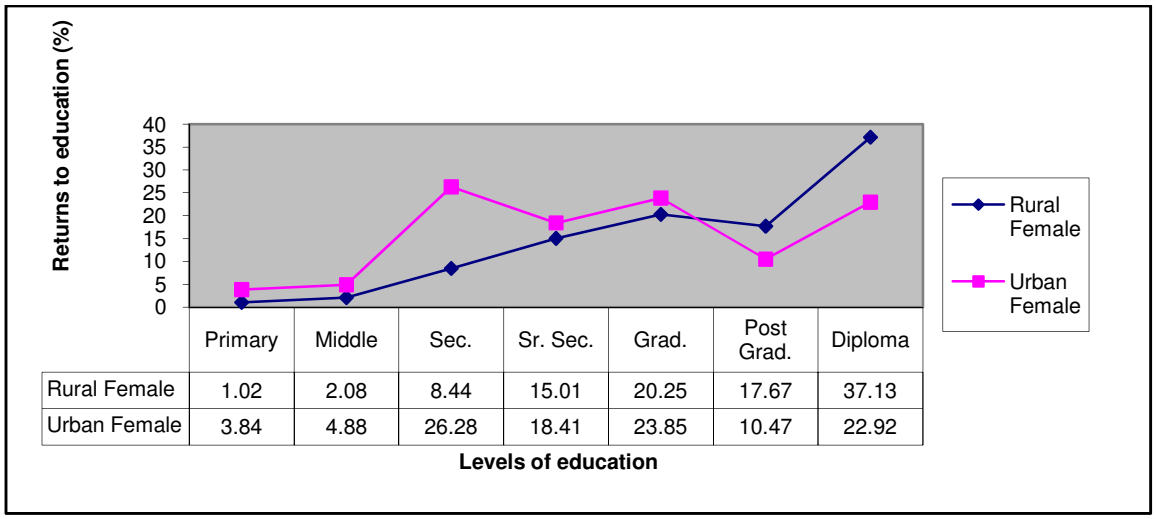
higher education is concerned, returns to technical diploma / certificate are much higher for rural females than for urban females.

Figure 6: Returns to different levels of education in urban areas (gender wise), 2009-10



	Primary	Middle	Sec.	Sr. Sec.	Grad.	Post Grad.	Diploma
Urban Female	3.84	4.88	26.28	18.41	23.85	10.47	22.92
Urban Male	3.23	7.09	12.42	13.62	20.74	16.12	22.2

Figure 7: Returns to education (Rural female Vs Urban female), 2009-10



	Primary	Middle	Sec.	Sr. Sec.	Grad.	Post Grad.	Diploma
Rural Female	1.02	2.08	8.44	15.01	20.25	17.67	37.13
Urban Female	3.84	4.88	26.28	18.41	23.85	10.47	22.92

Pseudo panel estimates using weighted least square technique (Table 8) also depict that overall returns to education is higher for urban females (18.75%) than for rural females (12%) and the difference is significant at 1% level of significance. In contrast to this finding, pseudo panel estimates using weighted least square technique (Table 8) also show that the overall returns to education for rural males (14.95%) is higher than for urban males (14%) and the difference is significant at 1% level of significance. Hence, rural urban differences in return become visible when we do gender wise comparison.

Figure 8: Returns to education (Rural male Vs Urban male), 2009-10

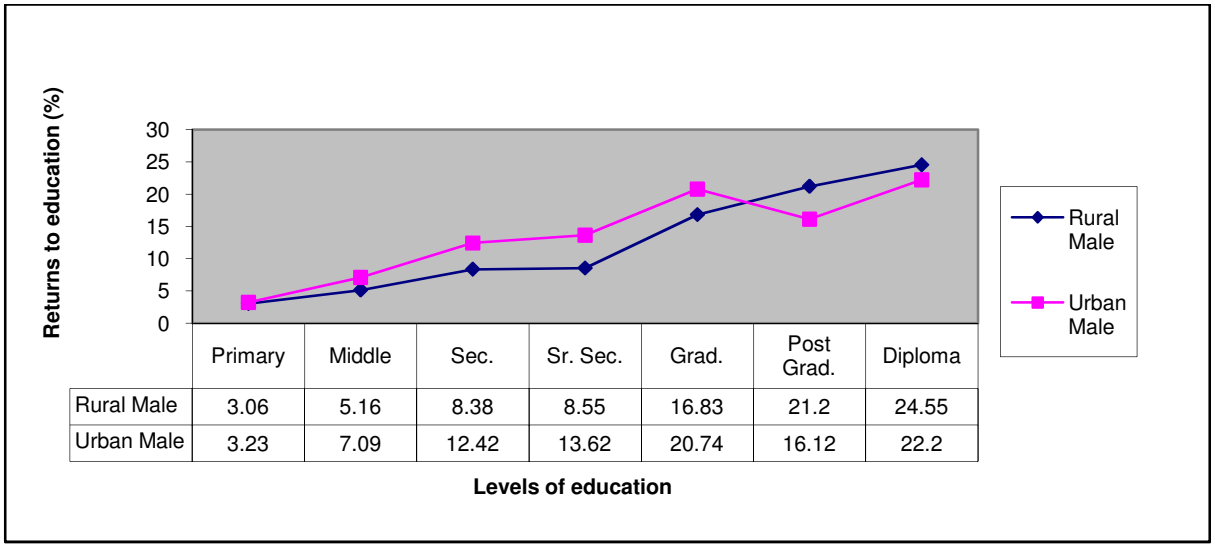


Table 9: Gender and location wise estimated earnings equations and returns to education in India (log of total daily wages as dependent variable), 2009-10

	Rural			Urban		
	Female	**Male**	**Both**	**Female**	**Male**	**Both**
Primary	0.0512 (1.02)	0.1532 (3.06)	0.1863 (3.73)	0.1920 (3.84)	0.1617 (3.23)	0.2496 (4.99)
Middle	0.1136 (2.08)	0.3079 (5.16)	0.3476 (5.38)	0.3383 (4.88)	0.3745 (7.09)	0.4739 (7.48)
Secondary	0.2825 (8.44)	0.4756 (8.38)	0.5257 (8.9)	0.864 (26.28)	0.6229 (12.42)	0.7666 (14.63)
Senior Secondary	0.5827 (15.01)	0.6466 (8.55)	0.713 (9.36)	1.2322 (18.41)	0.8954 (13.62)	1.0385 (13.59)
Graduation	1.1902 (20.25)	1.1515 (16.83)	1.2295 (17.22)	1.9478 (23.85)	1.5176 (20.74)	1.6610 (20.75)
Post graduation	1.5436 (17.67)	1.5756 (21.2)	1.6201 (19.53)	2.1572 (10.47)	1.8400 (16.12)	1.9461 (14.25)
Diploma/certificate course	1.3253 (37.13)	1.1377 (24.55)	1.2372 (26.21)	1.6906 (22.92)	1.3394 (22.2)	1.4645 (21.3)
Potential experience	0.0227	0.0324	0.0311	0.0513	0.0537	0.0539
potential experience square	-0.0003	-0.0004	-0.0004	-0.0007	-0.0007	-0.0007
Constant	3.8018	3.9377	3.847	3.3423	3.8883	3.7205
R^2	0.1905	0.2329	0.2315	0.5093	0.4652	0.4597

Note: All the coefficients are significant at 1% level of significance. Values in parenthesis are returns to education (%) at that level of education.

5. Conclusion and Policy Recommendations

This paper has discussed the enormous benefits associated with higher levels of education. Investment in human capital enables individuals to increase their future earnings and enhance their experience in the labour market. This study employs the pseudo-panel approach for

estimating returns to education in India for different levels of education, location wise and gender wise, using the standard Mincer equation. People of different ages are members of different cohorts and may have been shaped by different experiences and influences. For example, labor market conditions and quality of schooling may vary overtime. This is the problem of unobserved individual heterogeneity. The schooling variable is therefore endogenous as it is affected by differing ability, opportunity etc. For instance, high ability people have higher wages for each level of education than low ability people. So leaving out a variable measuring 'ability' can create a problem.

We need a panel data approach to account for heterogeneity at individual level. But due to lack of longitudinal data for Indian households, we have to resort to pseudo panel approach. Pseudo-panel dataare constructed from 61st and 66th round of NSSO employment and unemployment survey data. The average return to education, as calculated in this study, is about 15% per year of education. Return to secondary education is twice as large as that of primary/middle level education. Hence, it pays to acquire secondary education as returns to education are convex. College education in India proves to be rewarding with a return of 22.59% and university education at 16.8%.

A gender wise comparison of returns shows that returns at initial levels of education (primary and middle) are lower for females but for higher levels of education the situation reverses. Returns to female education for technical diploma / certificate are as high as 37.13% whereas it is 24.55% for male education. In urban areas, returns to female education are higher than returns to male education except for middle level and post-graduation. The gap is largest for secondary education. This tells us that secondary education proves to be very rewarding for urban females. Pseudo panel estimates show that returns to education in urban areas are higher for females (18.75%) in comparison to males (14%), whereas in rural areas, the situation is reversed as returns are higher for males (14.95%) in comparison to females (12%). Hence, it can be said that education is relatively more rewarding for females in urban areas and for males in rural areas, given the nature of job and opportunities.

Returns to schooling are generally lower in rural areas than in urban areas. The returns to higher education (college education and technical diploma / certificate) however, present a different picture, where the returns in rural areas are greater than returns in urban areas. This observation combined with the fact that 87.45% of rural labour force is employed in

agriculture and forestry and related activities implies that education has positive impact on productivity of labourers employed in agriculture sector particularly when education incorporates extension programmes and knowledge about agricultural techniques in terms of seeds and fertilisers. Hence education can improve the growth performance of agricultural sector too and there should be more emphasis on education at diploma courses requiring some specialisation.

Overtime comparison of estimates reveal that returns to school education were higher in 2004-05 whereas for higher education, returns are higher for the recent period 2009-10. School education has become relatively less rewarding and higher education more rewarding over the years. This finding is particularly true for urban areas in comparison to rural areas. Returns have increased in 2009-10 from secondary level onwards in urban areas and the difference is also substantial. In rural areas, returns to education have declined overtime except for post-graduation and technical diploma courses as job opportunities are not there in the rural areas.

Appendix

While estimating earnings equation, where dependent variable is log of daily wages and regressors are years of schooling, experience and its square, there could be a problem of endogeniety as there can be factors influencing both level of education and earnings, for example, 'ability' of an individual impacts both his/her earnings and educational attainment. In order to account for such individual specific effects, panel data estimation with individual fixed effects could be used. But, for Indian scenario, the data set that is being used for estimation consists of two independent rounds of surveys consisting of different sets of individuals. As a result of which panel data cannot be constructed from these surveys. Another way that is used in the paper is to generate a pseudo panel based on year of birth cohorts where all the observations/individuals with same year of birth are grouped together. Taking average over the cohort members for the variables under study, we generate a pseudo panel consisting of 158 (79+79) observations, as 79 age cohorts are generated for each round of survey. Averaging over the cohort members eliminates heterogeneity at individual level. As observed in table A1, number of observations per year cohort varies substantially, as a

result of which the disturbance term may be heteroskedastic. In order to deal with it, we use weighted least squares (WLS) estimation by weighing each year cohort with the square root of the number of observations in it.

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